

EIA of the WPP park “Valmiera-Valka”

Environmental Impact Assessment for the
implementation of the wind power plant park
“Valmiera-Valka” and its related infrastructure
project in Valmiera and Valka municipalities

Enviroprojekts

16.10.2024

Public Consultation version of the EIA Report

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ATTACHMENTS

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EIA Programme No 5-03/9/2023 with amendments

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Letters from institutions:

- Letter from the Nature Conservation Agency 17.04.2024. No 4.9/2372/2024-N
- Letter from the Nature Conservation Agency 23.05.2024. No 1.6.1/3200/2024-N
- Valka Municipality, Letter No 3.9/23/780 of 5 September 2023
- Valmiera Municipality, letter No 4.1.8.3/23/9582 of 29 October 2023
- Letter No 4-6/1385 of 20 September 2024 from the Latvian Centre for Environment, Geology and Meteorology on pollutant concentrations in the potential impact area of the polluting activity

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Annex 7

Noise assessment

8. Attached

Assessment of the flicker effect

9. Attached

Landscape assessment

10. Attached

Assessment by hydrologist/hydrogeologist

Annex 11

Calculation of costs and benefits

Annex 12

Mitigation measures

Annex 13

SKDS survey

14. Attached

Summary of the EIA Report

15. Attached

Polish expert's assessment of the WPP

16. Attached

Cartographic material (*.shp or *.gdb format):

- planned infrastructure facilities, access roads,
- deforested areas
- natural values: biotopes, habitats of rare species, nests of large birds and risk zones around them, beech trees, micro-reserves, Natura 2000 sites, planned Special Protection Areas, protected areas of JSC "Latvia's State Forest", protection zones and other natural values identified during the preparation of the EIA report.

Introduction

The Environmental Impact Assessment (hereinafter - EIA) has been prepared for the proposed activity - implementation of the wind power plant (hereinafter - WPP) park "Valmiera-Valka" and its related infrastructure project in the Plani municipality of Valmiera county and the Vijciema and Valka municipalities of Valka county.

During the initial feasibility phase of the project, 93 potential WPP sites were investigated. In consultation with certified experts and the Nature Conservation Agency, the number of WPPs was reduced - eliminating those that would cause significant adverse changes to the environment - to 84 WPPs, which were examined in more detail as part of the EIA procedure.

Sequentially, from 84 WPP sites up to 38 WPPs were recommended for construction of the proposed action. The EIA report provides an explanation of the analysis of all the WPP locations that determine the feasibility of these WPP parks. Each potential WPP could have a rated capacity of up to 8 MW. The proponent of the proposed activity is Latvijas vēja parki Ltd, registration No 40203415150, registered office: Pulkveža Brieža iela 12, Rīga, LV-1010. According to the decision of the Cabinet of Ministers, JSC Latvenergo has become the owner of 100% of shares in Latvijas vēja parki Ltd. Latvian Wind Parks Ltd. is a national company whose goal is energy independence, long-term renewable energy and value growth for the benefit of all Latvian citizens and businesses.

Decision No 5-03/9/2023 of the Environment State Bureau (hereinafter - ESB) on the application of EIA procedure for the proposed activity of Latvijas vēja parki Ltd - implementation of the Valmiera-Valka WPP park and its related infrastructure project in the Plani municipality of Valmiera county and the Vijciems and Valka municipalities of Valka county was adopted on 15 August 2023. EIA Programme No 5-03/9/2023 (as amended on 10 January 2024, No 5-02-1/4/2024) was issued on 12 September 2023 (Annex 1). An initial public consultation on the proposed action was held on 10-30 November 2023.

During the preparation of the EIA, consultative working group meetings on the Valmiera-Valka wind park were held in February 2024 in Valka and Seda on the following topics: landscape, biodiversity, physical impacts of the wind park and socio-economic feasibility and climate change impacts of the wind park. The meetings provided information on the EIA procedure; the methods used to prepare the EIA, and answered citizens' questions about the planned project.

The implementation of the Valmiera-Valka WPP Park and its related infrastructure project in the Plani municipality of Valmiera county and the Vijciems and Valka municipalities of Valka county (hereinafter - the Proposed Action) includes and is being assessed in the framework of the EIA procedure also infrastructure related to the functioning of the WPP Park - construction and operation of electricity transmission cable lines, transformer substations, electricity storage solutions and access roads.

Of the 84 WPPs initially assessed, 41 WPPs were identified as having significant environmental impacts on bird species, habitats or landscapes, following assessments by natural experts received in early 2024. The potential WPPs to be built were grouped into two alternative WPP park locations:

Alternative A consists of 29 WPPs in a compact area in the SW between Sedas and Puksi swamp and Gauja river;

Alternative B consists of 43 WPPs: 14 WPPs in a compact area to the NE of the Puksi bog, added to the 29 WPPs planned 7 km away in the SW part of the Operational Area (identified as Alternative A) (see Figure 4.1.4).

For these WPP Park alternatives, which consist of 29 and 43 WPPs respectively, an assessment of physical impacts (noise, flicker, landscape impact assessment) was carried out and a further assessment by natural experts comparing WPP Park location alternatives A and B was requested again in summer 2024. Following the additions to the expert opinions, the assessment of the WPPs to be implemented was adjusted in September 2024, as significant impacts on natural values were identified - impacts on bird species for 3 WPPs, one VES (VV62) was moved to the previous location of VES VV61, and for a further four WPPs it was recommended to choose two out of four, the choice to be made at the design stage, assessing the engineering conditions.

As a result, of the 84 WPPs assessed within the EIA, the experts recommend 46 WPP sites be rejected for various reasons. For all other WPP locations, a number of operational restrictions are recommended, including the installation of WPP containment chamber systems, limits on the maximum height of WPP turbines, etc.

In addition to the result of the assessment, the alternative locations of the WPP Park, the alternatives with the following number of WPPs are: Alternative A (above 29) has 27 WPPs (of which 25 would be built) and Alternative B (above 43) has 40 WPPs: of which 38 would be built, see Table 1 and Figure 1.

The chronology of the research of the territory of WPP park "Valmiera-Valka" is given in Table 1.

Table 1. Chronology of the research of the territory of WPP park "Valmiera-Valka"

Chronology of WPP site investigations	WPP park configuration
Initial feasibility phase	93 potential WPP sites have been investigated. 9 WPP were excluded from further investigation and 11 WPP were refined (93 - 9 = 84 WPP)
Situation at the start of 2024	84 WPP were studied in more detail in the framework of the EIA procedure - 41 WPP were identified as having significant environmental impacts and, due to the identified constraints, were excluded from the detailed study. (84 - 41 = 43 WPP). 43 WPP are being promoted for potential development
	The 43 selected WPP were grouped into two alternatives (A and B): the WPP park location options
	Alternative A: 29 WPP compact area in the SW part between Sedu, Gauja and Puksi swamp
	Alternative B: 43 WPP - 43 WPP: consisting of the compact area in the SW part (29 WPP of Alternative A) and 14 WPP in the compact area to the NE of the Puksi swamp, added to the 29 WPP planned 7 km away in the SW part of the site (identified as Alternative A). 29 + 14 = 43 WPP

Chronology of WPP site investigations	WPP park configuration
In September 2024, adjustments were made	<p><u>Nuisance</u> effects on bird species have been identified for 3 WPP (VV92, VV44, VV45), these 3 WPP have been excluded from the implementation plan.</p> <p>1 WPP (VV62) was moved to the previous location of WPP VV61 (moving this WPP does not change the WPP total in any of the alternatives).</p> <p><i>Additional clarification on the total number of WPP: one (VV92) excluded from the 14 WPP in the compact area to the N of Alternative B (13 NPPs remain); two (VV44 and VV45) excluded from the WPP in Alternative A).</i></p> <p><i>Hence - 2 WPP are removed from Alternative A: $29 - 2 = 27$ WPP, while all 3 WPP are removed from Alternative B (because the total number of WPP in Alternative B also includes WPP in Alternative A), i.e. $43 - 3 = 40$ WPP</i></p> <p>For the other 4 WPP (VV36, VV40, VV1, VV82), it is recommended that the choice for construction be made in favor of only two, the choice to be made at the design stage, after assessing the engineering conditions (thus - 2 more WPP are excluded from each alternative, i.e.</p> <p><u>Alternative A $27 - 2 = 25$ WPP,</u> <u>Alternative B $40 - 2 = 38$ WPP</u></p>
	<hr/> <p>Result (see Figure 1)</p>
	Alternative A with 27 WPP , of which 25 WPP would be built

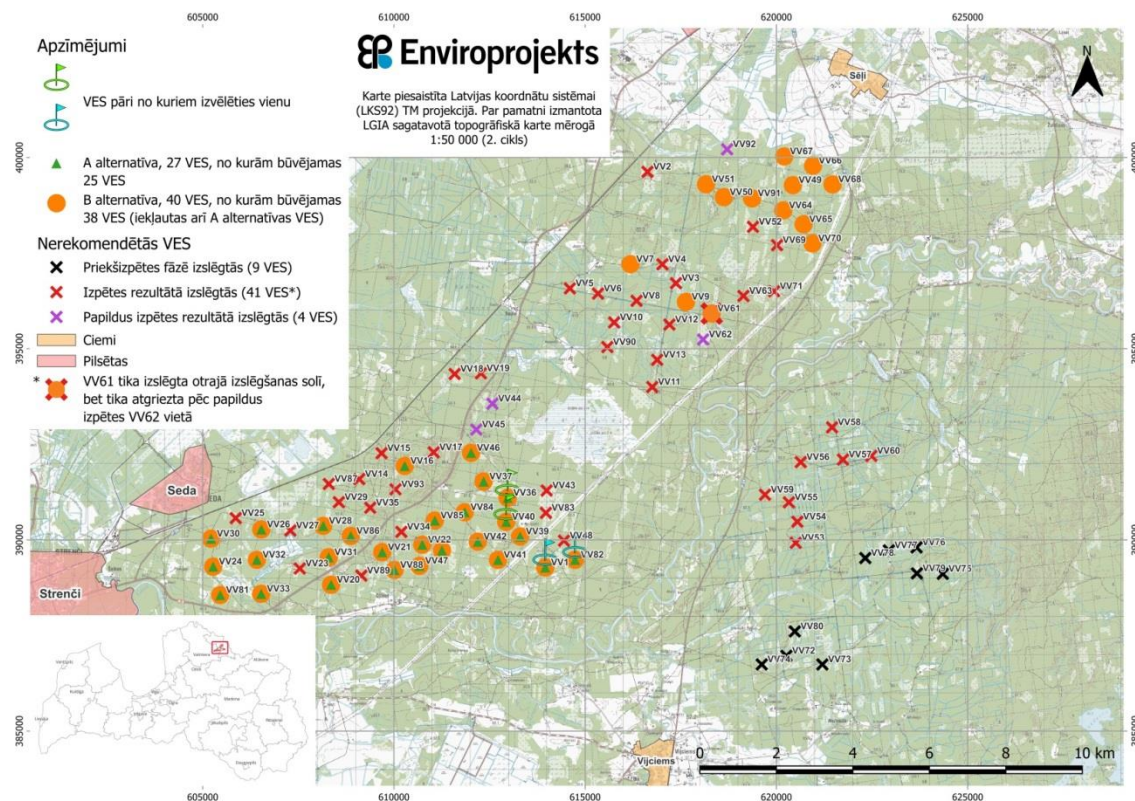


Figure 1. Planned location of the Valmiera-Valka WPP Park

The assessment of several areas in the public consultation version of the EIA report is on the potential WPPs to be constructed, corresponding to the Valmiera-Valka park location alternative A with 29 WPPs and location alternative B with 43 WPPs. For the public consultation version of the EIA report, an assessment of physical impacts (flicker, landscape impact), a calculation of climate change impacts and a calculation of socio-economic benefits were carried out for these alternatives for the location of the WPP park. It is envisaged that during the public consultation of the EIA report, the WPPs that are currently recommended for construction may be refined, taking into account the proposals submitted by the public and other institutions and the results of the public consultation. In the updated version of the EIA report, which will be submitted to the NPVB for its opinion, the assessments will be refined according to the number of recommended WPPs, but it can already be said that the refined results in areas such as flicker, landscape, deforested areas, etc. will have a lower potential environmental impact.

Despite the fact that the opinions of the experts in the relevant fields invited to prepare the EIA report have been drawn up with the necessary caution. The EIA did not identify any circumstances that would prevent the implementation of any of the alternatives to location A and B. By avoiding the siting of WPPs in locations with significant environmental impacts, both recommended alternatives for the location of the WPP park are feasible.

In the case of the implementation of the proposed activity, if the recommended alternative for the location of WPP Park A is implemented, deforestation will not exceed 90 ha, while if the recommended alternative for the location of WPP Park B is implemented, the deforested area will not exceed 145 ha.

The noise modelling has selected the WPP model (Nordex 175-6.8), which has a high noise power level, and no potential problems with exceedances of noise limits are expected as a result of the noise calculations (see Chapter 7.2.1).

For low-frequency noise, the limit values and procedures in Denmark are the basis, as there are no limit values in Latvia. The low frequency outdoor noise modelled in the EIA does not reach the lowest indoor level in any nearby development: 15 dB(A) (see Chapter 7.2.2).

The assessment of the flicker effect of WPPs in other countries and also the latest Latvian “Guidelines for Environmental Impact Assessment of Wind Power Plants and Recommendations on Requirements for Construction of Wind Power Plants” (2023) set desirable targets for the flicker effect. The shadow duration target of 10 hours per year is not exceeded in any of the houses (see Chapter 7.3).

The air quality has been assessed using the letter No 4-6/1385 of the Latvian Environment, Geology and Meteorology Centre (hereinafter – LEGMC) dated 20 September 2024 on the concentration of pollutants in the potential impact area of the polluting activity. Construction equipment and transport for the construction of the WPP will cause insignificant, local, temporary and episodic air pollution, which will be localised to the construction area. Given the limited construction period and the absence of residential development in the vicinity, no additional measures or restrictions are required during the construction period of the WPP.

In the context of the assessment of impacts on bat species, if automatic shutdown or non-start-up of wind turbines is ensured; monitoring of bats is ensured in the first and second year after the start of operation of the wind turbines, and if the limits on turbine operation are respected during operation of the WPP based on the results of the monitoring, the establishment of the WPP park is allowed under both siting alternatives.

In the context of the assessment of impacts on bird species, a detailed analysis of 55 bird species has been carried out to assess whether or not the construction of the WPP is proposed. For bird species for which fixed size areas around the species' breeding site are to be defined and the construction of a VES is not recommended, “exclusion species” (e.g. Lesser Spotted Eagle, Black Stork, etc.) are identified and VES-free zones around the breeding sites of these species and additional, outside this zone, necessary mitigation measures are identified. For bird species for which the construction of a WPP is likely in the vicinity of their habitats, the recommendation not to construct a WPP is made in areas of concentration for several bird species. Of the 84 WPPs originally planned and assessed in the EIA, the bird expert recommends that 38 should be abandoned for various reasons. For all other WPP sites, a number of operational restrictions are recommended, including. The installation of camera systems to stop the WPP. In terms of potential risks to ornithofauna, both proposed siting alternatives can be implemented with appropriate mitigation.

The assessment of the impact on landscape, cultural heritage, tourism and recreation concludes that the location of Alternative A has a lower impact compared to the location of Alternative B, which has a much higher impact due to the addition of 10 turbines in the northern part of the wind farm and three in the central part, which is an objective increase of the Proposed Activity with direct consequences on landscape changes.

Of the 84 WPPs originally planned and assessed in the EIA, the Vascular Plants and Habitats Expert recommends that 8 WPP sites be rejected for various reasons. For a number of WPP sites, a number of conditions have been recommended that need to be taken into account during design and construction. Both alternatives can be implemented with appropriate solutions, also from the point of view of the species and habitat expert.

It is assessed that the construction process of the WPP parks will not have a negative impact on the functioning of drainage systems in or around the area of the Proposed Action. Potential impacts on plant species and habitats in the SPAs and SACs that are dependent on the moisture regime can be considered to be insignificant, as the changes will be insignificant and little perceptible against the background of natural seasonal fluctuations in groundwater levels.

The EIA report has been prepared by Enviroprojekts Ltd, involving experts from various fields. A list of the experts involved in the preparation of the EIA is provided in the chapter "Authors of the Environmental Impact Assessment". The report provides detailed information on the proposed activity itself, the existing state of the environment, the impact on natural values in the area of the proposed activity and its surroundings, as well as alternatives to the proposed activity. Under the terms of the programme issued by the ESB, the report also provides information on monitoring requirements, assessment methods, etc.

The Environmental Impact Assessment Report, including all its annexes, has been prepared in accordance with the terms of Contract No 610000/23-15. Therefore, all the conclusions and findings made during the preparation of the Environmental Impact Assessment correspond to the situation (actual, physical, climatic, etc.) at the time of its preparation, as well as to the information provided by the client - Latvijas vēja parki Ltd. However, it should be noted that the overall environmental parameters of the site and the observations of natural values may change over time, so it is not acceptable to use data without updating if the reference data used in the environmental impact assessment are time-barred. Similarly, no interpretation or optimisation of the results of the environmental impact assessment that is not in line with the terms of reference of Contract No 610000/23-15 is allowed.

1. Reasoned justification for the choice of the proposed site of operation

The intended action is the implementation of the WPP Park and related infrastructure project in the Plani municipality of Valmiera and the Vijciems and Valka municipalities of Valka. Up to 38 WPPs are planned to be built in the WPP Park, each with a rated capacity of up to 8 MW.

In the initial feasibility phase of the project, 93 potential WPP turbines were investigated - but in consultation with certified experts and the Nature Conservation Agency, the number of turbines was reduced to 84 turbines, which were investigated in more detail as part of the EIA procedure, and those with significant adverse environmental impacts were discarded. The total area of the WPP construction and study area is 5387 ha.

The proposed activity also includes and the EIA assessed the infrastructure related to the functioning of the WPP park - construction and operation of transmission lines, transformer substations, BESS, assembly and maintenance yards and access roads.

The wind park is planned to be built in the south-western part of the territory of the Valka district and in the south-eastern part of the Valmiera district, ~1 km from Seda, ~2 km from Strenči and ~5 km from Valka. Other nearby settlements (villages) are Vijciems, Sēļi and Jērcēni. There are also a number of farmsteads in the immediate vicinity of the proposed wind farm, see Figure 3.2.

The WPP and the assembly and maintenance sites will be located in the forest areas of JSC “Latvijas valsts meži”. JSC “Latvia's State Forests”, as the manager of Latvia's strategic asset - land, is actively involved in achieving the goals set out in the Latvian National Energy and Climate Plan 2021-2030 to strengthen energy independence and economic development. In addition to the requirements for protected forest areas, JSC “Latvijas valsts meži” has identified land units under its management where it is justified to carry out a study for wind farms¹.

JSC “Latvijas valsts meži” has determined that wind parks will not be established on the lands of JSC “Latvijas valsts meži”²:

- in and within 800 m of towns and villages, and within 800 m of residential and public buildings;
- in nature conservation areas where the construction of wind farms is incompatible with the laws and regulations of the Republic of Latvia;
- in areas where the purpose of forest land management is nature conservation and JSC “Latvia's State Forests” has additionally established protection for preserved environmental values, as well as in forest areas important for recreation of the population, etc;
- where cultural monuments are located.

¹ <https://www.lvmgeo.lv/dati>

² <https://www.lvm.lv/biznesa-partneriem/zemes-pirksana-un-noma/veja-parki>

The location of the WPP study area and the 84 WPP assessed in detail in Valmiera and Valka districts are presented below (Figure 1.1).

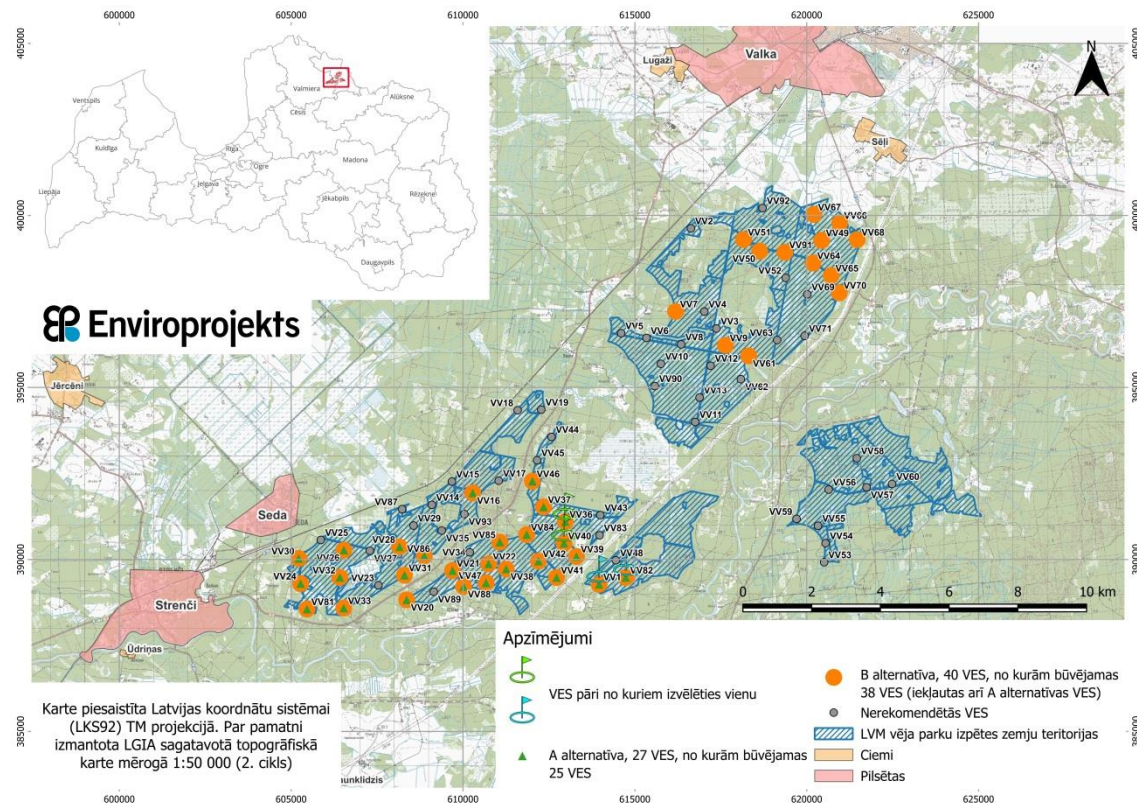


Figure 1.1. Valmiera-Valka Wind Park JSC LVM wind park exploration lands³ Location of the area and 84 WPPs studied in more detail in Valmiera and Valka districts

Based on the information of the State Land Service, the type of use of the land units included in the territory of the Proposed Action is forest. Given that the construction of the WPP Park is planned in a forest area, in accordance with Article 4 of the Law on the Procedure for the Construction of Facilitated Energy Supply Structures to Promote Energy Security and Independence, the construction of the WPP Park infrastructure will be subject to deforestation and land transformation to the extent necessary in accordance with Article 9(1) of the same Law. Information on the area and volume of land to be transformed (deforestation) is provided in Chapter 7.1. Under the current regulations, such activities are not allowed on agricultural land. According to the Law on the Procedure for the Construction of Facilitated Energy Supply Structures for the Promotion of Energy Security and Independence, if wind power plants are constructed on forest land, the negative effects of deforestation shall be compensated by afforestation in accordance with the opinion of the State Environmental Oversight Office on the report. The costs of the compensatory measures shall be borne by the Proponent of the Proposed Action.

³ Under the conditions set out at <https://www.lvmgeo.lv/dati>

The location of the existing 110 kV and 330 kV power lines and substations of JSC “Augstsprieguma tīkls” (Latvian electricity transmission system operator) is shown in Figure 1.2.

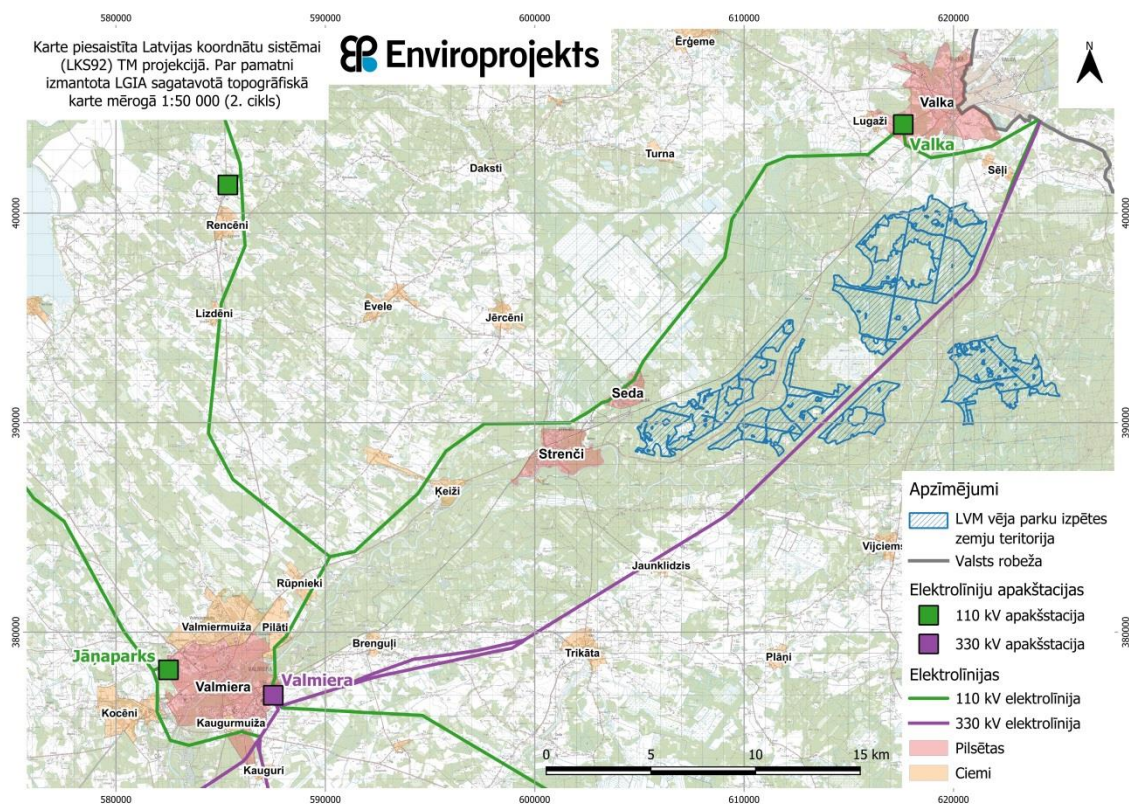


Figure 1.2. Augstsprieguma tīkls AS power line and substation in relation to the location of the Valmiera-Valka Wind Park JSC LVM wind park study land

In terms of environmental impact assessment, the proposed activity is planned on 31 land plots, summarised in Table 1.2.

Table 1.2. Land units included in the recommended area of the Valmiera-Valka WPP Park

No.	Name of the real estate	Cadastral number	Cadastral designation of the land unit
1.	State Forest 94760020021	94760020021	94760040033
2.	State Forest 94880120008	94880120008	94880130056
3.	State Forest 94760030020	94760030020	94760030020
4.	State Forest 94760020020	94760020020	94760020020
5.	State Forest 94760020020	94760020020	94760010054
6.	State Forest 94760040031	94760040031	94760040031
7.	State Forest 94760020021	94760020021	94760040032
8.	State Forest 94880120008	94880120008	94880130012
9.	State Forest 94880120008	94880120008	94880130009
10.	State Forest 94880120008	94880120008	94880120008
11.	State Forest 94760020021	94760020021	94760020021
12.	State Forest 94760040031	94760040031	94760020022
13.	Without subject (high voltage line)	94760010017	94760010017
14.	State Ltd “Latvijas Valsts ceļi” 94760010057	94760010057	94760010057

15.	"Zāģeri", Plāņu par., Valmieras nov.	94760010010	94760010010
16	"Vītola Pļava", Plāņu par., Valmieras nov.	94760010015	94760010015
17.	"Egli", Plāņu par., Valmieras nov.	94760010004	94760010004
18.	Reserve land fund	94760030017	94760030017
19.	Untitled	94760030010	94760030010
20.	"Kaķi", Plāņu par., Valmieras nov.	94760030012	94760030012
21.	State Forest 94760040033	94760040033	94760040033
22.	State Ltd "Latvijas Valsts ceļi" 94760040039	94760040039	94760040039
23.	State Ltd "Latvijas Valsts ceļi" 94880130026	94880130026	94880130026
24.	State Forest 94880130016	94880130016	94880130016
25.	Without subject (high voltage line)	94880130017	94880130017
26.	Untitled	94880130032	94880130032
27.	State Ltd "Latvijas Valsts ceļi" 94880120015	94880120015	94880120015
28.	"Medņi", Valkas par., Valkas nov.	94880120022	94880120022
29.	State Ltd "Latvijas Valsts ceļi" 94760020027	94760020027	94760020027
30.	State Ltd "Latvijas Valsts ceļi" 94760020024	94760020024	94760020024
31.	State Ltd "Latvijas Valsts ceļi" 94880100152	94880100152	94880100152

A very important advantage of this project is the location of the WPP in predominantly forested areas, thus minimising flicker, noise and landscape change impacts for farmsteads and residents.⁴ However, there are 25 farmsteads in the study area of the proposed wind farm⁵ (see Figure 3.2). According to the Cabinet of Ministers Regulation No.240 of 30.04.2013 "General Regulations on Spatial Planning, Use and Construction", for wind power plants with capacity greater than 2 MW, the distance from the nearest planned wind power plant and wind park boundary to residential and public buildings shall not be less than 800 m. This EIA process has identified that the closest residential house to the boundary of the WPP park, at a distance of 816 m (from the closest/marginal WPP), is "Residential house 145 km".

Based on the data from the Nature Data Management System (hereinafter - NDMS) "Ozols", there are no specially protected nature areas and micro-reserves included in the Natura 2000 network⁶ in the study areas of the wind park "Valmiera-Valka" JSC LVM. For more detailed information on protected areas and natural monuments, as well as biodiversity in the study area, see Section 3.2 below). The nearest NATURA 2000 site is the protected landscape area

⁴ https://www.zalabriviba.lv/wp-content/uploads/veja_izmantosanas_analize_skersli_iespejas-1.pdf

⁵ According to www.kadastrs.lv (29.09.2024)

⁶ Natura 2000 teritorijas Latvijā | Dabas aizsardzības pārvalde

“Ziemeļgauja”, which borders and lies to the south, east and north-east of the study area. The site of the proposed activity is completely surrounded by the micro-reserve “Bulvāra riests” (NATURA 2000 site).

The mineral resources required for construction are available in the vicinity of the proposed activity (see Section 6.12.2 below).

There are no contaminated or potentially contaminated sites in the site and vicinity of the proposed activity (see Section 3.2 below).

There are no protected cultural monuments in the areas where the WPP are planned (see subsection 6.5.2 below).

There are no objects included in the Cabinet of Ministers Regulation No 46 of 21.01.2021 “List of objects of increased danger” at the site and in the vicinity of the proposed activity.

The site has a well-developed road infrastructure: the main national road A3, the regional road P24, local roads V261 and V260, an extensive road network of JSC Latvijas Valsts Meži, in the wider vicinity - roads P23, P25, V240 and V237, as well as municipal roads.

High-voltage 330 kV and 110 kV transmission lines run directly through the area of the Proposed Action, which economically justifies the construction of the WPP park close to the electricity connection, also reducing the area to be deforested, as the new connection line is shorter.

In the vicinity of the Valmiera-Valka WPP Park there are, and in the future there are plans to develop, companies that are large consumers of electricity, such as in the Valmiera region - the glass fibre manufacturer Valmiera glass; Valmieras piens, Rūjiena ice cream, Valmiermuiža brewery, Valpro metal fuel can manufacturing plant, etc, in Valka region, the manufacturer of polyethylene foam products and bubble wrap is PEPI RER Ltd, the metalworking company Akords-3 Ltd, the woodworking company Vārpas-1 Ltd, etc.

The JSC LVM wind farm study area, which includes 17 land units, is adjacent to 237 land units⁷.

The territory of the proposed action is located in the Gauja river basin district. The largest watercourses are the Gauja, Seda and Vija rivers. For more information on the hydrological conditions of the study area, see Chapter 6.2.

In 2022, the Law on the Procedure for the Construction of Facilitated Energy Supply Structures to Promote Energy Security and Independence was adopted, the aim of which is to promote the production of renewable energy, promote the energy security and independence of the Republic of Latvia, and mitigate the processes of negative climate and environmental change. In order to fulfil the objectives set out in the Law, as well as in the context of the European Green Deal and other factors and aspects affecting energy supply, on 28 November 2023 the Cabinet of Ministers approved Order No 831 “On Approval of the Lump Sum Amount in Connection with the Right to Conclude a Development Right Agreement for the Siting of Strategically Important Wind Parks on State Forest Land”, which allows the Ministry of Agriculture to grant exploration and development rights to “Latvijas vēja parki” Ltd for

⁷ Number of land units, according to the State Land Service on 27 September 2024

strategically important wind parks on state forest land. The development right agreement with Latvijas vēja parki Ltd has been signed by the state forest land manager - JSC "Latvijas valsts meži". The contract is for 30 years, with the right to extend it if permitted by law.

The rationale for the location of the proposed Valmiera-Valka WPP Park was determined, inter alia, by the following factors:

- the possibility to transfer the generated electricity to the transmission infrastructure of JSC Augstsprieguma tīkls (hereafter - AST) (high voltage power lines in the vicinity of the study area are shown in Figure 1.2);
- restrictions, requirements and minimum distances set out in legislation and sectoral guidelines:
 - For WPPs with a capacity greater than 2 MW, the distance from the nearest planned wind power plant and wind park boundary to residential and public buildings shall be at least 800 m (in accordance with the Cabinet of Ministers' notice of 30.04.2013. 240 "General Regulations on Planning, Use and Development of the Territory", p. 163.2), see Figure 3.2.2;
 - The construction of wind turbines is allowed outside towns and villages in the industrial building area, technical building area, agricultural area, forest land, as defined in the spatial plan of the local municipality, provided that the distance from residential and public buildings to the nearest boundary of the planned wind turbine and wind park is at least 800 metres (cf. the Law on the Procedure for the Construction of Facilitated Energy Supply Structures to Promote Energy Security and Independence (2022)). Article 4), see Figure 3.2.2;
 - Deployment of WPPs is prohibited in Specially Protected Nature Areas - NATURA 2000 territories (in accordance with Cabinet of Ministers Regulation No. 264 of 16.03.2010 "General Regulations on Protection and Use of Specially Protected Nature Territories") and micro-reserves (in accordance with Cabinet of Ministers Regulation No. 940 of 18.12.2012 No 940 "Regulations on the establishment and management of micro-reserves, their protection, as well as the designation of micro-reserves and their buffer zones", p. 37);
 - In order to protect bird species or nature values from the impact of wind power plants and wind farms, the conditions and minimum permissible distance for the siting of wind power plants shall be determined in accordance with the environmental impact assessment (see Cabinet of Ministers' decision of 30.04.2013 No. No 240 "General Regulations on Planning, Use and Construction of the Territory", p. 163.3);
 - in the zone of visual perception of state protected cultural monuments, the impact of WPPs and wind farms on the landscape must be assessed, taking into account the specific situation and the specificity of the cultural monument (cf. Cabinet decision of 30.04.2013. 240 "General Regulations on Planning, Use and Construction of the Territory", p. 163.4) (see Fig. 6.14 for a map with cultural and historical sites located in the area adjacent to the Proposed Action);

- WPP are not allowed in the protection zones around land-based navigational aids for national defence and military maritime surveillance aids. The maximum width of the protection zone around navigational aids for national defence on land is 15 kilometres from the centre of the object (according to the Protection Zones Act (1997)). 50.p. 3));
- If the wind turbines of the wind farm will be located up to 16 km from the navigation aid or the outermost zone of influence of the beacon, then an in-depth analysis and assessment of the impact of the wind farm on the operation of the beacon is required (In accordance with the European Organisation for Safety in Air Navigation Guidelines for Assessing the Potential Impact of Wind Turbines on Surveillance Sensors (EUROCONTROL-GUID-0130; Ed.No.1.2; Ed.Date 09/09/2014));
- In addition, restrictions in operational, sanitary and safety protection zones along linear and associated objects - gas pipelines, gas supply installations and structures, gas warehouses and storage facilities, electronic communications networks and radio monitoring points, electricity networks, heat networks, optical telescopes and radio telescopes, national and public use railway lines; other public use roads, etc. must be taken into account.
- an assessment of the climatic conditions and wind parameters in the area to assess the efficiency of the turbines in the wind farm.

The planned activity is a direct result of the overall strategic objectives of Latvenergo AS and the Cabinet of Ministers' Order No 464 of 27 June 2022 establishing “Latvijas vēja parki” Ltd. to implement strategically important wind park projects. The choice of the Valmiera-Valka Wind Park site is based on the possibility of concluding a development agreement, the proximity of the transmission line and other factors listed above.

2. Legislative overview

Table 2.1 provides an assessment of the proposed activity's compliance with environmental, nature protection and other regulatory enactments that contain requirements for the proposed activity.

Table 2.1. *Overview of regulatory enactments and compliance of the Proposed Action with their requirements*

No.	Statutory instrument and its requirements	How it has been taken into account in the EIA report
1	European Landscape Convention (Florence, 20 October 2000)	This has been taken into account in the landscape impact assessment (Chapter 6.5).
2	Directive (EU) 2023/2413 of the European Parliament and of the Council of 18 October 2023 amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC and repealing Council Directive (EU) 2015/652 with regard to the promotion of the use of energy from renewable sources	Under DIRECTIVE 2023/2413, the EU has set a target of becoming climate neutral by 2050 and an interim target of reducing net GHG emissions by at least 55% below 1990 levels by 2030 (Chapter 7).
3	Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery and amending Directive 95/16/EC (recast) (Text with EEA relevance)	This Directive requires that the conformity assessment process under the EU Directives requires the manufacturer to carry out a risk analysis and assessment of its product and its intended use, covering design, manufacture, production and use as well as performance (Chapter 5.3).
4	Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy	The Gauja River Basin District (hereinafter GRBD) Management Plan assesses the existing water quality in water bodies in relation to the requirements of the EU Water Framework Directive (Chapter 6).
5	Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora	The Directive was taken into account in the SEA assessment. Species of Annex II of the Habitats Directive (BD II) found and recorded in the site (Chapter 4.1).
6	Regulation (EU) 2024/1991 of the European Parliament and of the Council of 24 June 2024 on nature restoration and amending Regulation (EU) 2022/869 (Text with EEA relevance)	NATURA 2000 has been taken into account in the assessment process (Chapter 7.9).
7	Council Directive of 2 April 1979 on the conservation of wild birds	Identify the bird species and groups of bird species to be assessed for the effects of the Proposed Action (Chapters 6 and 7).
8	Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic	The Directive is taken into account with regard to the protection of citizens (chapter 5.3).

No.	Statutory instrument and its requirements	How it has been taken into account in the EIA report
	compatibility (recast) Text with EEA relevance	
9	Directive b8/EU of the European Parliament and of the Council of 4 July 2012 on the management of major-accident hazards involving dangerous substances and amending and subsequently repealing Council Directive 96/82/EC Text with EEA relevance	The conclusions of the Environmental Impact Assessment (Chapter 5) were taken into account.
10	Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (recast) (Text with EEA relevance)	This has been taken into account in the preparation of the Environmental Impact Assessment (Chapter 7).
11	European Commission Regulation No 601/2012 of 21 June 2012 concerning monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council;	The Regulation is taken into account in the climate change impact assessment (chapters 5.4 and 12).
12	Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing a framework for climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ("the European Climate Act")	Specifies that Member States should support the accelerated development of renewable energy projects, in cooperation with local and regional authorities, by identifying and defining land, surface, underground and marine or inland water areas required for the installation of renewable energy plants for the production of energy from renewable sources and related infrastructure to meet the 2030 renewable energy target. This will also support the achievement of the 2030 renewable energy target and support the achievement of the 2050 climate neutrality target under Regulation (EU) 2021/1119 (Chapter 7).
13	Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions - A European Green Deal	This has been taken into account in the preparation of the Environmental Impact Assessment (Chapter 6.10).
14	EC report on the Council conclusions of 12.07.1999. (1999/519/EC) Recommendation on limiting exposure to electromagnetic fields (0 Hz to 300 GHz).	Taken into account for the protection of the population (chapter 5.3).
15	Waste Management Law, 18.11.2010, amended 11.04.2023.	Waste management during construction is taken into account. During the construction phase, there is a low risk of contamination of the ground and groundwater. During construction and operation, the requirements for the organisation of construction works

No.	Statutory instrument and its requirements	How it has been taken into account in the EIA report
		and the requirements for the technical condition of the equipment (Chapter 5.1) will be complied with.
16	<p>Law on Specially Protected Nature Areas, in force since 07.04.1993, with amendments in force since 13.04.2022.</p> <p>The aim of the Law is to establish the basic principles of the system of specially protected nature territories, the procedure for establishing and ensuring the existence of specially protected nature territories, the procedure for managing specially protected nature territories, monitoring and accounting for their status, as well as to combine national, international, regional and private interests in the establishment, conservation, maintenance and protection of specially protected nature territories. The annex to the law contains Latvia's Natura 2000 list of protected areas of European importance.</p>	<p>The statutory list has been taken into account in the characterisation of the natural values of the area surrounding the Proposed Development (Chapters 3.1, 6.4, 7.6 and 7.9).</p> <p>There are 4 Natura 2000 sites in the vicinity of the proposed activity area, these are:</p> <ul style="list-style-type: none"> • The Protected Landscape Area "Ziemeļgauja" borders the area of the Proposed Action; • The site of the proposed activity is completely surrounded by the micro-reserve "Bulvara riests"; • The nature reserve "Purgailes upes meži" is located ~450 m from the nearest VES; • Nature reserve "Sedas purvs" is 0.9 km from the WPP park.
17	<p>Energy Law, in force since 06.10.1998, Article 24, the energy utility shall indemnify the owner of the immovable property for losses directly related to the installation of new facilities of the energy utility or to the operation and repair of existing facilities. The energy supply undertaking shall compensate the owner of the immovable property for the restriction of the right to use the land if:</p> <ol style="list-style-type: none"> 1) the property is used for a new energy utility site 2) the redevelopment of the site increases the area of land occupied by the energy supplier's facility or the buffer zone along or around the facility. <p>Article 19 stipulates that the energy supply undertaking shall be obliged to coordinate with the land owner the conditions for the installation of new energy supply facilities, as well as the right to replace the coordination procedure with informing the land owner if the land is used for the installation of new energy supply undertaking facilities - equipment, devices, installations, networks, lines and their accessories, if at least one of the conditions</p>	<p>The EIA report takes into account and assesses the buffer zones (Chapters 3 and 4).</p> <p>The procedure for the installation and approval of energy supply facilities will be followed.</p>

No.	Statutory instrument and its requirements	How it has been taken into account in the EIA report
	<p>mentioned in the Article has occurred, including the installation of the energy supply undertaking facility is provided for in the spatial planning or detailed planning of the local self-government</p> <p>Article 191 of the Energy Law stipulates that for the installation, reconstruction, renovation and operation of facilities of energy supply utilities (except buildings), restrictions on the right of use of immovable property shall be established, and the scope and procedure for the use of restrictions on the right of use of immovable property owners shall be determined in this Law and in the Law on Protection Zones.</p> <p>These restrictions shall apply to new facilities of energy supply undertakings from the date of their installation in accordance with the procedure laid down in Article 19 of this Law. If the landowner does not consent to the establishment of a new energy utility facility, the restrictions shall be determined by a court judgment in accordance with the procedure laid down in the regulatory enactments.</p>	
18	<p>Law on the Procedure for the Construction of Facilitated Energy Supply Structures to Promote Energy Security and Independence, effective 05.10.2022.</p> <p>Article 7. Environmental impact assessment and timelines for wind farm construction</p> <p>(1) The environmental impact assessment of the construction of wind power plants shall be carried out in accordance with the Law “On Environmental Impact Assessment”, unless otherwise provided for in this Law.</p> <p>(4) The State Environmental Bureau shall issue an environmental impact assessment programme within 15 days from the date of receipt of the decision referred to in the third paragraph of this Article or the decision of the State Environmental Service on the application of the environmental impact assessment procedure for the construction of wind power plants.</p>	<p>Taken into account in the context of the initial consultation foreseen in the assessment. Programme No 5-03/9/2023</p> <p>Environmental Impact Assessment for the implementation of the wind farm “Valmiera-Valka” and its related infrastructure project in the Plani municipality of Valmiera and the Vijciems and Valka municipalities of Valka was received prior to the Initial Public Consultation (Initial Consultation) of the Proposed Action - on 12 September 2023.</p> <p>The law does not provide that there should be no Initial Consultation at all. Consequently, Programme No 5-03/9/2023</p> <p>The proponent of the proposed activity, in accordance with Article 15 of the Environmental Impact Assessment Law, must ensure the Initial Consultation on the impacts of the proposed activity, which took place from 10 to 30 November (3., 4. And Chapter 8).</p>
19	Construction Law , in force since 01.10.2014.	To be taken into account when determining

No.	Statutory instrument and its requirements	How it has been taken into account in the EIA report
		the construction order (Chapter 4).
20	Water Management Act , in force since 15.10.2002.	Taken into account in determining the ownership of the area of the Proposed Action. According to this law, the area of the Proposed Action falls within the GRBD (Chapter 6).
21	Environmental Impact Assessment Act , in force since 13.11.1998.	Taken into account in the EIA process (throughout the document - all chapters).
22	Protection Zones Act , the restrictions set out in the protection zones, the requirements of Articles 35 and 45, and others.	Taken into account for any works/activities in the buffer zones that require protection of the sites. These works will be carried out in agreement with the owner of the site concerned (Chapters 3.6 and 7).
23	Species and Habitats Conservation Act , in force since 19.04.2000.	Taken into account for the assessment of measures needed to protect protected plant, fungi, lichen, animal species, their habitats and habitats (Chapters 6.4, 7.6 and 7.9).
24	Law on Land Reclamation , in force since 25.01.2010.	The law is taken into account in the assessment of drainage systems in the study area (Chapters 4, 6 and 8).
25	Amendments to the Electricity Market Law , effective from 05.01.2024.	This has been taken into account in the preparation of the Environmental Impact Assessment (Chapter 14).
26	Annex 1 to the Cabinet of Ministers Regulation No 500 of 19.08.2014 "General Building Regulations"	They are taken into account when determining the category of the substation structure and the measures required for its construction. For the purposes of these Regulations, a substation (high voltage) is a Category 3 structure and its design requires expert examination, which may take up to 6 months in addition to the design work (Chapter 4).
27	Para 8 of the Cabinet of Ministers Regulation No 982 of 05.12.2006 "Methodology for Determination of Protective Zones of Energy Infrastructure Objects" stipulates that if, while carrying out earthworks, legal or natural persons find a cable that is not specified in the technical documentation for the works, they shall stop the earthworks and ensure the preservation of the cable, as well as immediately notify the owner or possessor of the electrical network and the local municipality.	They are taken into account in the planning of works during construction and in the design of the relevant buffer zones (Chapter 3.1).
28	Cabinet of Ministers Regulation No 635 of 07.11.2023 "Regulations on Electricity Trade	Taken into account when planning the connection of electricity installations to the

No.	Statutory instrument and its requirements	How it has been taken into account in the EIA report
	and Use” establishes the procedure for electricity supply to electricity users, the rights and obligations of the electricity trader and the electricity system operator and the user in the supply and use of electricity. According to Paragraph 3 of the said Regulation, the connection of the user's electrical installations to the electricity system or the increase of the permitted loads shall be carried out in accordance with the system connection rules for electricity system participants approved by the Public Utilities Regulatory Commission.	electricity system. The connection of the electricity installations to the electricity system will take place after the decision of the Council of the Public Utilities Regulatory Commission on the terms of system connection for the electricity system participants (Chapters 4 and 14).
29	Cabinet of Ministers Regulation No 253 of 09.05.2017 “Construction Regulations for Certain Engineering Structures”	The design and construction of the electricity supply will be carried out in accordance with these Regulations (Chapter 4).
30	Cabinet of Ministers Regulation No.574 of 30.09.2014 “Regulations on Latvian Building Code LBN 008-14” Location of Engineering Networks”	Determine the location of utilities planned in the area of the Proposed Operation. The location of utilities planned in the planning area complies with the provisions of the Regulations. Easy access to the existing and planned power supply facilities will be ensured for the personnel of JSC “Sadales tīkls”, their vehicles and other equipment. Certain areas will be used for the implementation of the proposed action: <ul style="list-style-type: none">• for the construction of wind power plants, including sites for their installation• for the construction of access roads;• for the construction of step-up transformer substations;• for the construction of temporary storage areas for materials and equipment. The development will be located on land with the owners of which the applicant for the Proposed Action has entered into development right agreements (Chapter 4).
31	Cabinet of Ministers Regulation No 303 of 19.03.2011 “Individual Rules for the Protection and Use of the North Vidzeme Biosphere Reserve”.	These have been taken into account in the preparation of the Environmental Impact Assessment. The proposed activity is not located within the Northern Vidzeme Biosphere Reserve. These have been taken into account in the preparation of the Environmental Impact Assessment (Chapters 3 and 6).
32	Cabinet of Ministers Regulation No. 240 of	Will be taken into account in the siting of

No.	Statutory instrument and its requirements	How it has been taken into account in the EIA report
	<p>30.04.2013 "General Regulations on Spatial Planning, Use and Construction"</p> <p>According to the requirements of the regulations, WPPs with a capacity of more than 20 kW are allowed to be located in the industrial area (R), technical area (TA), agricultural area (L) and forest area (M), in accordance with the conditions of the spatial plan.</p> <p>163. The following conditions shall apply to the siting of wind turbines and wind farms:</p> <p>163.1. for wind turbines with a capacity of 20 kW to 2 MW, the distance from the nearest planned boundary of the wind turbine and wind farm to residential and public buildings shall be at least 500 m;</p> <p>163.2. for wind turbines with a capacity greater than 2 MW, the distance from the nearest boundary of the proposed wind turbine and wind park to residential and public buildings shall be at least 800 m;</p> <p>163.3. in order to protect bird species or nature values from the impact of wind power plants and wind farms, the conditions and minimum permissible distance for the siting of wind power plants shall be determined in accordance with the environmental impact assessment;</p> <p>163.4. in the zone of visual perceptibility of state protected cultural monuments, the impact of wind power plants and wind farms on the landscape shall be assessed, taking into account the specific situation and the specificity of the cultural monument;</p> <p>163.5. the boundary of the wind park shall be defined from the outermost tower of the wind turbine.</p> <p><i>(MK 13.10.2020. Regulation No 630)</i></p> <p>163.¹ These Regulations 163. The conditions referred to in Paragraph 163 shall also be complied with in cases where new residential or public buildings are planned in the vicinity of existing wind power stations and wind farms.</p>	<p>WPPs - planned WPPs will be sited within the minimum distances set for the construction of WPPs.</p> <p>According to the spatial plans of Valmiera and Strenči municipalities, the construction area of the WPP park includes land units or their parts, the planned (permitted) use of which is basically defined as a forest area. Relatively small areas of the WPP construction area are covered by water.</p> <p>Where necessary, changes or additions to the spatial planning documents will be initiated (Chapters 1, 3, 5, 6 and 7).</p>
33	Cabinet of Ministers Regulation No 163 of 23.04.2002. "On noise emission from	They are taken into account in the buffer zone. The boundary of the wind park is

No.	Statutory instrument and its requirements	How it has been taken into account in the EIA report
	equipment for use outdoors”, point 5	defined from the edge generator, so the decision not to install individual generators may affect the potential buffer zone, resulting in a change in the potential total population in each area (Chapter 7).
34	Cabinet of Ministers Regulation No.208 of 12.04.2016 “Regulations on Electromagnetic Compatibility of Equipment”	Taken into account when assessing the cooperation of communication equipment with WPPs. The Regulations require that electrical and electronic equipment must, on the one hand, not cause electromagnetic interference to other equipment and, on the other hand, be capable of functioning to the required quality for its intended purpose, even in the presence of electric and magnetic fields likely to be present in a normal environment. Therefore, modern communications equipment manufactured in accordance with EU and Latvian requirements should not be subject to interference from WPPs, even in close proximity (Chapter 6).
35	Cabinet of Ministers Regulation No.16 of 07.01.2014 “Noise assessment and management procedure” specifies permissible noise levels for various equipment, noise assessment, calculation methods, etc.	<p>The assessment of noise from the operation of WPPs was carried out using the calculation methods specified in these Regulations, noise from the operation of industrial noise sources: the calculation methods specified in Annex 5 to the Regulations.</p> <p>The equipment to be used during installation and operation shall comply with the requirements of this Regulation (Chapters 6, 7 and 10).</p>
36	Cabinet of Ministers Regulation No 432 of 17.09.2017 Regulations on Latvian Building Code LBN 003-19 “Building Climatology”	They are applied in the determination of climatological parameters applicable to the construction of buildings and their elements (Chapter 4).
37	Cabinet of Ministers Regulation No 306 of 02.05.2012 “Regulations on the Methodology for Determining the Operational Protection Zone around Drainage Structures and Devices on Agricultural Land and Forest Land”	They are applied in the methodology for determining the operational protection zone around drainage structures and devices (hereinafter - the protection zone) on agricultural land and forest land (Chapters 6 and 7).
38	Cabinet of Ministers Regulation No 1055 of 19.09.2009 “Regulations on the List of Species of Fauna and Flora of European Community Importance in Need of Protection and the List of Individuals of Fauna and Flora of European Community Importance whose Harvest in the	The list referred to in the Regulations has been taken into account in the description of the natural values of the area surrounding the Proposed Development (Chapters 4, 6 and 7).

No.	Statutory instrument and its requirements	How it has been taken into account in the EIA report
	Wild may be Subject to Conditions of Restricted Use” establishes the list of species of fauna and flora of European Community importance in need of protection (Annex 1) and the list of individuals of fauna and flora of European Community importance whose harvest in the wild may be subject to conditions of restricted use (Annex 2).	
39	Cabinet of Ministers Regulation No 925 of 30.09.2010 “Content of the expert opinion in the field of species and habitat conservation and minimum requirements contained therein”.	The species and habitat expert opinions annexed to the report have been prepared in accordance with the Regulations (Chapters 6 to 9).
40	Cabinet of Ministers Regulation No 511 of 07.07.2008 “Procedure for assessing damage to natural monuments and calculating the costs of remediation measures”	Determine damage assessment and remediation measures for natural monuments designated by the Cabinet of Ministers and the municipality (Chapters 6 and 7).
41	Cabinet of Ministers Regulation No 213 of 31.03.2007 “Regulations on the Criteria to be Used for Assessing the Significance of the Impact of Damage to Specially Protected Species or Specially Protected Habitats”	Establishes the criteria used to assess the significance of the effects of damage to specially protected species or specially protected habitats compared to the baseline condition. The Regulations require that significant adverse changes from baseline are determined using numerical data for species and measurable data for habitats (Chapters 6 to 9).
42	Cabinet of Ministers Regulation No 153 of 25.02.2006 “Regulations on the List of European Union Priority Species and Habitats Occurring in Latvia” provides a list of European Union priority species and habitats occurring in Latvia.	The list contained in the Regulations has been taken into account in the characterisation of the natural values of the area surrounding the Proposed Development (Chapters 6 to 9).
43	Cabinet of Ministers Regulation No 350 of 28.06.2017 “Regulations on the List of Specially Protected Habitat Types” defines the list of specially protected habitat types.	The list contained in the Regulations has been taken into account in the characterisation of the natural values of the area surrounding the Proposed Development (Chapters 6 to 9).
44	Cabinet of Ministers Regulation No 264 of 31.03.2010 “General Regulations on the Protection and Use of Specially Protected Nature Territories”.	The compliance of the Proposed Activity with the general procedure for the protection and use of specially protected nature territories, including the permitted and prohibited types of activities in protected areas, as well as the model of the special information sign to be used in nature to mark protected areas and the procedure for its use and establishment (Chapters 1 and 7) was taken into account.

No.	Statutory instrument and its requirements	How it has been taken into account in the EIA report
45	Cabinet Regulations 01.07.2015. No 329 Regulations on Latvian Building Standard LBN 224-15 "Melioration systems and hydrotechnical structures"	<p>The area of the proposed action is largely forested.</p> <p>Paragraph 116 of the Regulation states that the regulation of woodland moisture is provided by a regulating network of drainage ditches, swales and road ditches (Chapters 4 and 6).</p>
46	Cabinet of Ministers Regulation No 720 of 26.10.2021 "Regulations for the Recording, Protection, Use and Restoration of Cultural Monuments"	According to these rules, natural or legal persons who, in the course of construction or other works, discover an object of cultural heritage value, shall notify the Administration and shall cease the works until notified by the Administration. Within one month, the Administration shall organise the identification of the open object, the ascertainment of its cultural and historical value and the establishment of measures for its conservation (Chapters 6 and 7).
47	Cabinet of Ministers Regulation No 46 of 21.01.2021 "List of objects of increased danger"	These have been taken into account in the identification of the sensitive receptors in the area of the Proposed Action. The sites listed (Chapters 1 and 3) are not located within the site.
48	Cabinet of Ministers Regulation No 570 of 21.07.2008 "Regulations on marking and equipping objects with protective lights"	In accordance with these provisions, each VPP within the area of the Proposed Operation will be equipped with two security lights so that their position in the horizontal plane provides the pilot of the aircraft with a view of at least one security light from any direction and a 360° range of the security light (Chapter 4).
49	Cabinet of Ministers Regulation No 131 of 01.03.2016 "Procedure for risk assessment of industrial accidents and risk reduction measures"	Potential accident risks to be assessed in accordance with these Regulations (Chapter 5).
50	Cabinet of Ministers Regulation No 397 of 03.07.2018 "Regulations on the Classification of Water Management Districts"	According to these rules, the area of the Proposed Action is located in two large basin areas: The Gauja (large catchment area code 52) and the Gauja-Salaca (large catchment area code 54) are divided into several catchment areas (Chapter 6).
51	Cabinet of Ministers Regulation No 396 of 14.11.2000 "Regulations on the List of Specially Protected Species and Specially Protected Species of Restricted Use"	The status of protected species and habitats has been determined in accordance with these Regulations (Chapters 6 and 7).

No.	Statutory instrument and its requirements	How it has been taken into account in the EIA report
52	Cabinet of Ministers Regulation No 940 of 18.12.2012 "Regulations on the establishment and management of microreserves, their protection, as well as the designation of microreserves and their buffer zones"	The bird species and groups thereof on which the impact of the Proposed Action has been assessed are those bird species included in the list of Annex I to the Cabinet of Ministers Regulation No. 396 of 14 November 2000 "Regulations on the List of Specially Protected Species and Specially Protected Species of Restricted Use", species included in the list of Annex I to the Cabinet of Ministers' Regulation No. 940 of 18 December 2012 "Regulations Regarding the Establishment and Management of Micro-reserves, Their Conservation, as well as Determination of Micro-reserves and Their Buffer Zones", and species included in Annex I or II to the Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds (Chapters 1, 6 and 7).
53	Cabinet of Ministers Regulation No 957 of 20.11.2008 "Protected Landscape Areas "Individual Rules for the Protection and Use of the "Ziemeļgauja"	This has been taken into account in the development of the Environmental Impact Assessment (Chapters 6 and 7).
54	Cabinet of Ministers Regulation No 113 of 18.02.2021 "Procedure for accounting of waste and its transportation"	This has been taken into account in the preparation of the Environmental Impact Assessment (Chapter 5).
55	Cabinet of Ministers Regulations No 317 of 02.05.2012 Individual Regulations for the Protection and Use of the Gauja National Park	This has been taken into account in the preparation of the Environmental Impact Assessment (Chapter 6).
56	Cabinet of Ministers Regulation No 674 of 21.11.2023 "Regulations on Nature Reserves"	These have been taken into account in the development of the Environmental Impact Assessment (Chapters 1, 3, 6 and 7).
57	Latvia's sustainable development strategy "Latvia 2030"	Taken into account in the preparation of the Environmental Impact Assessment (all chapters).
58	Latvian National Development Plan 2021-2027 (NAP2027)	Taken into account in the preparation of the Environmental Impact Assessment (all chapters).
59	National Energy and Climate Plan 2021-2030	Taken into account in the preparation of the Environmental Impact Assessment (all chapters).
60	Landscape Policy Implementation Plan 2024-2027	This has been taken into account in the development of the Environmental Impact Assessment (Chapters 6 and 7).
61	Latvia's climate change adaptation plan for the	Taken into account in the preparation of the Environmental Impact Assessment (all

No.	Statutory instrument and its requirements	How it has been taken into account in the EIA report
	period to 2030;	chapters).
62	Latvia's strategy to achieve climate neutrality by 2050	Taken into account in the preparation of the Environmental Impact Assessment (all chapters).
63	Environmental Policy Guidelines 2021-2027	Taken into account in the preparation of the Environmental Impact Assessment (all chapters).
64	Vidzeme Planning Region Sustainable Development Strategy 2030	This has been taken into account in the preparation of the Environmental Impact Assessment (chapters 6 and 7).
65	Amendments to the spatial plan of Valka municipality (from 2017)	Assessment of the Proposed Development's compatibility with the spatial plan and existing land use (all chapters).
66	Spatial plan of Strenči municipality 2012-2023	The compatibility of the Proposed Development with the spatial plan and the existing use of the site has been assessed.
67	Valka Municipality Sustainable Development Strategy 2013-2037	Taken into account in the preparation of the Environmental Impact Assessment (all chapters).
68	Valka Municipality Development Programme 2022-2028	Taken into account in the preparation of the Environmental Impact Assessment (all chapters).
69	Development Programme of the newly established Valmiera Municipality 2022-2028	Taken into account in the preparation of the Environmental Impact Assessment (all chapters).
70	Sustainable Development Strategy 2022-2038 for Valmiera Municipality	Taken into account in the preparation of the Environmental Impact Assessment (all chapters).

3. Description of the site of the proposed operation

3.1. Compatibility of the proposed activity with the spatial plan and the existing use of the site

In accordance with Article 161 of the Cabinet of Ministers Regulation No 240 of 30 April 2013 "General Regulations on Spatial Planning, Use and Construction", wind power plants with a capacity of more than 20 kW are allowed to be located in the industrial construction area (R), technical construction area (TA), agricultural area (L) and forest area (M) in accordance with

the conditions of the spatial plan. Article 163 states that the following conditions must be met when planning the location of wind power plants and wind farms:

- for wind power plants with a capacity of between 20 kW and 2 MW, a distance of at least 500 m between the nearest planned wind power plant and the boundary of the wind farm and residential and public buildings;
- for wind farms with a capacity greater than 2 MW, the distance between the nearest planned wind farm and the boundary of the wind farm and residential and public buildings shall be at least 800 m;
- to protect bird species or nature values from the impact of wind farms and wind farms, the conditions and minimum permissible distances for the siting of wind farms shall be determined in accordance with the environmental impact assessment;
- in the visual perception zone of the national protected cultural monuments, the impact of wind power plants and wind farms on the landscape shall be assessed, taking into account the specific situation and the specificities of the cultural monument;
- the boundary of the wind park is defined by the outermost tower of the wind farm.

These conditions shall also be complied with where new residential or public development is planned in the vicinity of existing wind farms and wind farms.

Administratively, the territory of the Proposed Action falls within the municipality of Plani, Valmiera County, and the municipalities of Valka and Vijciems, Valmiera County, but the EIA study area also includes the municipalities of Brenguli, Evele, Jercēnu and Trikata, Valmiera County, Seda and Strenči, Ergeme and Zvārtava municipalities of Valka county and Valka town, Bilska municipality of Smiltene county (small part), and Valga municipality of Valga county (*Valga vald*), which also includes the town of Valga in the assessment of transboundary impacts.

Taking into account that after the administrative-territorial reform implemented on 1 July 2021, Valmiera region unites several administrative territories (former Valmiera city, former Beverīna, Burtnieku, Kocēnu, Mazsalaca, Naukšēnu, Rūjiena and Strenči municipalities (includes Plani municipality)), then until the date of the new Spatial Plan coming into force, the binding regulations on spatial plans of the former municipalities constituting Valmiera region are valid.

According to the Valka and **Valmiera municipality** territory (in the currently valid Strenči municipality territory plan 2012-2023, the plan for Plani municipality) planning - rules of territory use and construction (hereinafter - TIAN), the construction area of the WPP park includes land units or their parts, the planned (permitted) use of which is basically defined as forest area. Relatively small areas of water or other land uses occupy the VPP construction site.

TIAN states that the construction of WPPs is not allowed:

- The territory of the Protected Landscape Area "North Gauja" in the municipality,
- In the protection zones of cultural monuments,
- In the territory of the North Vidzeme Biosphere Reserve (hereinafter - NVBR) in accordance with the Cabinet of Ministers (hereinafter - CM) Regulation No 303 of 19 April 2011 "Individual Rules for the Protection and Use of the North Vidzeme Biosphere Reserve":

It is prohibited to install WPP in the Reserve, except:

- WPP whose highest point does not exceed 30,0 m;
- WPP without height limitation in the areas specified in Annex 2 to this Regulation, subject to the following conditions:
- WPP shall be sited after obtaining written permission from the Nature Conservation Agency;
- WPPs shall be located in groups of no more than 20 WPPs, minimising the distance between adjacent WPPs. The distance between the groups shall not be less than two kilometres.

WPP without height limitation in the areas defined by Cabinet Regulation No 303 of 19 April 2011.

The rest of the former territory of Strenči municipality in accordance with the laws and regulations:

1. WPP with a maximum capacity of more than 20 kW are allowed to be located in industrial territories, technical building territories and agricultural territories, but not less than 200 m away from any residential building, except for a residential building on the property on which the wind generator is located.

2. WPP with a maximum capacity of 20 kW may be located in residential areas of detached houses, subject to the following conditions:

- a. The height of the WPP mast (to the rotor axis) shall not exceed 12 m;
- b. it is possible to provide a WPP protection zone (height x 1.5, but such protection zones have been abolished by the amendments to the Law on Protection Zones of 20 October 2022) within the same land plot where the wind generator is located, or an agreement has been reached with the owner of the adjacent real estate on the encumbrance - protection zone by registering it in the Land Register in accordance with the CM Regulation No 982 of 5 December 2006 "Methodology for Determining Protection Zones for Energy Infrastructure Facilities".
- c. WPP with a maximum capacity exceeding 20 kW may be located in industrial areas, technical building areas and agricultural areas, but not less than 50,0 m from any residential or public building, except a residential building on the property on which the WPP is located.

TIAN *of Valka municipality*⁸ states that forest territory (M) is a functional zone defined to ensure conditions for sustainable development of forests and implementation of their main functions - economic, ecological and social functions.

Main uses of the area:

- Forestry use (21001).
- Forest in specially protected areas (21002).
- Landscaped outdoor space (24001).

⁸ https://geolatvija.lv/geo/tapis#document_22074

- Outdoor space without landscaping (24002).
- Additional uses of the site
- Farmstead development (11004).
- Commercial or service buildings (12002).
- Tourist and recreational facilities (12003).
- Sports facilities (12005).
- Defence and security buildings (12006).
- Mining (13004).
- Engineering infrastructure (14001).
- Buildings for energy supply installations (14006).
- Agricultural use (22001).

Building height up to 12 m, except for towers and WPP.

Deforestation of forest land shall be carried out in accordance with the requirements of the applicable laws and regulations.

According to the TIAN of Valka Municipality, WPPs with power up to 6kW are allowed to be located in all building areas, provided that the written consent of the owners of adjacent land units is obtained.

A single power plant with a maximum capacity of up to 20 kW for individual use shall be permitted on a parcel of land in a rural area, provided that the mast height (to the rotor axis) does not exceed 12 m and it is designed no closer than the height of the WPP to the boundaries of adjacent parcels or closer if agreed to in writing by the owner of the affected parcel, as well as in compliance with the requirements of the applicable laws and regulations.

New WPPs with a maximum capacity of more than 20 kW are allowed to be located in the "Industrial area" (R), "Technical area" (TA) and "Agricultural area" (L), "Forest area" (M), their construction is allowed not closer than 500 m from residential and public buildings (for power plant capacity of 20 kW to 2 MW), and not closer than 800 m (for power plant capacity greater than 2 MW). Distance is determined from the WPP tower.

The requirements of the applicable regulatory enactments must be complied with when planning a WPP.

The relevance of the Valmiera Municipality Sustainable Development Strategy 2022-2038 and the Development Programme 2022-2028 to the proposed action is presented in Chapter 6.10 and Chapter 6.6.1.

The relevance of the Valka Regional Sustainable Development Strategy 2013-2037 to the proposed action is presented in Chapter 6.10.

As part of the EIA procedure, the Proponent consulted the municipalities of Valmiera and Valka on the proposed activity.

Valka Municipality, prior to the initial public consultation meeting, in its letter No 3.9/23/780 received on 5 September 2023 (attached as Annex 2), has indicated that as Latvijas vēja parki Ltd intends to carry out studies and obtain expert opinions on noise, vibration,

electromagnetic radiation, etc. on the impact on inhabited places, specially protected nature territories, objects for which protection zones have been established, as well as, if necessary, to propose changes to the spatial plan, the Valka Municipality does not impose additional conditions on the amount and detail of the information. It also points out that the requirements and conditions of the Nature Conservation Agency, the State Forest Service and the State Environmental Service must be taken into account in the EIA.

After the initial public consultation of the wind park "Valmiera-Valka", which took place from 10 to 30 November 2023 (SSA report attached as Annex 4), the municipality of Valka County supplemented the previously expressed opinion with the following information - according to the spatial plan of Valka County, the territory of the wind park is planned to be located in the functional zone Forest territory (M), as well as part of these territories are located protected landscape area "Ziemeļgauja" and microreserves. According to Paragraph 53.5 of Cabinet Regulation No.240 "General Regulations on Spatial Planning, Use and Construction", wind park sites can be located in indexed subzones. There are no indexed sub-zones of Forest areas in the existing spatial plan of Valka municipality. Therefore, **in order to start the development of a wind park in Valka Municipality, a Local Plan for the planned wind park area must first be developed** to amend the existing spatial plan.

Valmiera Municipality, prior to the initial public consultation meeting, in its letter No 4.1.8.3/23/9582 received on 29 October 2023 (attached as Annex 2), indicated that the Valmiera Municipality Sustainable Development Strategy 2022-2038 sets "Attractive living environment and space" as one of the long-term priorities and the Valmiera Municipality Development Programme 2022-2028 sets "Attractive living environment and space" as one of the long-term priorities. In order to achieve the long-term priority "Attractive living environment and space", the action line "Engineering and technical infrastructure" has been set, with the task "Promote the transition to renewable energy and circular economy" with the sub-task - to promote RES production and use in the public services sector, as well as to create a supportive environment for RES production and use for enterprises and citizens. The strategic objective "Entrepreneurship Development", when implemented in the long term, aims to attract investment to Valmiera, high productivity, careful and sustainable approaches to the use of natural resources, as well as the reuse of resources. The municipality's economic specialisation identifies energy production, among other priority sectors. Valmiera municipality also points out that since the Strenči municipality spatial plan does not indicate the location of wind power plants in forest areas as a permitted use and the location of the planned activity is not included in SN No.17/2011, Volume 2, Annex 12.1, **in order to implement the proposed activity in Valmiera Municipality, it is necessary to carry out a local plan for the land units where it is planned to install wind power plants or to submit an application with a request to indicate the construction of wind power plants as a permitted use in the area of the planned activity when drawing up the new Valmiera Municipality spatial plan.** Among other things, Valmiera Municipality confirms that the proposed activity is in line with the Valmiera Municipality Sustainable Development Strategy and should be supported.

All of the conditions set out in the spatial planning documents listed above are relevant to the Proposed Action and must be taken into account in the implementation of the Proposed Action. The conditions of the spatial plans impose a number of conditions, but the Proposed Action does not conflict with them. According to the currently valid conditions in Valmiera

Municipality, the planned area of the wind park will have to be subject to local planning, while in order to implement the planned activity in Valmiera Municipality, it is necessary to carry out local planning for the land units where it is planned to install wind power plants or to submit an application with a request to provide for the construction of the WPP park "Valmiera-Valka" when developing the new Valmiera Municipality spatial plan.

An overview of how the Proposed Development complies with the buffer zones identified in the spatial plans that could potentially restrict the implementation of the Proposed Development is provided in Chapter 7.5. The site of the proposed development is not affected by the following protection zones.

3.2. Description of the site and surroundings of the proposed operation

The wind park is planned to be built in the south-western part of the territory of the Valka district and in the south-eastern part of the Valmiera district, ~1 km from Seda, ~2 km from Strenči and ~5 km from the town of Valka. Other nearby settlements (villages) are Vijciems, Sēļi and Jērcēni (Figure 1.1). There are also a number of farmsteads in the immediate vicinity of the proposed wind farm (see Figures 3.2.1 and 3.2.2 for population densities and farmstead locations with buffer zones (800 m) around turbines). 800 m buffer zone around the recommended turbines presented in Figure 3.2.2.

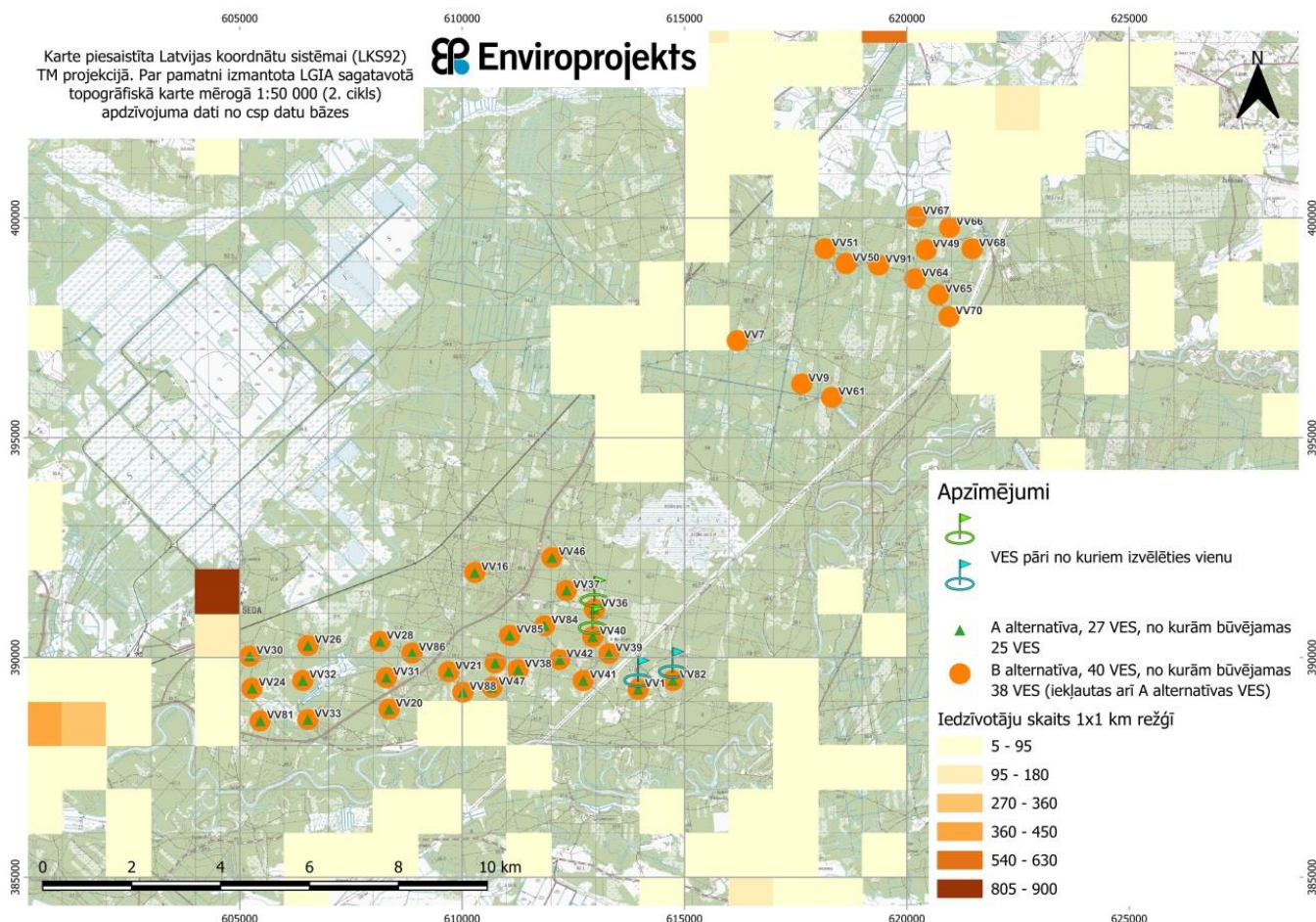


Figure 3.2.1. Population density in the vicinity of the planned Valmiera-Valka Wind Park

The land units included in the area of the proposed action are currently used for forestry activities. It is located in the catchment area of the River Gauja. The nearest watercourses are the Gauja, Daudzupīte, Vija and Vīksnes rivers. The largest bodies of water are Lakes Leiši, Zāli, Dziļais and Diben. Part of the Wind Park area is crossed by national and forest drainage systems. The distribution of land by land use is shown in Figure 3.2.3.

According to the nature protection network maintained by the Nature Conservation Agency, the closest protected nature areas are the NVBR (landscape protection zone) and NATURA 2000 sites of European importance: the nature reserve "Sedas purvs", the nature reserve "Burgas pļavas" and the protected landscape area "Ziemeļgauja", as well as the microreserves "Bulvāra riests" and "Igaunijas riests". 62 microreserves have been identified within a 10 km zone of the area of the proposed action. More detailed information on the natural values of the area is provided in Chapter 6.4.

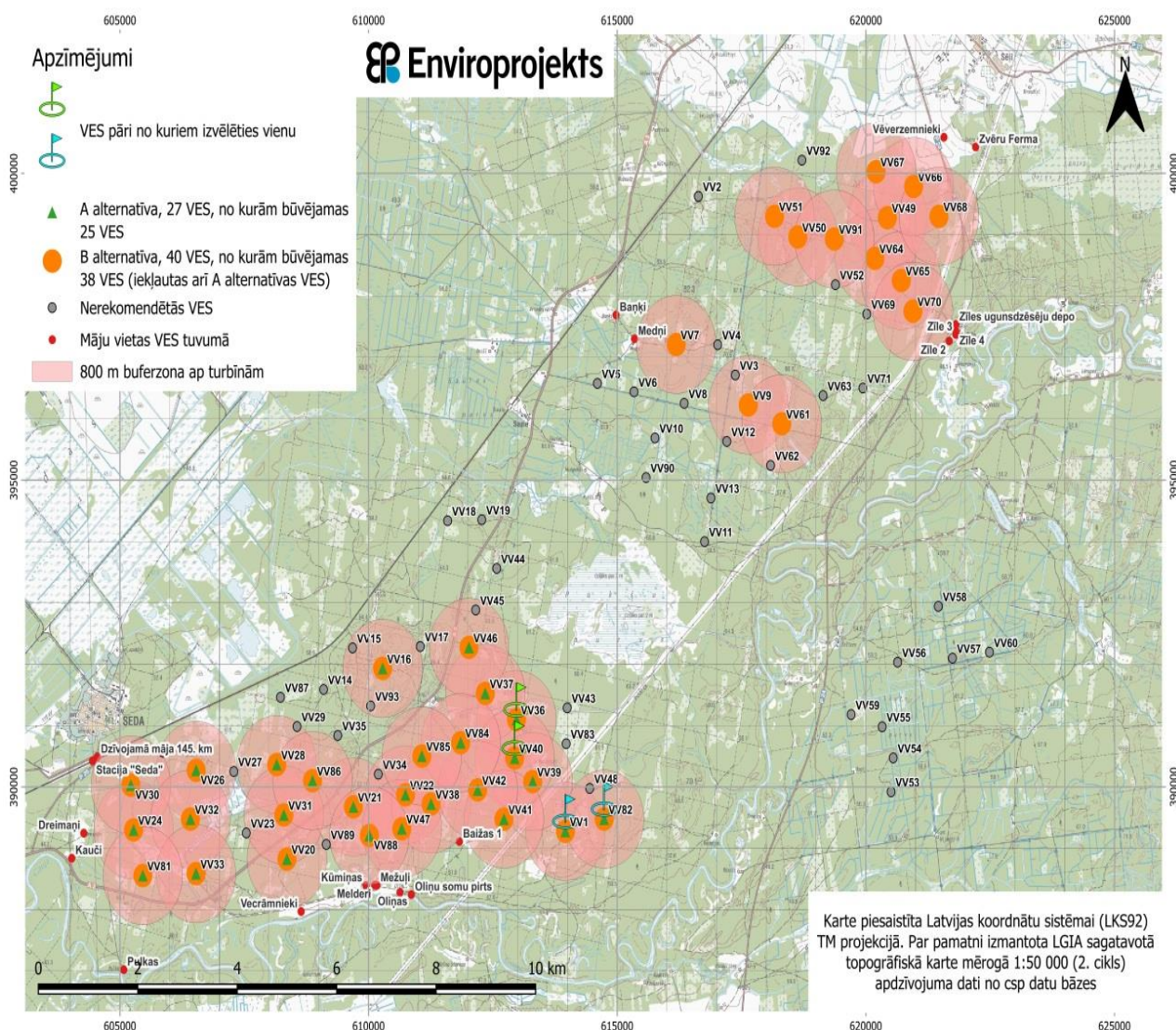


Figure 3.2.2. 800 m buffer zone around the 84 turbines assessed and the location of houses in the vicinity of the Valmiera-Valka Wind Park, JSC LVM wind farm study area

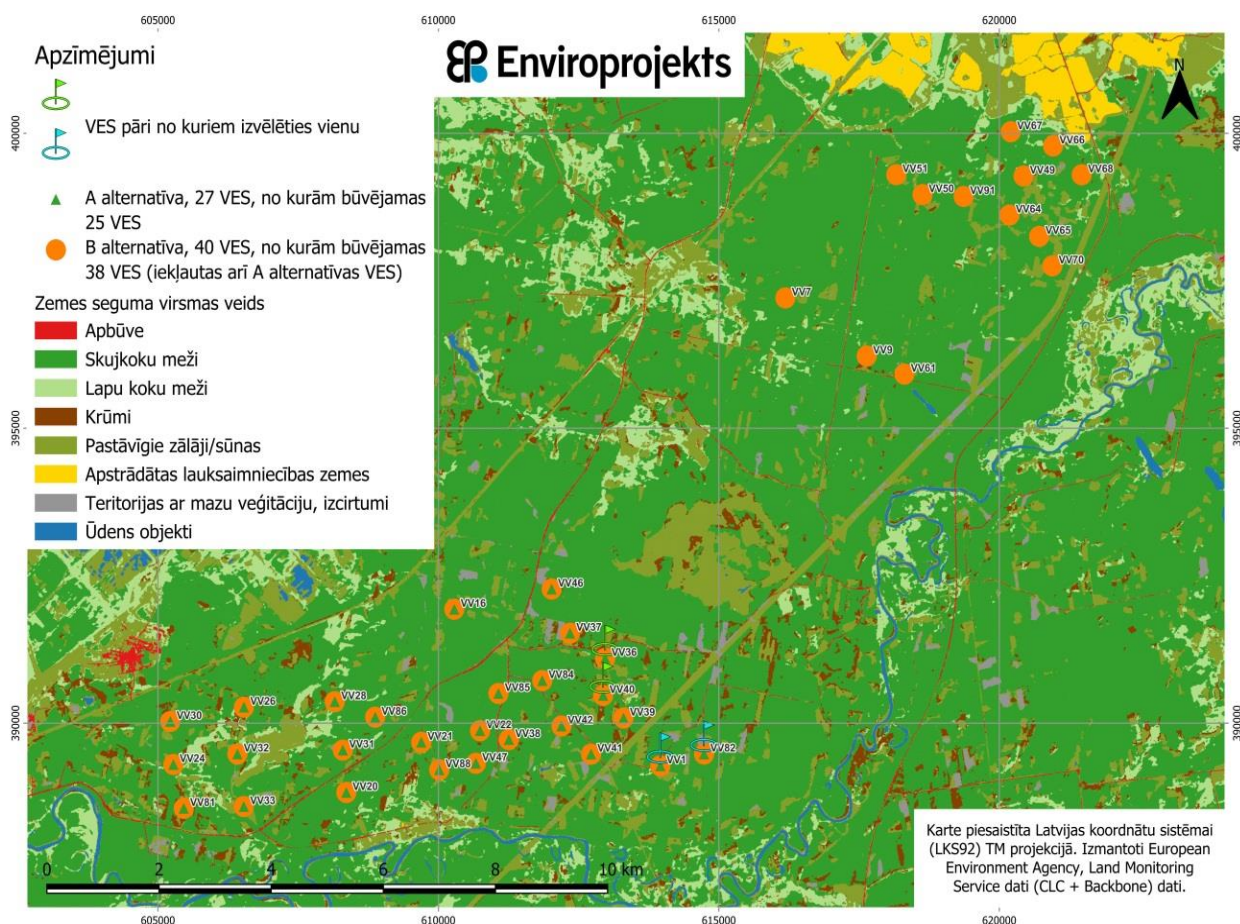


Figure 3.2.3. Land cover in the vicinity of the 40 WPPs recommended for the Valmiera-Valka wind park (source: EEA Land monitoring service)

As the Estonian territory is located within 4.2 km of the nearest wind turbine included in the assessment, the impacts are described for those aspects affecting these areas - potential impacts on landscape and ornithofauna.

According to the publicly available information of the LEGMC⁹, mineral resources such as sand, sand-gravel and peat are present in the vicinity of the Proposed Action. Sand and sand-gravel are extracted for construction, road building, maintenance and repair. Peat is used for export, agriculture and peat substrate production. There are 7 sand, sand-gravel and 6 sapropel projected resource areas in the planned Wind Park area, there are no deposits with mineral reserves accepted by the LEGMC. Information on mineral deposits is provided in Chapter 6.12.2.

From 1 May 2024, the new contaminated sites management website created by the State Environmental Service (hereinafter – SES) and LEGMC will be available: pvps.vvd.gov.lv. However, given that this website has only recently been opened to the public, it does not yet

⁹ <https://videscentrs.lv/gmc.lv/iebuve/zemes-dzilu-informacijas-sistema>

contain the full list of contaminated and potentially contaminated sites that was available in the previous register of the LEGMC until 1 May this year. Therefore, the EIA report used the information obtained in February 2024 from the previous LEGMC register of contaminated and potentially contaminated sites. The information obtained indicates that no contaminated or potentially contaminated sites are located in the area of the Proposed Action¹⁰.

The nearest potentially contaminated sites in Valmiera municipality are Rūķi, Plani municipality. Municipal waste landfill reg. No 94768/3370 (473 m away), Lathol Ltd, wood processing plant reg. No 94337/4464 (2,2 km away) in the SW direction from the planned Wind Park and 2,2 km away from the territory of the Proposed Activity is Strenči Forest Industry Farm reg. no. 94628/4542. The nearest contaminated site in Valka municipality is located in Valka town – Tīne Ltd petrol filling station reg. No 4015/3392 (2.9 km away) (Figure 3.2.4).

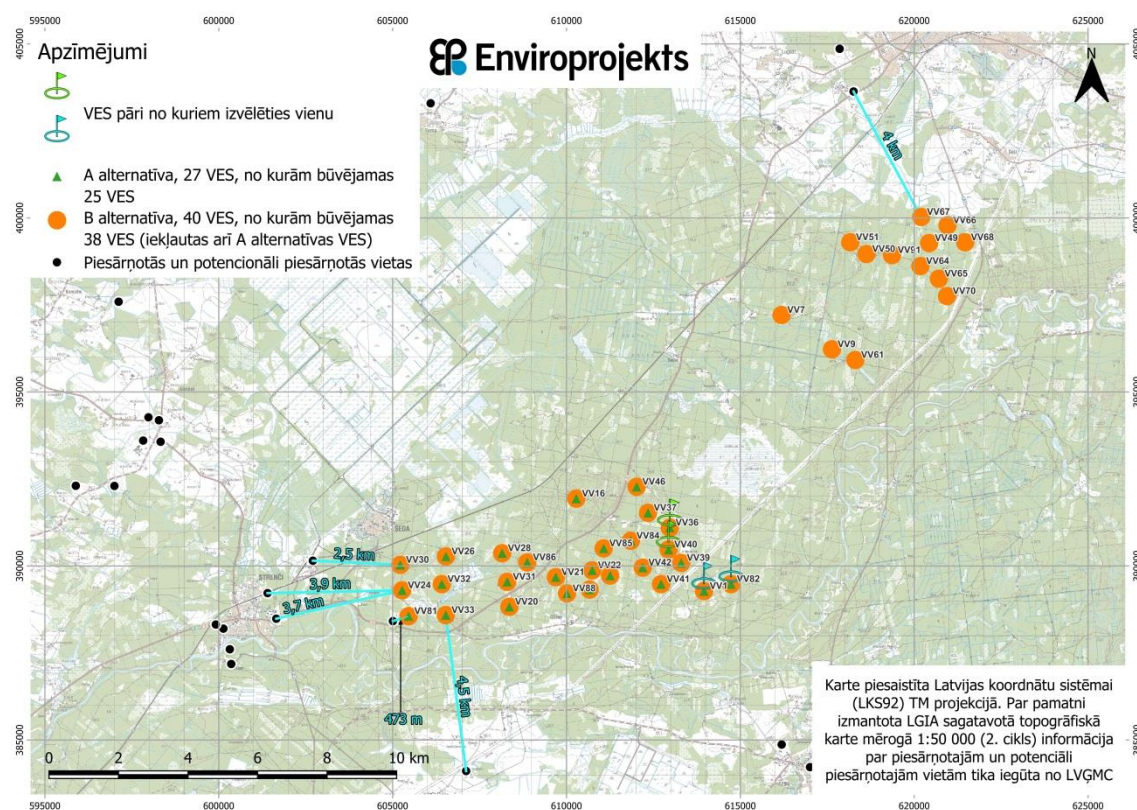


Figure 3.2.4. Contaminated and potentially contaminated sites in the vicinity of the Valmiera-Valka wind park, JSC LVM wind park study lands and the 84 WPP sites assessed

According to the Cabinet of Ministers Regulation No 46 of 21 January 2021 "List of Objects of Increased Danger", none of the sites mentioned in the list are located in the territory of the JSC LVM wind farm exploration lands.

There are a number of residential or public buildings in the area of the proposed wind farm. According to Cabinet Regulation No 240, for wind power plants with a capacity greater than 2

¹⁰ <http://parissrv.lvgmc.lv/#viewType=pppvMapListView&incrementCounter=1> – skatīts. February 2024.

MW, the distance from the nearest planned wind power plant and wind park boundary to residential and public buildings shall be at least 800 m. The closest to the WPP (VV30) is "Residential house at km 145": 816 m.

The location of the proposed activity in relation to other wind farms in the immediate vicinity in the northern part of Latvia for which environmental impact assessments have been carried out or are in various stages of preparation is presented in Figure 3.2.5. The assessment of the cumulative environmental impacts of wind farms is based on publicly available information on these wind farms. The closest wind park is the Valka Wind Park, which borders the area of the

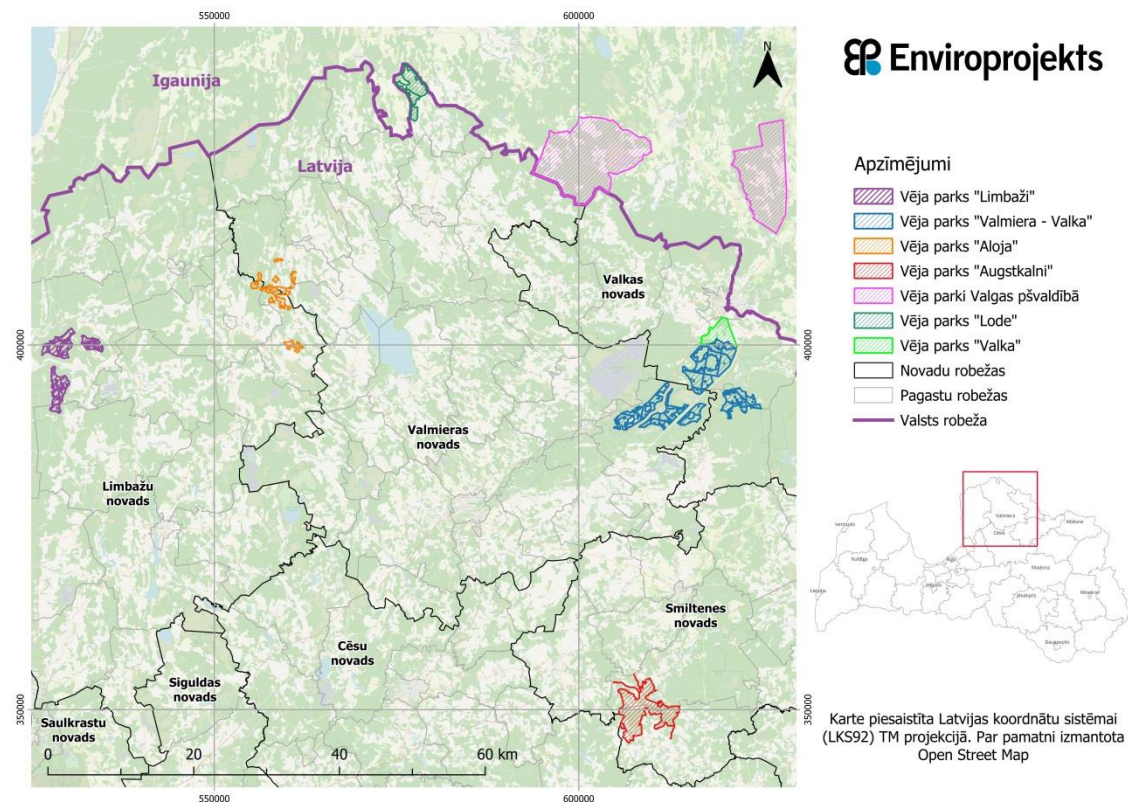


Figure 3.2.5. Location of the proposed activity in relation to other wind farms in the vicinity

Proposed Action to the north, between the Valmiera-Valka Wind Park and the town of Valka. The cumulative impacts of the parks are not assessed in the EIA report for this project, as the cumulative impacts would be assessed in the environmental impact assessment of the Valka WPP.

According to the information available on the website of the Environment State Bureau¹¹, the decision on the necessity of an EIA for the wind park was adopted on 14 June 2024 and the EIA Programme was issued on 1 July 2024.

The other wind farms in northern Latvia and southern Estonia are located at distances where no cumulative environmental effects are expected to occur. The study area of the nearest wind park in the municipality of Valga is more than 15 km away from the area of the Proposed

¹¹ <https://www.vpvb.gov.lv/lv>

Action and, in addition, between these two parks is the Valka wind park, for which the EIA is at an early stage and the initial public consultation has been completed. The cumulative impact of this wind park with Valmiera-Valka will have to be assessed in its Environmental Impact Assessment, as there is no information on this in this EIA, whereas full information on this EIA will be available in its EIA.

3.3. Characteristics of wind conditions

Wind conditions in the area of the Proposed Action are an important aspect to be taken into account when selecting the site for the WPP farm and the location of the wind turbines within it, as well as when assessing their environmental impact. Information on wind conditions in the area of the Proposed Action is based on long-term observation data at the nearest stations of the national meteorological network.

The EIA uses data from the ERA5 5th generation ECMWF Global Climate Atmosphere Reanalysis¹² for the period 2013-2023: a total of 95304 wind measurement records with 200 m height conversion (WindPRO Meteo Data Export version 7, Geographical coordinates (WGS84): longitude 26,000000, latitude 57,750000, Local coordinates: (LKS92) Y: 619030,26 X: 402634,28).

The wind data used in this EIA describes the wind at a point in the vicinity of the Proposed Action near Valka (Figure 3.3.1.).

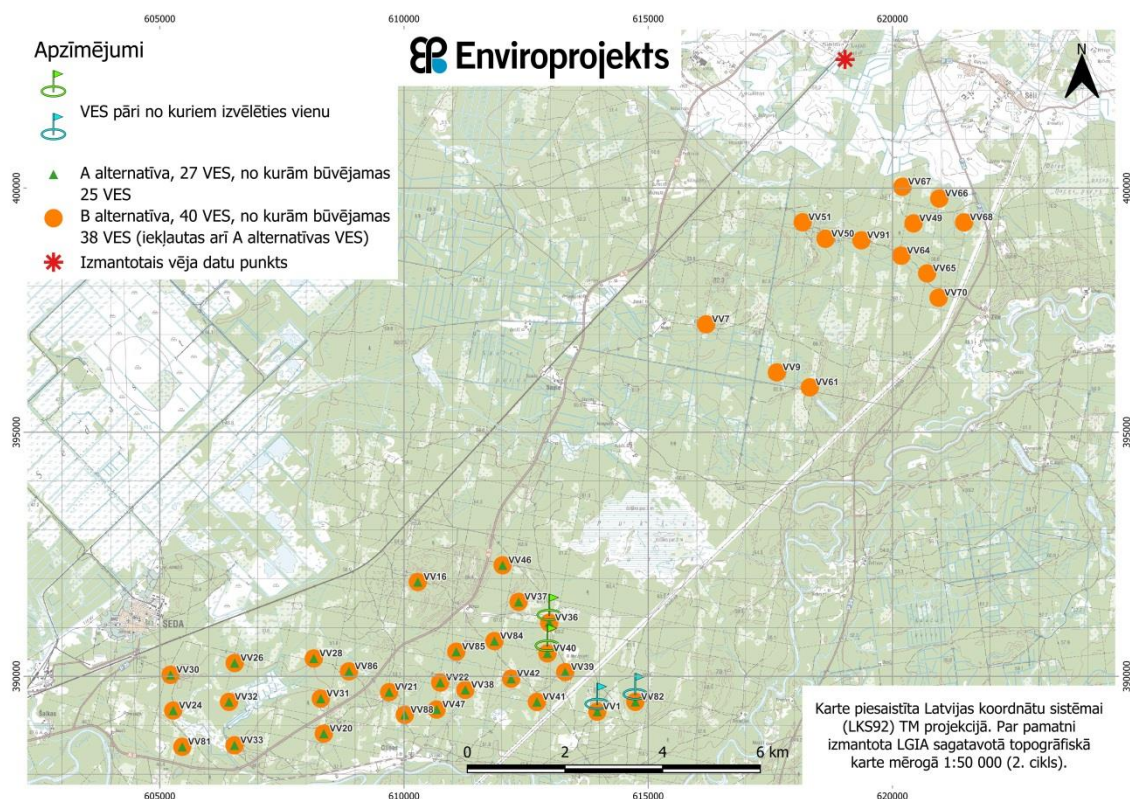


Figure 3.3.1. WPP park with a point characterised by the wind data used

¹² <https://climate.copernicus.eu/copernicus-regional-reanalysis-europe-cerra>

Based on this data, a wind rose with the distribution of wind speeds and directions at 200 m height has been created (Figure 3.3.2.).

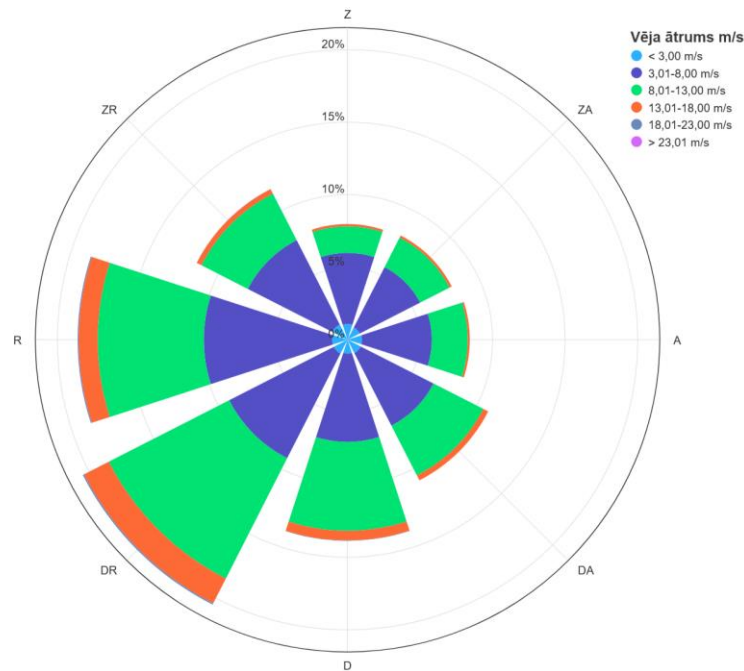


Figure 3.3.2. Wind rose with wind speed and direction distribution at 200 m (ERA5 data)

The distribution of the number of entries based on the wind rose is given in Table 3.3.1 (absolute numbers) and Table 3.3.2. (percentages).

Table 3.3.1. Distribution of wind measurements by speed and direction in absolute numbers

	Z	ZA	A	DA	D	DR	R	ZR	Total
Up to 3,00 m/s	1029	899	952	976	922	1015	1014	1129	7936
3,01-8,00 m/s	4678	4459	4590	5365	5796	7720	8427	6217	47252
8,01-13,00 m/s	1740	2174	2360	3672	5836	8876	6975	3433	35066
13,01-18,00 m/s	153	157	132	362	636	1830	1245	337	4852
18,01-23,00 m/2	2	2	0	0	22	90	66	10	192
23,01-infinity	0	0	0	0	0	2	4	0	6
Total	7602	7691	8034	10375	13212	19533	17731	11126	95304

Table 3.3.2. Percentage distribution of wind measurements by speed and direction

	Z	ZA	A	DA	D	DR	R	ZR	Total
Up to 3,00 m/s	1080	0943	0999	1024	0967	1065	1064	1185	8327
3,01-8,00 m/s	4909	4679	4816	5629	6082	8100	8842	6523	49,58
8,01-13,00 m/s	1826	2281	2476	3853	6124	9313	7319	3602	36794
13,01-18,00 m/s	0161	0165	0139	0380	0667	1920	1306	0354	5092
18,01-23,00 m/2	0002	0002	0	0	0023	0094	0069	0010	0,2
23,01-infinity	0	0	0	0	0	0002	0 004	0	0 006
Total	7 978	8,07	8,43	10 886	13 863	20 494	18 604	11 674	100

Based on the results of the wind condition characterisation, the area of the Proposed Action is suitable for the siting of WPPs designed for areas with low wind speeds (average speed at mast height of at least around 7.5 m/s). According to the international standard IEC 61400-1 "Wind turbines. Part 1: Design Requirements", these are Class III turbines, as assessed in detail in the noise and shadow flicker impact assessment (Table 4.2.1)¹³.

For the noise modelling (subsection 7.2.1) and the flickering shadow modelling (section 7.3) these wind data are used for the speed range 3-23 m/s, which is 91.7% of the time. The WPP does not operate in no wind (below 3 m/s) and automatically stops in excessive wind (above 23 m/s) (assuming that a WPP model will be installed in the area of the Proposed Action that automatically stops at wind speeds above 23 m/s).

3.4. Characteristics of adverse meteorological conditions

The meteorological conditions in the area of the proposed operation are appropriate for the siting of the WPPs, which comply with the international standard IEC 61400-1 "Wind turbines. Part 1: Design Requirements" as defined in Class III and S (designed for areas with low wind speeds). Class III and S WPP are suitable for installation in areas where the average wind speed at mast height is at least 6 m/s.

Modern WPPs operate mainly in the wind speed range 3 to 23-24 m/s: at ~3 m/s the rotor starts to rotate slowly, by ~10 m/s the rotation speed is close to the rated speed and continues until wind speeds of ~23-24 m/s, with the rotation speed no longer increasing in proportion to the wind speed for safety reasons: excessive rotation speed can damage and even break the generator or the wings. The rotation speed is technologically limited in two ways:

- 1) as wind speed increases, the orientation of the wingplane becomes more and more inclined to the wind direction, letting some of the wind energy pass by,
- 2) Modern WPP with gearboxes combine the above adaptation of the wing orientation with an increase of the gear ratio, bringing more energy to the generator and consequently braking the rotor more strongly, i.e. extracting more energy from the same rotational speed.

At wind speeds of ~23-24 m/s, the rotor wings turn parallel to the wind direction, thus letting the wind pass by and not turning again: this is a safety measure to prevent excessive wind energy from breaking the wings. As the wind speed drops to 22-23 m/s, the wings start to catch the wind again and the rotor starts to turn again.

Thus, the conditions that are unfavourable for the operation of WPPs are:

- 1) windless (< 3 m/s),
- 2) winds too strong (>24 m/s).

The distribution of wind speeds at the proposed site is described in Section 3.3., including Table 3.3.2: adverse wind conditions are expected ~8,3% of the time throughout the year.

Other adverse meteorological conditions include icing on the wings, which can lead to the risk of ice chips detaching and being swept away: this is discussed in Section 5.3.

¹³ <https://i-windenergy.com/content/popularity-class-iii-wind-turbines>

In terms of the environmental impact of WPPs, sunny weather is also considered to be a somewhat unfavourable meteorological condition: in bright sunshine, WPPs can cause a disturbance to the flickering shadow of surrounding houses that does not exist on cloudy days. The characteristics of sunniness are presented in Chapter 7.3, including Table 7.3.1.

4. Description of the proposed action and alternatives

4.1. Location of the WPP park, study areas and WPP site alternatives

4.1.1. Location of the WPP study area

The total area of the wind park construction study areas of Valmiera-Valka, which have been identified by JSC Latvia's State Forests as areas where it is justified to carry out wind park construction studies, or the total area of *the JSC LVM wind park study areas* is 5387 ha (Figure 4.1.1). Of this area, the construction of WPPs and related facilities will require up to 300 ha.

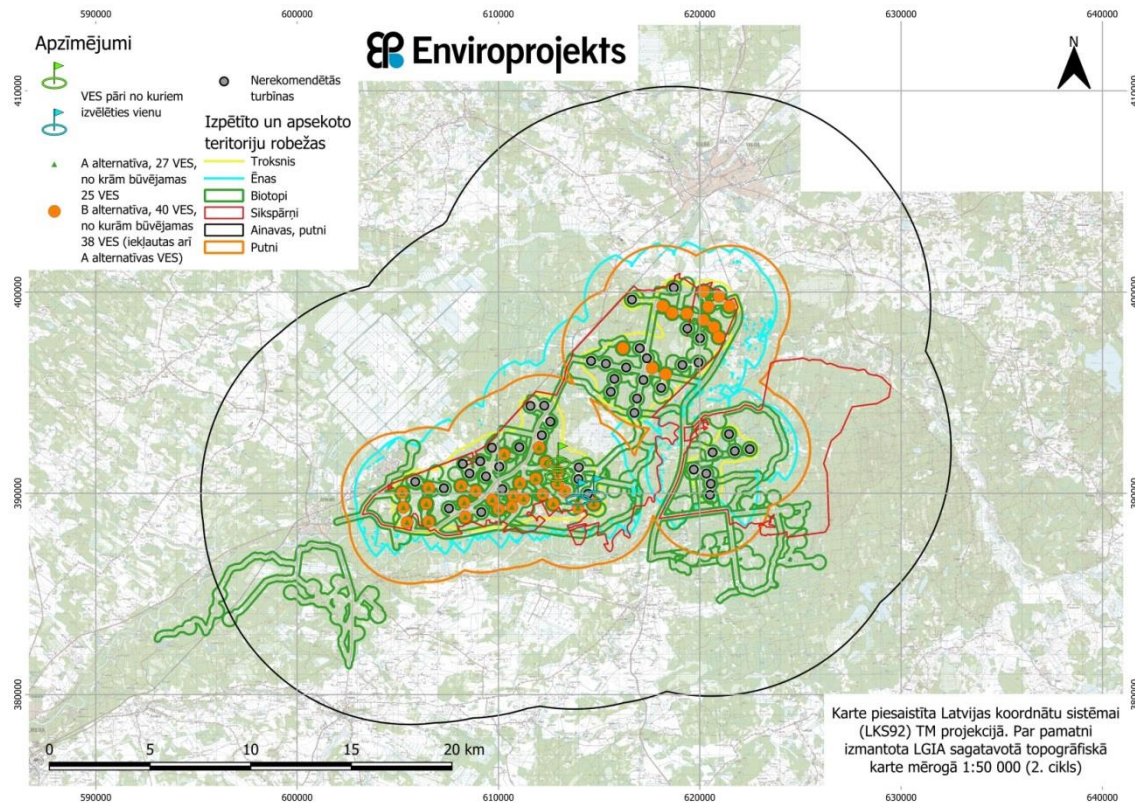


Figure 4.1.1. The boundaries of the surveyed areas in relation to the JSC LVM survey area and the 84 WPP assessed

During the EIA preparation, the boundaries of the investigated and surveyed areas in relation to *the area of the JSC LVM study lands* were different, which was determined by the assessed environmental area, such as:

- in assessing the impact of the Proposed Action on protected habitats, the site was surveyed by visiting and/or assessing the site of the Proposed Action and the areas of potential impact - the proposed location of the WPP and the area within 350 m around it; potential access roads and the area up to 150 m along them, as well as potential electricity cable routes and the area up to 20 m along them;
- The ornithofauna study area covers an area of approximately 26 500 ha, covering a 3 km zone around all the turbines assessed, and a 10 km zone for migratory birds;

- The Landscape Assessment Study Area is a 10-kilometre zone around the maximum possible outer boundary of the wind farm (from the outermost wind turbine);
- noise and flicker, assessed to the extent that the likely effects of the Proposed Action are calculated.

In the vicinity of the WPP Park site, the absolute elevation of the terrain on the site and in the immediate vicinity varies between 45-60 m asl. The area is characterised by inland dune masses - the most compact dune area with the largest absolute height range (at least 20 metres) is around the Birch House in Plani parish, between the A3 motorway and the Riga-Valga railway. The other such area is in the vicinity of Silezers, to the east of the lake, see Figures 4.1.2 and 4.1.3.

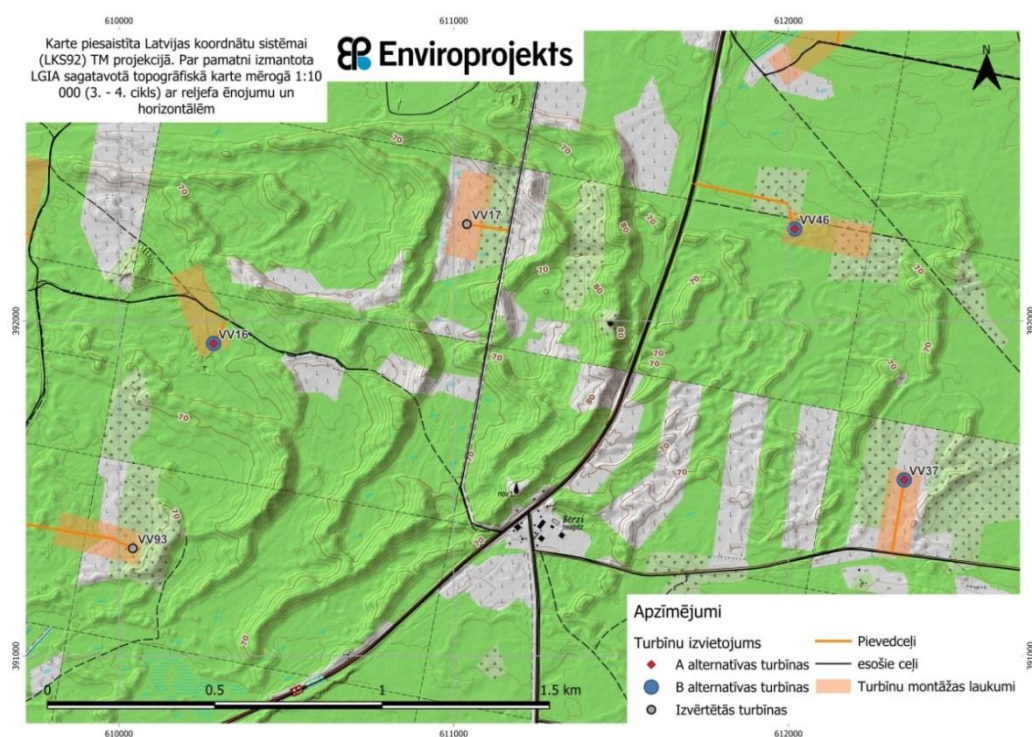


Figure 4.1.2. *Inland dune masses in the Valmiera-Valka wind park study area near the "Bērzi" houses*

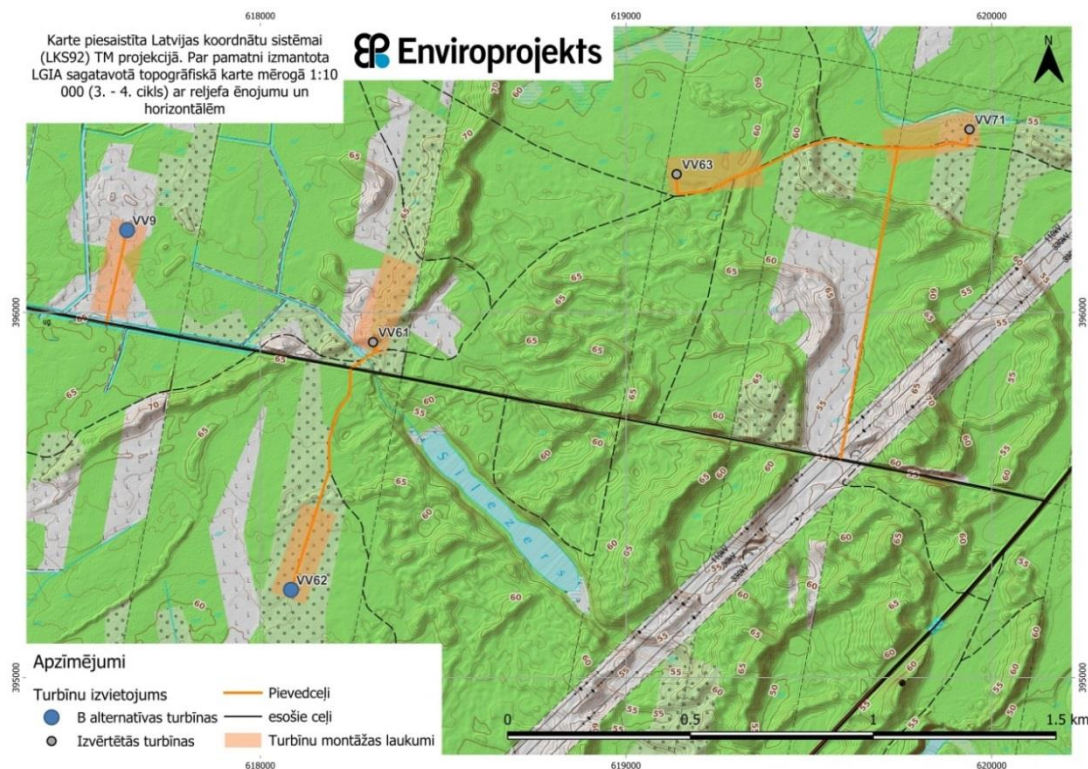


Figure 4.1.3. *Inland dune massifs in the study area of the Valmiera-Valka wind park in the vicinity of Silezers*

4.1.2. Study area alternatives

The EIA assessment included an assessment of the natural values and an impact assessment of the Proposed Action over a wide study area in the Valka and Valmiera districts before the EIA programme was received, including a chemical feasibility study of the area, as well as an expert assessment of species and habitats. Species and habitat experts started surveying the potential WPP area in spring 2022, which resulted in a reduction of the potential WPP area and the maximum number of turbines, from 93 WPPs to 84 WPPs (see Figure 4.1.4).

After consultation with Nature Conservation Agency (hereinafter – NCA) - as far as possible, WPP and infrastructure are planned in accordance with the information in the DDPS OZOLS - outside microreserves and their buffer zones, species sites, SSSIs, habitats of EU importance and protection zones around them (NCA recommendation 40 m around wet habitats of EU importance). In 2022, information on potential new or expanding SPAs and NPSs was received from the NCA and its infrastructure is planned outside these areas where possible.

Also, the NCA recommended in early 2022 that WPPs and their infrastructure should be located as far as possible in clearings and young forests.

- **Preliminary alternative for the location of the WPP turbine study area.** The assessment of nature values (bird species, bat species and species and forest habitats) was launched in 2022. Initially, 93 WPP turbine locations were assessed, see Figure 1 (in the introduction to the EIA report).

- **A basic alternative for the location of the WPP turbine study area.** Following initial fieldwork by experts in nature conservation, expert interviews, recommendations and conclusions, the design of the WPP turbines was refined. The baseline alternative for the location of the study area, for which EIA Programme No 5-03/9/2023 was issued on 12 September 2023 (as amended on 10 January 2024 by No 5-02-1/4/2024), includes a total of 17 land units, where 84 potential WPP sites have been identified. In contrast to the location of the study area in the original alternative, 9 WPP were excluded from further study and 11 WPP were refined in location, see Figure 4.4.

4.1.3. Alternatives to the location of the proposed activity assessed in the EIA report

Following the EIA programme, 84 potential WPP sites have been assessed in detail for their environmental impacts. Of the 84 WPPs assessed, 41 WPPs were identified as having significant environmental effects on bird species, habitats or landscape, see the relevant subsections in Chapter 7 of the EIA Report "Assessment of the significant environmental effects of the proposed activity and its possible alternatives" and the summary in Chapter 8, Tables 8.1 and 8.4.

Overall, taking into account the recommendations of an ornithologist, a species and habitat expert, a landscape expert, a bat expert and a hydrologist for the location and operational conditions of the WPPs, it was concluded in June 2024 that up to 43 WPPs could be constructed. Enviroprojekts Ltd together with certified nature experts recommend to abandon part of the originally planned turbines in order to mitigate the impact not only on the species (including plants, birds and bats) present in the area of the Proposed Action, but also to mitigate the impact on migratory birds and the surrounding Natura 2000 sites (see Chapter 7), as a result the feasible WPP turbines were grouped into two alternative locations. The assessment of the final alternatives also takes into account the guidance of the Publications Office of the European Union on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC: 1) site screening (to exclude significant impacts on Natura 2000 to the maximum extent possible) and 2) assessment (to exclude negative impacts on Natura 2000, their integrity and connectivity)¹⁴.

The assessment of alternatives and the siting of the final turbines also assess cumulative impacts from certified expert opinions and EIA expert assessments, as well as mitigation and exclusion of cumulative impacts on Natura 2000 sites.

For the alternatives for the location of the WPP turbines, see Figures 4.1.5 and Table 4.2.3 in Chapter 4.2:

Alternative A - 29 WPP: compact area in the SW between Seda and Puksi swamps and the Gauja river (Figure 4.1.4)

Alternative B - 43 WPPs: 14 WPPs in a compact area to the N of the Pukši swamp added to the 29 WPPs planned in the SW part of the site (identified as Alternative A) (Figure 4.1.4).

For these WPPs, 29 and 43 respectively, a physical impact assessment was carried out in July 2024 and at the same time an additional assessment by natural experts comparing

¹⁴ [Assessment of plans and projects significantly affecting Natura 2000 sites - Publications Office of the EU \(europa.eu\)](https://european-council.europa.eu/media/en/press-communications/infographic/Pages/infographic.aspx?lang=en&id=12345)

Alternatives A and B was requested. In August 2024, following the supplementary expert opinions, the assessment of the WPP to be implemented was revised, as significant environmental impact factors - impact on bird species - were identified for 3 more WPP (VV44, VV45 and VV92) and for 4 more WPP (VV1 and VV82 or VV36 and VV40) it was recommended to choose two out of four, the choice to be made at the design stage, after assessing the engineering conditions. **After further assessment**, the alternative locations for the WPP Park, as defined above, are 27 for Alternative A (of which 25 WPPs could be built) and 40 for Alternative B: of which 38 WPPs could be built (see Figure 4.1.4).

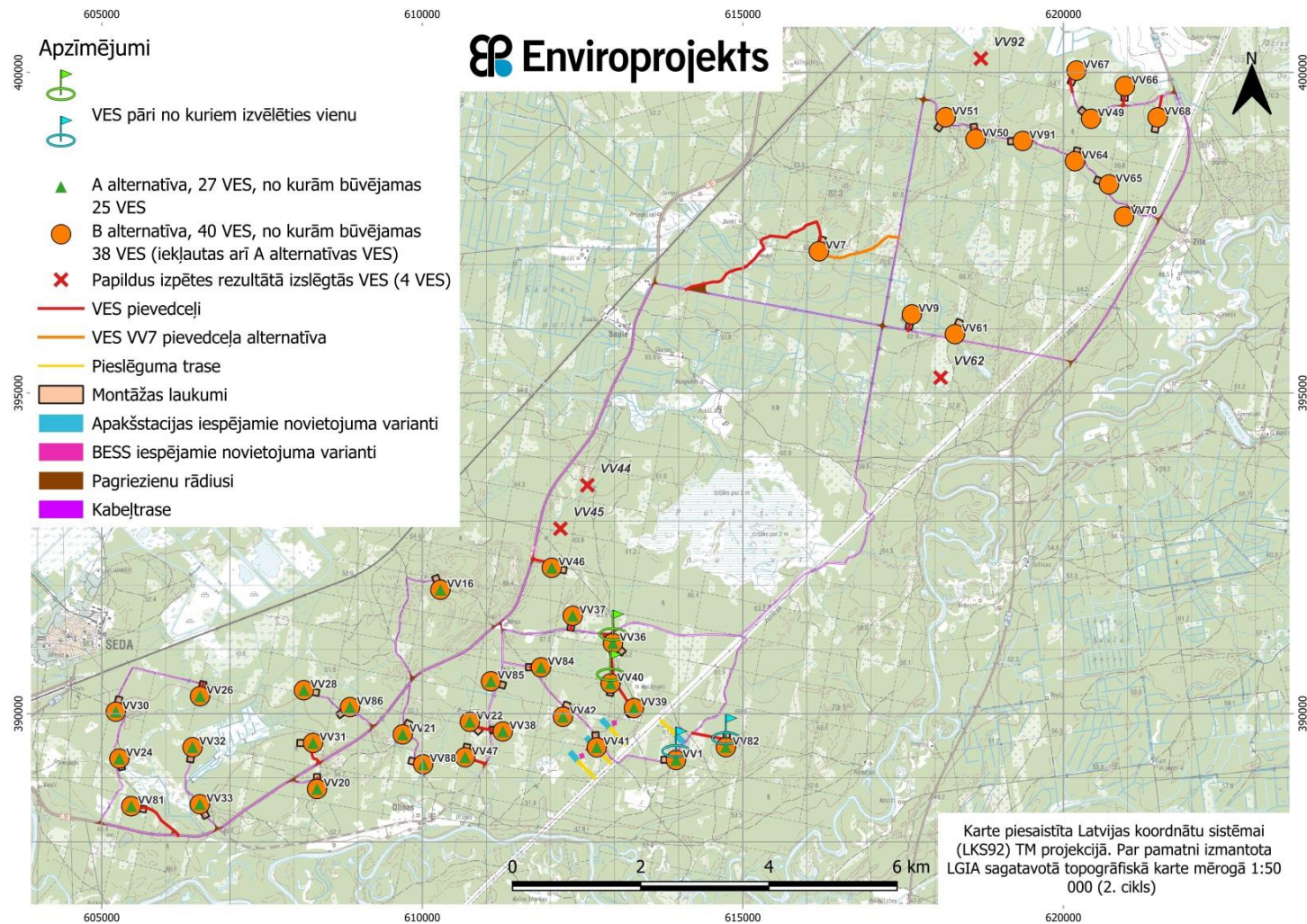


Figure 4.1.4. Alternative A and B for the location of the Valmiera-Valka wind park, after additional assessment by nature experts

As a complement to the information on recommended WPP, we would like to inform that the Promoter of the Proposed Action contacted an environmental impact assessment expert from Poland, who provided an assessment based on her experience on WPP stations that were not recommended by the bird expert involved in the preparation of this EIA report. The Polish expert concluded that 10 of the non-recommended WPPs could be constructed if the mitigation measure "*Installation of a WPP containment chamber*" is implemented, the expert's assessment is attached as Annex 15.

4.2. Characteristics of WPP technologies and alternative solutions

A CHP generator generates electricity by turning its rotor wings in the wind, which is fed through underground cables to a transformer substation. A WPP converts wind energy into turbine rotational energy, which is further converted into electricity by magnets. The rotor of the WPP turns automatically against the wind, so its orientation changes. In no-wind conditions, the rotor does not rotate as the wind speed increases, while in too strong winds the rotor wings rotate parallel to the wind flow for safety and the rotor stops. This technology has been validated in world practice and is fundamentally safe.

As technology advances, the height of the WPP mast and the rotor diameter (wingspan) increase: the higher above the ground, the stronger and more stable the wind, the larger the rotor diameter (wingspan), the more energy can be extracted from the wind¹⁵.

The model and technical characteristics of the WPP to be installed have not yet been determined and selected, and a number of possible models are being considered, assessing their differences, advantages, including height, wing diameter, capacity and other relevant parameters. Currently available WPP models with a high rated generation capacity, i.e. above 6.0 MW (see Table 4.2.1), were evaluated for comparison, but the final decision on the choice of model will be based on the conditions set out in this EIA, assuming that the WPP model from the comparison below or another model with equivalent characteristics is likely to be installed, given the rapid technological development in this sector. The maximum height of the WPP is expected to reach 300 m, with rotor diameters of up to 200 m.

Table 4.2.1. Technical characteristics of commercially available WPP models

Manufacturer	Model	Rotor diameter, m	MW	Mast height, max, m	Wing tip height, max, m	Starting, m/s	End of run, m/s
Nordex ¹⁶	N175/6.X	175	6,0–6,9	179	266,5	3,0	20
Vestas ¹⁷	V172	172	7,2	199	285,0	3,0	25
Enercon ¹⁸	E175	175	6,0	162	249,5	2,0 ¹⁹	25 ²⁰

¹⁵ <https://www.windpowerengineering.com/calculate-wind-power-output/>

¹⁶ Information: N175/6.X - Nordex SE (nordex-online.com)

¹⁷ Information: V172-7.2 MW™ (vestas.com)

¹⁸ Information: ENERCON wind turbines | New top model E-175 EP5 | Further models: E-160 EP5, E-138 EP3, E-82 EP2

¹⁹ <https://en.wind-turbine-models.com/turbines/2472-enercon-e-175-ep5>

²⁰ <https://en.wind-turbine-models.com/turbines/2472-enercon-e-175-ep5>

Manufacturer	Model	Rotor diameter, m	MW	Mast height, max, m	Wing tip height, max, m	Starting, m/s	End of run, m/s
Siemens Gamesa Renewable Energy ²¹	SG170	170	7,0	185	270,0	3 ²²	25 ²³
General Electric ²⁴	Cypress	164	6,1	167	249,0	3 ²⁵	25 ²⁶

According to the technical information provided by the manufacturers, the mast height can be adapted to the customer and location requirements according to current technological possibilities up to 200 m, rotor diameters range from 160 m to 175 m.

With regard to noise, their frequency level and maximum noise are equivalent and the differences are negligible (106.0 dB(A)-107.0 dB(A)), all the models considered have aerodynamically improved latest generation wings to reduce noise and a change of operating modes to optimise noise.

There are various solutions for de-icing wings, such as automatic icing detection systems, automatic wing heating systems and additional warnings.

Several models have built-in bat protection systems, such as turbine shutdown if there is a higher risk of collision in the vicinity.

The lifetime of the WPP models considered is ~25 years (25-30 years depending on the manufacturer and turbine lifetime). The latest technologies can have a working life of up to 35 years.

According to the information provided by the leading manufacturers of WPPs, the wind speed at which the plant starts operating is 3 m/s, while it stops at 23-24 m/s (however, this may vary from model to model).

The WPP will be delivered disassembled and consist of several modules, a rotor and wings. The WPP is assembled at the installation site. After the installation of the WPP, the wiring work is carried out and the cables are connected.

Similarly, the masts of the comparable WPP models are mostly made of steel sections, the rotor consists of three fibreglass composite wings with adjustable wing sweep, and the nacelle incorporates a generator, transformer, brakes, gear unit, equipment and mechanisms for monitoring and controlling the operation of the station. When steel mast sections cannot be transported to the WPP installation site due to their large diameter, they are split into several

²¹ Information: Onshore Wind Turbine SG 7.0-170 - NEW TURBINE | Siemens Gamesa

²² <https://en.wind-turbine-models.com/turbines/2346-siemens-gamesa-sg-6.6-170>

²³ <https://en.wind-turbine-models.com/turbines/2346-siemens-gamesa-sg-6.6-170>

²⁴ Information: Cypress Onshore Wind Turbine Platform | GE Renewable Energy

²⁵ <https://en.wind-turbine-models.com/turbines/2307-ge-vernova-ge-6.0-164-cypress>

²⁶ <https://en.wind-turbine-models.com/turbines/2307-ge-vernova-ge-6.0-164-cypress>

individual mast segments, which are assembled together at the WPP installation site (Figure 4.2.1).



Figure 4.2.1. Multi-segment WPP mast section (Vestas LDST²⁷)

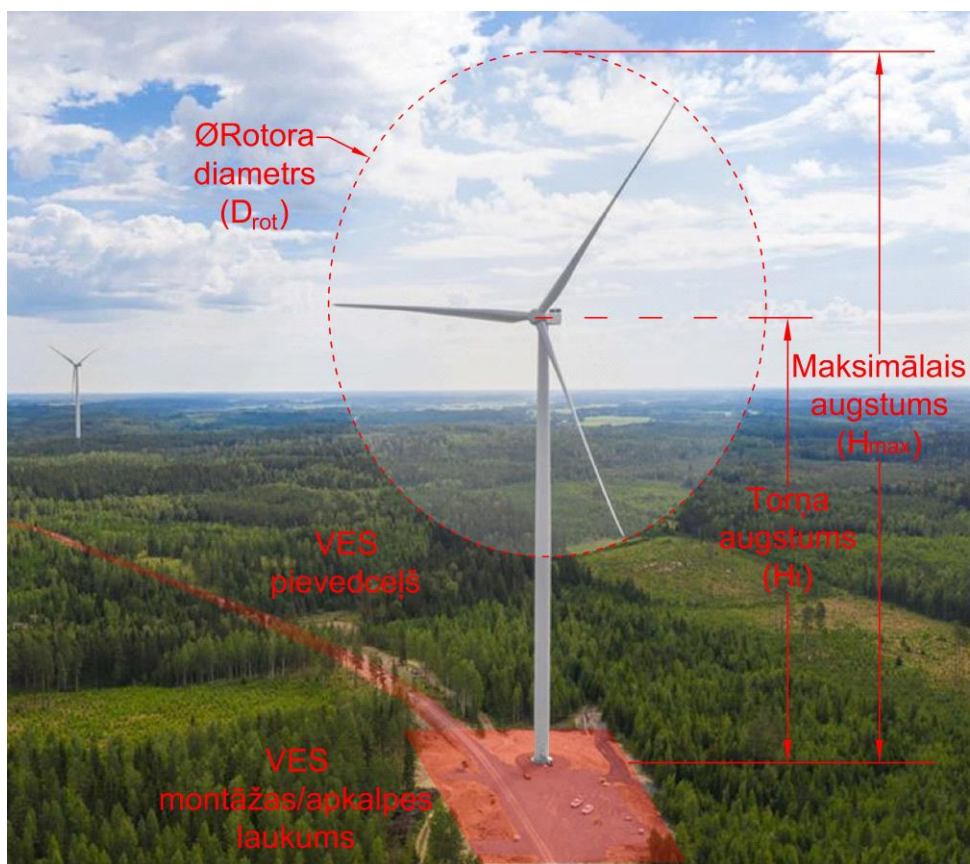


Figure 4.2.2. WPP design parameters

This EIA assesses alternatives for the location of the WPP park and the height of the WPP tower(see Table 4.2.2). The height alternatives for the WPP tower are defined for the two

²⁷ <http://terralwind.com>

location alternatives defined above: the different height constraints of the WPP as defined in the landscape expert's opinion are assessed in a comparative way. Technological alternatives for WPP models are not evaluated, but the maximum precautionary principle is used to select the WPP model with the highest noise output.

For each of the areas assessed during the EIA process, the alternative options for the implementation of the Proposed Action are summarised in Table 4.2.3.

Table 4.2.2. WPP location alternatives A and B and additional tower height alternatives A' and B' - compared WPP height limits in metres

No. p. k.	Name of the WPP site	Alternative A	Alternative A'	Alternative B	Alternative B'
1	VV1	250	275	250	275
2	VV7			300	300
3	VV9			300	300
4	VV16	300	300	300	300
5	VV20	300	300	300	300
6	VV21	300	300	300	300
7	VV22	300	300	300	300
8	VV24	250	275	275	300
9	VV26	300	300	300	300
10	VV28	300	300	300	300
11	VV30	250	275	250	275
12	VV31	300	300	300	300
13	VV32	300	300	300	300
14	VV33	300	300	300	300
15	VV36	250	275	250	275
16	VV37	300	300	300	300
17	VV38	300	300	300	300
18	VV39	300	300	300	300
19	VV40	300	300	300	300
20	VV41	300	300	300	300
21	VV42	300	300	300	300
22	VV46	300	300	300	300
23	VV47	250	275	250	275
24	VV49			250	275
25	VV50			300	300
26	VV51			300	300
27	VV62			300	300
28	VV64			300	300
29	VV65			250	275
30	VV66			250	275
31	VV67			250	275
32	VV68			250	275

No. p. k.	Name of the WPP site	Alternative A	Alternative A'	Alternative B	Alternative B'
33	VV70			250	275
34	VV81	250	275	250	275
35	VV82	300	300	300	300
36	VV84	300	300	300	300
37	VV85	300	300	300	300
38	VV86	300	300	300	300
39	VV88	250	275	250	275
40	VV91			300	300
Total		27	27	40	40

Table 4.2.3. Areas assessed and corresponding alternatives assessed - location and/or technological

Area assessed	EIA Units	Location alternative	Technological alternative
Species and habitats	6.4.1, 6.4.2, 7,6.	X	
Bats	6.4.4., 7.6.4., 7.6.5.	X	
Birds	6.4.3., 7.6.2., 7.6.3.	X	
Invertebrates	6.4.5., 7.6.6.	X	
Landscape	6.5., 7.7.	X	X
Cultural history	6.5., 7.7.	X	X
Tourism and recreation	6.5., 7.8.	X	
Natura 2000	7,9.	X	
Noise	6.7., 7.2.1.	X	X
Low frequencies	7.2.2.	X	
Flicker	7,3.	X	X
Air	7,4.	X	
Hydrology	6.1., 6.2.	X	
Environmental risks and accidents	5,3.	X	
Vibration	7.3.2.	X	
Climate	5.4., 5.5.	X	

4.3. Construction process

4.3.1. Description of the construction works and components of the WPP project

The total time required for the construction of the WPP park is expected to be approximately two years and the construction works will be carried out in accordance with the organisation of works and in compliance with the requirements of the regulatory enactments (Figure 4.3.1). During construction, the recommendations of experts, including ornithologists, bat experts, etc., will be taken into account with regard to construction activities and their prohibition during certain periods of time, and the activities will be carried out without endangering protected natural values. In case of changes in the construction works, the changes are to be

agreed separately with the expert in the relevant field. Meteorological conditions such as strong winds, snow, etc. that may affect the construction process will also be taken into account.

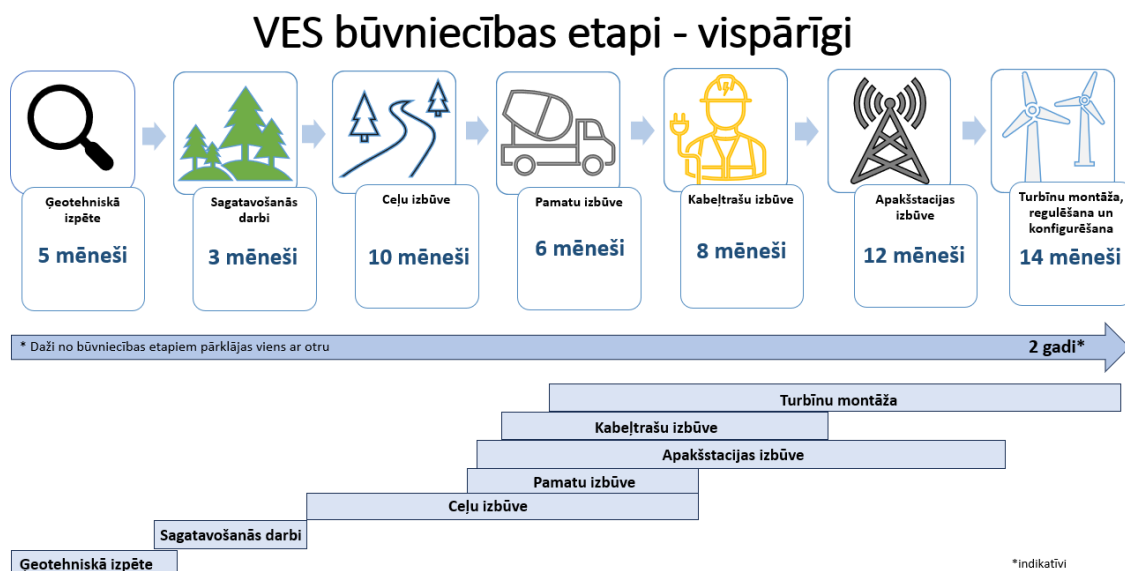


Figure 4.3.1. Preliminary timetable for the phases of WPP construction

Access roads

Assessing the existing road network and making improvements to improve the carrying capacity or dimensions of the road. The project is planned to use the existing road network as much as possible, reinforcing or widening the roads of JSC Latvijas Valsts meži and/or municipalities, if necessary.

Construction of road connections between the existing JSC Latvijas Valsts meži and/or municipal road and the prospective WPP station. Each WPP will be assessed individually.

Construction work service area

Creation of a common service area for the project - to create a temporary area for the temporary storage of bulk materials and earth-moving machinery. The optimal location of the site will be determined during the design process, taking into account the constraints identified and adapting its location for more efficient use of vehicles and construction materials. The site is to be rehabilitated after the construction work is completed.

Electricity connection

The construction of the 35 kV medium voltage electricity cable network in the project area will be carried out in open or closed trenches in the road right-of-way, where possible, minimising the impact on adjacent properties.

WPP service (assembly) area

The service area for each WPP can be up to 2.6 hectares, according to the conditions of the WPP manufacturers and designers. After construction, some of these sites are partially

reclaimed and can be reused for forestry in parallel with the operation of the WPP, as a smaller site than for construction is usually sufficient for maintenance, depending on the specific location of each individual WPP. However, in this park it will be assessed whether these sites should be reclaimed after construction and returned to forestry, as periodic maintenance of the equipment would be required, which would imply re-deforestation of the area.

WPP

A WPP with a capacity of up to 8 MW and a total height of up to 300 m is currently under development. The model and technical characteristics of the WPPs to be installed are currently still to be determined and selected, and a number of possible models are being considered, inter alia in the light of the results of the EIA report. In the Valmiera-Valka Wind Park project area, the location of the WPPs is planned in a compact south-western part of the study area (25 WPPs of Alternative A), as well as the feasible WPPs north of the Pukši swamp (13 WPPs), which together with Alternative A form Alternative B - 38 WPPs.

High-voltage substation

The construction of the high-voltage substation is being carried out in accordance with the technical conditions of JSC AST. For the substation, a high load capacity road will be constructed to ensure the load capacity of the equipment delivery by specialised transport. A standardised solution for the substation is envisaged with a total required substation area of up to 0.5-1 ha. An essential element of a high-voltage substation and the high-voltage network (110/330 kV) is the construction of overhead transmission lines between the substation and the high-voltage network. The length of the overhead line is an important cost element, which is why the substation is located close to the overhead lines of the high-voltage network. The proposed length of the overhead line is less than 300 m, given that the substation is to be located on land crossed by a high-voltage line. The transmission line can also be implemented as a cable. The exact technical solution will be worked out in the construction project.

BESS

The BESS will be located on a site of up to 1 ha, adjacent to the high voltage substation site. A more detailed description of the BESS technology is given in chapter 4.4. For site preparation, hard surfaced areas will be constructed with a suitable surface for the chosen technological solution, comprising a crushed stone or hard surfaced area on which energy storage equipment delivered in standardised transport equipment (container type) will be placed. The water drainage and technological solutions will be adapted to the chosen technology.

4.3.2. Planned site preparation works

The EIA procedure assesses the worst-case scenario, which in this case includes a maximum possible height of 300 m and a maximum possible turbine diameter of 200 m. The choice of the specific WPP model to be built will depend on many conditions outside the EIA procedure for the supply of equipment, such as the availability of manufacturers' models on the market, delivery times, price, etc.

The WPP is planned to be constructed on a monolithic reinforced concrete foundation, following the technical specifications prepared by the WPP manufacturers, and taking into

account the soil bearing capacity in the area of the Proposed Operation. As part of the technical design, a geotechnical investigation should be carried out to assess the soil bearing capacity at each WPP site. If the geotechnical investigation reveals insufficient soil bearing capacity for the installation of the selected WPPs, the foundation will be based on piles at the appropriate locations. The need for piles and the technological solution for their construction will be determined in the construction project. The bearing capacity of the soil at each WPP site will be determined as part of the geotechnical investigation.

The construction of the WPP will start with site preparation works, which will include the establishment of storage areas for equipment, construction machinery and materials, the removal of topsoil and subsoil in areas where new roads and the WPP are to be built, and the preparation of construction pits for the construction of the WPP foundations.

One area could be created on the site of the proposed activity for temporary storage of machinery, equipment and materials during construction. The site will accommodate construction materials, excluding loose materials for road and site construction, WPP components, construction machinery and waste collection containers. The pitch will be up to 2,6 ha in area and will be constructed of gravel and crushed stone, ensuring a minimum load-bearing capacity of 250 kN/m².

The temporary storage area will also house a construction management centre. This control centre will have a stand-alone electricity and water supply, as well as a mobile wastewater collection solution if needed.

In areas where new roads and sites are planned for the installation of WPPs, as well as where WPP foundations are to be built, deforestation will be carried out before construction work starts.

According to the letter No 4.9/2372/2024-N of the Nature Conservation Agency of 17.04.2024, the construction of the planned WPP park is also planned in historical forest massifs, which are now partially fragmented due to the increasing logging in the country, but still contain an important gene pool of rare forest species. Old-growth forests will be significantly more affected by the construction of WPPs and associated infrastructure than if WPP parks were planned on agricultural land, in quarries, etc. Therefore, taking into account the request of the NCA, in the area of the Proposed Action, which affects old, historical forest massifs, experts have been engaged not only for forest or swamp habitats, but also for mosses, lichens and vascular plants.

Estimates of the total deforested area are given in Chapter 7.1.

After deforestation, topsoil will be removed. The removed topsoil will be temporarily placed along the boundary of the construction site. The areas where the new roads and WPPs are to be constructed are not located in waterlogged areas where significant quantities of poor bearing soils would need to be removed prior to construction. It is expected that part of the removed topsoil will be used for reclamation during the final phase of the construction process, while the remainder will be used for the improvement of nearby agricultural land. It is expected that soil not required for the reclamation of the construction area will be removed from the temporary spoil heaps once the access roads and plazas are completed.

During site preparation works, construction pits will be dug in the areas where the foundations of the WPP will be constructed. Indicatively, each construction pit will have an area of up to 1000 m² and a maximum depth of up to 5 m (final solution after geotechnical investigation at the design stage). The spoil removed from the pit will be temporarily placed along its perimeter. Part of the excavated spoil will be used for post-construction reclamation; while the rest will be removed from the temporary spoil heaps once the access roads and plazas are completed (Figure 4.3.2).



Figure 4.3.2. WPP construction (illustrative image)²⁸

An assembly area must be created at each WPP to be built. Its size and configuration depend on the model of the WPP to be built, the machinery used in the assembly process, the location of the site, changes in ground surface elevation, logistical solutions and rotor assembly solutions. The configuration of each assembly area will be designed in cooperation with the selected WPP manufacturer or its authorised construction company. The elements of the assembly site - access roads, the main crane working area and the hard surfaced areas (hard surfacing - compacted gravel material meeting specified load bearing capacity) and the WPP foundation area - will be created during the construction process and maintained during the lifetime of the WPP within the boundaries of the land unit allocated to each WPP, using only part of its 2.6 ha area. The elements of the assembly area - assembly area, wing stowage area, crane assembly area, equipment/ballast stowage area, auxiliary crane working area outside the access road - will be created during the construction process and dismantled after the construction of the WPP. The elements of the assembly site - hard surfaced areas, assembly area, equipment/ballast staging area, auxiliary crane working areas, hard surfaced areas in the WPP wing staging area and crane assembly area - shall be constructed of gravel and crushed stone material and shall have a minimum load bearing capacity of 250 kN/m².

²⁸ <https://www.peikko.ae/reference/simo-wind-park/>



Figure 4.3.3. *Installation area of the WPP (example - VESTAS 5,6 MW)*

4.3.3. Construction solutions for roads and squares

The delivery of the WPP equipment and components will be carried out on the road network identified in the EIA, and the same roads will be used for construction transport. The road network will also be used for maintenance of the WPP after the end of the construction works - no heavy traffic is planned on the road network after the end of the construction works.

The sequence of works shall include the construction of access roads in accordance with the designers' instructions (Figure 4.3.4). Depending on the solutions envisaged in the construction design and the results of the geotechnical investigations, the topsoil will be removed and placed at the edge of the construction area with the aim of returning it after the completion of the construction works (Figure 4.3.2). The necessary engineering structures and drainage will be realigned according to the construction design solutions to be agreed with the respective road owner (for the existing road network) or according to the Latvian State Forest road construction solutions and equipment manufacturers' conditions (for new roads).

According to the manufacturers, the minimum required road width for moving equipment and wings is 4,5 m in straight sections and 6,5 m in small curved sections (depending on the assessment and specification of each individual turbine manufacturer after thorough site investigation and survey). It is not planned to construct new road infrastructure and carry out deforestation works on the existing road sections, the construction of which was carried out in accordance with the requirements of JSC Latvijas Valsts meži "Technical Regulations for Design of Forest Infrastructure Objects, 2015".

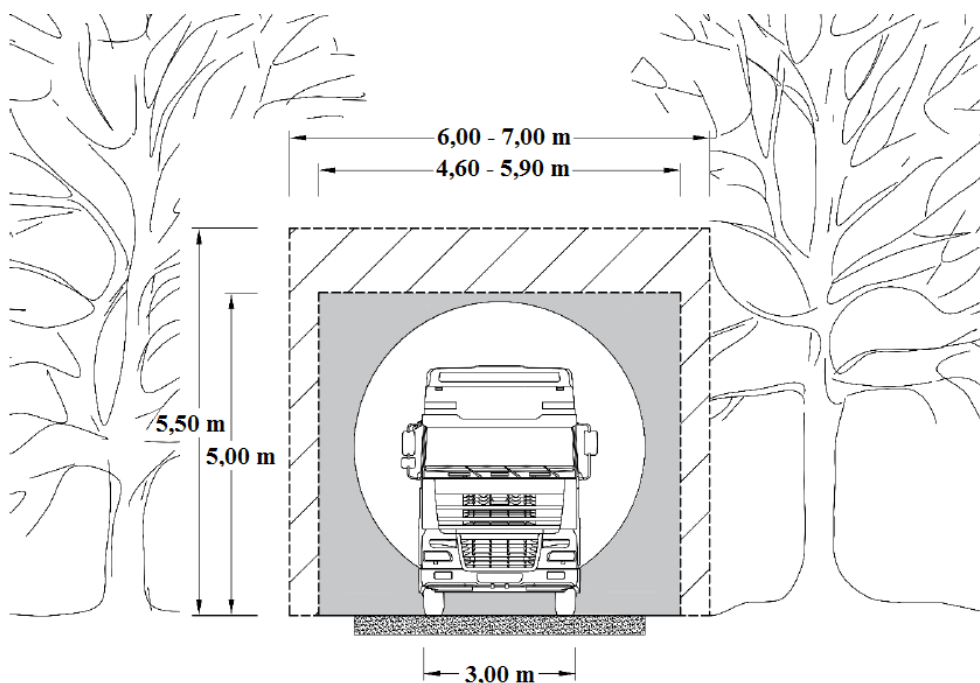


Figure 4.3.4. Access characteristics (example)

Outside Latvia, in countries where equipment and extra-long turbine wings are transported over mountainous roads with difficult terrain, specialised transport units are also used that can lift a given wing to a certain height above the ground, thus reducing the required in-plane turning radius. The specific solution will be evaluated during the design of the works, once the specific turbine model and its parameters are known, taking into account cost conditions and the availability of specialised vehicles.

Road carrying capacity and width issues for the substation access road and the BESS site need to be addressed separately. The substation transformer (unfilled with oil) weighs approximately 40 tonnes and has non-standard transport dimensions, which place increased demands on it. It is recommended that separate supply designs be developed for the supply of the transformer and other substation process equipment if their dimensions exceed standard transport dimensions (Figure 4.3.5). The BESS site is up to 1 ha and requires the removal and replacement of the fertile soil with a layer of high load bearing, non-confined pavement to allow vehicular and crane access in the event that the BESS equipment package (container) needs to be replaced.

The turbine service areas for the WPP will consist of a permanent use area and temporary use areas (Figure 4.3.6).

The construction period is significantly constrained by the climatic conditions in Latvia and, consequently, by the load capacity of the access roads and their limitations during the period in question. In parallel, these periods need to be aligned with an appropriate timeframe for securing supplies from the equipment manufacturer, as well as the availability of the necessary heavy-duty equipment. Given the current high demand for WPP equipment on the world market and especially in the EU - it is necessary to plan the construction period based on the possible availability of supply and the availability of the relevant technical supplier's personnel, as well as to take into account the weather conditions - it is not possible to assemble the wind farm components in strong winds.



Figure 4.3.5. Road construction solution for the WPP park (photo: Enviropojekts)



Figure 4.3.6. The WPP site base under preparation (photo: Enviropojekts)

4.3.4. Solution for WPP foundation structures

According to the information provided by the manufacturers, the WPP mounting areas are known to have a load capacity of at least 250 kN/m^2 .

As an indication, the foundations of a single WPP will require up to 1000 m^3 of concrete and 125 t of steel on average. Thus, up to $38\,000 \text{ m}^3$ of concrete and 4750 t of steel reinforcement are needed to construct the foundations for 38 WPPs (for each turbine and each soil condition, the solution may vary according to the results of the geological investigation) (Figures 4.3.7 and 4.3.8).



Figure 4.3.7. Part of the WPP foundation steelwork under construction (photo: Enviropojekts)



Figure 4.3.8. Part of the WPP foundation steelwork under construction (photo: Enviropojekts)

4.3.5. Installation of temporary service area, mast structure and WPP

The installation area for the WPP should not exceed 100 x 260 m. The longest edge of the installation area shall be up to 100 m long. Before installation, the WPP is brought disassembled, with the longest wing component being 100 m. At the EIA stage, a rectangular area was assessed on a best-caution basis (in reality this area is smaller) to accommodate the assembly areas of the manufacturers of all major WPPs (Table 4.2.1) - the approximate configuration of the construction area is shown in Figure 4.3.9.

The installation of the WPP at the site of the Proposed Operation will be carried out by the WPP manufacturer or its authorised construction company. A detailed plan for the installation of the WPP will be developed in the construction project. The time needed to install a single WPP is usually within one week, but weather conditions play an important role in the process. The installation of a WPP may be delayed if there are high wind speeds at the time scheduled for installation, limiting the ability to safely install the WPP.

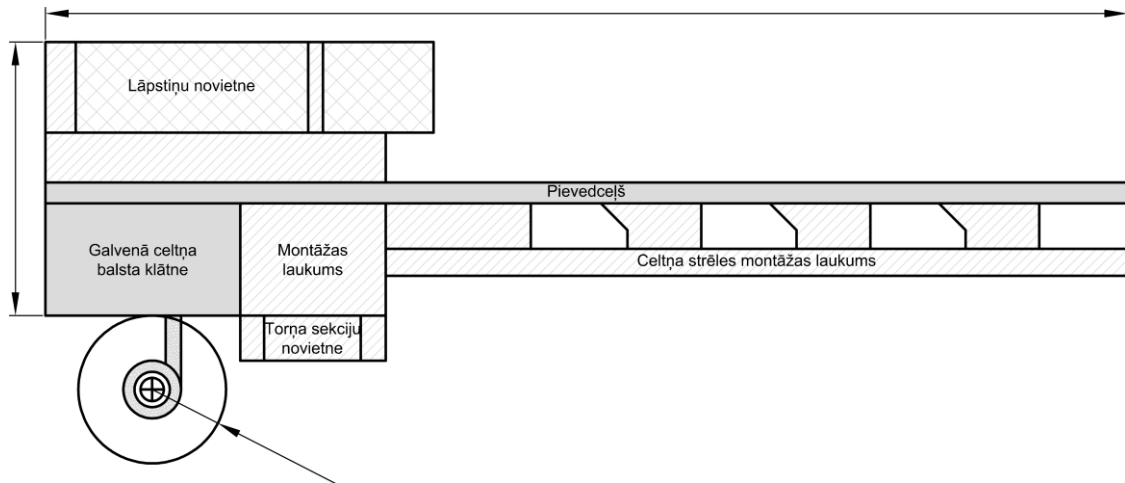


Figure 4.3.9. VESTAS 5.6 MW model site configuration

The 5.6 MW area of the VESTA model (Figure 4.3.9) is indicative. WPP technology for 300 m high onshore wind turbine models has not yet been developed, so information on similar turbines with appropriate site margin (plus 20%) for larger component dimensions is used (Figure 4.3.10).



Figure 4.3.10. Installation process of a WPP turbine in Latvia - Tārgale project, 2022 (photo: Enviroprojekts)

4.3.6. Construction of utilities

In the WPP area, electricity utilities are usually constructed using two solutions - overhead transmission lines or cable lines. In this project, cable lines are planned to connect the WPP turbines to the common electricity grid, as this solution has less impact on the future use of the forest land. The cable connection of the WPP turbines is implemented in a 20-40 kV cable line with a connection to the AST substation, which in turn is connected to the AST overhead line, which will be connected to the common power grid in accordance with the technical regulations issued by AST.

Prior to the start of construction, a detailed engineering study will be carried out to determine the optimal final route of the cable routes, taking into account the geological conditions and the environmental protection requirements set out in the EIA opinion on the planned activity, in accordance with the cable routes defined in the EIA report and which have been investigated in the field.

For optimal power supply solutions, the planned layout of the WPP turbines is taken into account, as cables must be run from each turbine to transformers or collection points. The cables shall be placed at the optimum excavation depth according to the engineering survey data to protect them from environmental influences (mechanical damage, e.g. movement of logging machinery). Special cable conduits or protective structures are laid in the trenches where the cable ducts are installed to protect the cables from water, soil pressure and other environmental factors. Medium-voltage cables (10-30 kV) are commonly used to transport electricity from turbines to collection points, as well as high-voltage cables (110 kV and above) between collection points and power grids. After the cables are installed, they are tested to check their integrity, durability and safety. Tests include both power flow testing and safety tests against surges or other possible malfunctions.

As part of the construction of the WPP Park project, a new substation is to be built, which will be connected to the 330 kV network of AST (Figure 4.3.11).

The LVP foresees a substation on the 330 kV high voltage line Valmiera-Tsirguliina. The EIA assessed five options for substation locations. An agreement will be concluded with AST for the construction of the substation. A 20-35 kV network will be constructed to interconnect the WPP stations with the substation to be built, the technical parameters of which will be detailed in the electricity network design.

During the construction process, communication networks will also be built for the management and monitoring of the WPP projects. It is expected that the networks to be built (fibre optic and low-current cable lines) will be laid parallel to the electricity transmission networks and that the data networks will be built in parallel to the access roads.



Figure 4.3.11. *High-voltage substation under construction - Tārgale project, 2022 (photo: Enviroprojekts)*

In accordance with the technical regulations of AST, which will be received after the conclusion of the EIA procedure, the process of connection and substation construction will also be implemented. It is expected that the Substation construction project will be implemented together with the construction of the full set of equipment required for the construction of the AST equipment and LVP equipment. The substation area will house the main equipment groups in two small-scale technical application buildings, one of which is intended for the needs of AST technical staff, and the other - on the medium voltage side - for the needs of Latvian wind farms. The building on the medium voltage side can also be designed to provide a safe minimum amount of storage space for the safe storage of unscheduled maintenance materials for the operation of the WPP.

A BESS system will be constructed on the land immediately adjacent to the substation site (up to 1 ha), according to the technical design of the proposed operation, making optimal use of the road and cable infrastructure. The site will be surfaced with a non-load bearing material of adequate strength for the maintenance of the BESS system and for the replacement of process equipment. The technological equipment will be delivered and installed in standardised transport solutions (sea containers) ready for operation, without any additional construction work.

4.3.7. Transport of WPP components

The delivery of the components of the WPP to the site of the proposed activities will be carried out by the manufacturer of the WPP or its authorised transport company. A detailed transport plan for the WPP will be developed in the construction project in cooperation with the WPP manufacturer or authorised distributor. The transport plan will take into account the size, mass, road width and load capacity of the components of the WPP to be transported and other constraints (bridges, viaducts, overhead power lines, etc.).

The components of the WPP will be delivered from their place of manufacture to the port (options: Salacgrīvas, Skultes, Rīgas). They will be transported from the port by road: some parts will be transported by road on public roads without special permits, and some parts, such as the bulky mast sections, nacelle and wings, will be transported by specially built and equipped or adapted bulky goods vehicles, each of which requires a special permit. Of these, the undivided wings up to 100 m long will be the real traffic bottleneck, which may require temporary stoppages of other traffic in places during manoeuvring. However, according to traffic needs and possibilities, on the route from the port to the installation site of each WPP, the projection of the wing length on roads and access roads is reduced by special transports that carry the wing half-raised at greater or lesser angles, while the length of the transport itself is only ~30 m. The mast sections are ~30 m long, so they may also require additional manoeuvring measures, but to a much lesser extent. The other loads requiring permits will be heavy goods only, not bulky goods, and the traffic complications they cause are negligible, mostly just slow speeds.

Every overweight freight journey on public roads has the potential to cause inconvenience to other road users, but it is the necessary permits that ensure that the journey is planned to minimise this inconvenience. Transport of bulky parts could be planned for weekends, when traffic is significantly less. It is even lower at night, while it is more dangerous to correctly perceive and safely overtake a slow-moving bulky goods carrier in the dark of the day, and it is more difficult to notice and understand in time a temporary traffic stop for a bulky goods manoeuvre that has been organised ahead.

The delivered components of the WPP will be placed either at the WPP assembly site or at one of the sites constructed for the temporary storage of machinery, equipment and materials.

The approximate mass and number of components of the planned analogue WPPs are as follows (indicative, may vary slightly from the chosen WPP model):

- basic ring: 20 t (divisible),
- mast: 500 t (each section 40-70 t, number ~8),
- gondola: 50 t (indivisible)
- generator: 100 t (consisting of 4-5 parts of 15-50 t each),
- wings: 3 x 20 t (indivisible),
- Total: up to 750 t (including ~13 indivisible bulky and/or heavy loads).

In addition to these details, the literature gives a maximum for the largest WPP with a safety margin: the amount of concrete for the foundations shall not exceed 2500 t (including reinforcement, which is negligible in this mass).

Existing dirt roads will be used as far as possible for access to the WPP, and new roads are planned to allow for construction and operation of the WPP. It is expected that access to the

planned WPP park during construction and operation will be provided by the national trunk road A3 (Inčukalns-Valmiera-Valka), regional roads P24 (Smiltene-Valka) and P26 (Seda feeder road), national local road V260 (Egli-Olinas-Berzs), municipal roads, forest roads maintained by the State Forests of Latvia, as well as newly built or adapted existing feeder roads.

Site access is planned on the basis of the transport conditions required for construction and delivery of equipment. The projected vehicle volumes during the construction of the WPP in the vicinity of the Proposed Action are presented in Figure 4.3.12.

Estimated number of transport units for each phase of the project works (see Table 4.3.1 for a summary):

- Substation construction and construction of new access roads and increasing the load capacity of existing roads for delivery of heavy equipment (Substation area up to 1 ha, access road with load capacity >250 kN)
- (up to 350 lorries per substation and up to 25 lorries for every 100 linear metres of road to be built/reconstructed);
- 330 kV grid connection (overhead line) (Planned length of the overhead line (before obtaining technical regulations from AST) - 400 m (up to 50 trucks/m);
- BESS - technology construction and equipment supply. Required area up to 1 ha, [unpaved area to be provided] (up to 370 lorries/m in total);
- Construction of access roads to each WPP (up to 25 lorries/m for every 100 linear metres of road to be constructed/reconstructed);
- Construction of service bays for each WPP (300 lorries/m for each service bay to be built);
- WPP foundation and footing construction (average 1100^{m³} of reinforced concrete per footing construction - 50 lorries/m per WPP);
- Delivery of WPP equipment (mast, generator and wings) to the sites (up to 20 lorries per WPP);
- Installation of WPP equipment (up to 7 lorries per WPP).

Table 4.3.1. Number of transport units for each phase of the project works

Project phase	Number of lorries/m
Substation construction	Up to 350 plus up to 25 for every 100 consecutive metres of road
Connection to high voltage line	Up to 50
Installation of a battery energy storage system	Up to 370
Construction of new feeder roads for each WPP	Up to 25 for every 100 metres of road
Construction of service (assembly) areas	Up to 300 x 38 WPP
WPP foundation construction	Up to 50 x 38 WPP
Supply of WPP equipment	Up to 20 x 38 WPP
Installation of WPP equipment	Up to 7 x 38 WPP

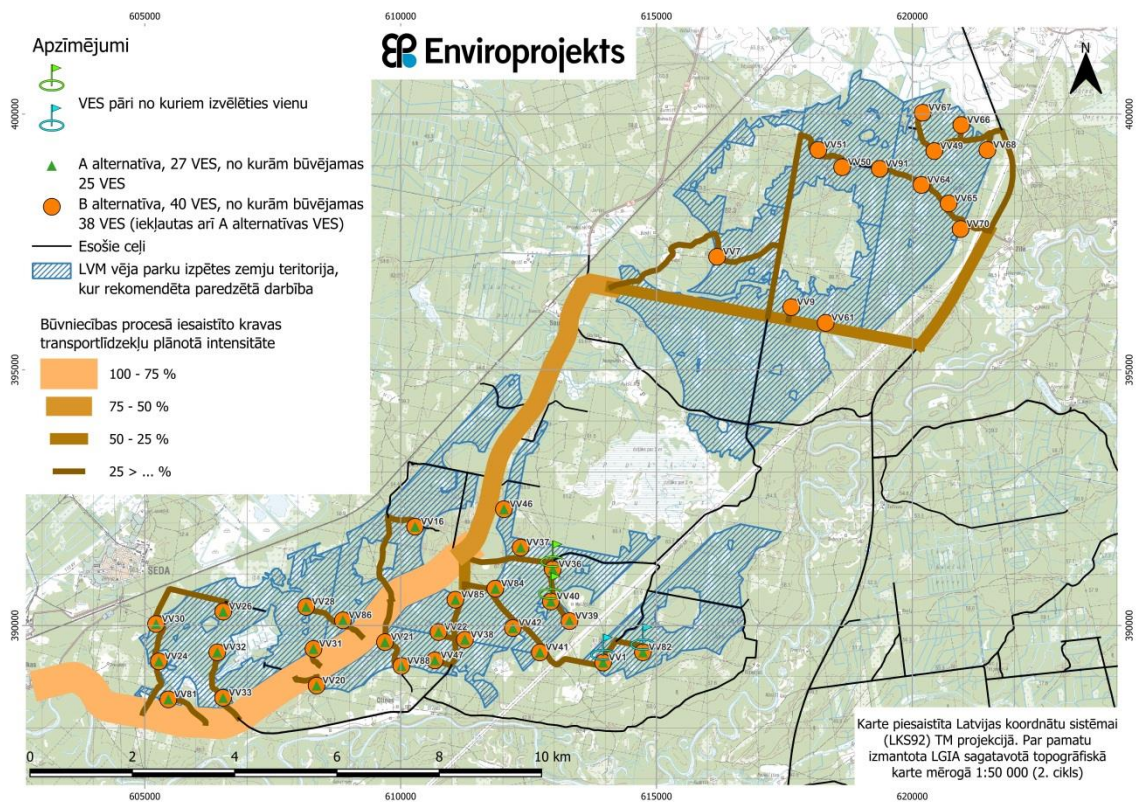


Figure 4.3.12. Projected vehicle volumes during the construction of the WPP



Figure 4.3.13. Special equipment for transporting WPP wings



Figure 4.3.14. Transport of WPP turbine parts in Latvia - Tārgale project, 2022 (photo: *Enviroprojekts*)

4.3.8. Installation of additional security, lighting and monitoring equipment for WPP

Various auxiliary equipment will be installed to help control, regulate and manage the turbine and grid parameters of the WPP. Equipment manufacturers can offer different solutions depending on the customer's requirements and project conditions. These systems are integrated into the Industrial Process Control and Visualisation System (SCADA).

In line with the requirements of nature experts and the NCA, the WPP turbines will be equipped with the necessary digital bird and bat monitoring systems, allowing them to be shut down at short notice when certain conditions are present. The most appropriate solution for the site of the proposed activity will be determined during the pre-construction monitoring. There are currently several such systems on the market, such as *IdentiFlight*, *Bioseco*, etc., but the market is evolving rapidly and the most appropriate solution will be selected in the light of the results of the post-construction monitoring when installing wind turbines in the area of the Proposed Action.

All potential turbine suppliers also offer tailored retrofit packages for climate (winter) risks such as de-icing and others as part of their technology specification. To prevent aviation safety risks, WPP will be equipped with lighting equipment in accordance with the requirements of aviation legislation.

4.3.9. Inspection, testing and acceptance of equipment

After the construction and installation of the wind park and the facilities and equipment related to its functioning in accordance with the technical regulations - for the WPP, the BESS and also for the high voltage substation, a multi-stage commissioning phase will be carried out to ensure the stable operation of both the WPP as an electricity generator and the BESS, as well as the connection and the stability of the high voltage line.

In line with previous practice in similar projects in Latvia - the commissioning programme for a substation can take more than six months.

Experience from similar projects shows that a major benefit of the substation test programme is the temporary connection to the medium voltage electricity grid.

4.3.10. Reclamation of construction sites and WPPs

After the construction of the WPP park, the project area will be reclaimed. At the end of the construction works, the temporary storage areas for machinery and construction materials, as well as all materials used in the delivery and installation of the WPP, will be dismantled. If the material used for the site is to be returned to another location, contamination analyses of the material will be carried out. Depending on their results, a decision will be taken on their possible re-use as road or square surfacing material or for the restoration of fertile soils.

The possibility of reclaiming the site and returning parts of the site to forestry will also be assessed during the construction phase. However, this possibility should be assessed under the conditions of the equipment supplier for the future servicing of the WPP turbine. The study areas of the WPP Park project are forest land, so no agricultural use is planned after completion of the construction works.

The lifetime of a WPP is typically 25-30 years. Turbine manufacturers are now also prepared to offer service contracts for a 35-year life cycle. A well-maintained plant can be operated for longer if the benefits of realising the energy generated by the plant outweigh the costs of maintenance and upgrading. Experience from other countries shows that the actual lifetime of a WPP can also be affected by technological developments and industry policies. At the end of its lifetime, the WPP is dismantled *or repowered*. In dismantling, the WPP is completely demolished with all foundations, while in rebuilding, old stations are mostly replaced by new ones on the same or new foundations. Metal structures and equipment from dismantling can be recycled and reused, e.g. as REF (waste-derived fuel), or concrete can be recycled as construction waste²⁹.

In 2021, the wind industry called for a Europe-wide ban on landfilling of WPP wings³⁰ and committed to reuse, recycle or recover 100% of used wings. WPP manufacturers have set targets for fully recyclable wings and have developed wing recycling solutions³¹. For example, *Siemens Gamesa Renewable energy*, a manufacturer of WPP turbines, has announced the commercial availability of wind turbines with fully recyclable blades³². Also, turbine manufacturer VESTAS has announced that, in collaboration with Aarhus University and the Danish Institute of Technology, it has discovered a new method for breaking down epoxy resin (which has been a major barrier to recycling turbine blades) to facilitate the recycling of existing and future turbine blades³³. Other wind turbine manufacturers are also developing this line of research.

²⁹ <https://windeurope.org/newsroom/press-releases/repowering-wind-farms-a-major-opportunity-for-europe/#:~:text=In%202021%20the%20wind%20industry,and%20developed%20blade%20recycling%20solutions.>

³⁰ <https://windeurope.org/newsroom/press-releases/wind-industry-calls-for-europe-wide-ban-on-landfilling-turbine-blades/>

³¹ <https://windeurope.org/eolis2023/programme/sessions/blade-recycling-projects-i/>

³² <https://www.siemensgamesa.com/global/en/home/explore/journal/recyclable-blade.html>

³³ [Vestas unveils circularity solution to end landfill for turbine blades](#)

Reclamation of the project at the end of the project life cycle (25-30 years) involves several possible options:

- 1) Complete site reclamation, dismantling all elements of the WPP, including reinforced concrete structures. Such dismantling work has previously been carried out in Latvia at former missile sites such as Zvaigznīte, which are technologically more complex structures. The contractors have also published video and photo footage from the projects at³⁴.
- 2) Re-use of equipment foundations with newer and more efficient equipment (so-called *Repowering*). Such refurbishment is highly likely earlier than at the end of the project life cycle. The German Wind Energy Project Development Report states that 25% of new installations in Germany in the first half of 2023 were replacements of existing WPPs with more efficient ones (repowering)³⁵.

4.4. Description of BESS technologies and related infrastructure

BESS is one of the fastest growing technologies for storing electricity. Stationary battery EV energy storage systems are applicable to a wide range of power system applications, such as peak load smoothing, balancing of intermittent power (solar panels, WPP), voltage stability, inertia, *black start* and arbitrage (market benefits from electricity price differentials). Thanks to their fast response times, their power is increasingly used in the ancillary services market for frequency regulation. In addition, in line with electricity market price fluctuations, the arrival of large-scale renewable energy sources (RES) and the synchronisation of the Baltic and continental European power systems, fast response electricity storage systems will become an integral part of the power system from 2025 onwards. On a broader scale, Latvijas veģa parki will not only be able to improve its ability to sell electricity on the market at the highest possible prices and reduce costs for RES balancing, but also to provide services to the Transmission System Operator (hereinafter - TSO) for balancing needs. Primarily, TSOs will need frequency holding reserves (FCR) and frequency restoration reserves (FRR).

Electricity can be stored using several different technologies: mechanical, thermal, chemical, electrochemical and electrical. In total, more than 50 storage technologies are represented worldwide, including various battery technologies, compressed air energy storage, flywheels, hydrogen energy storage, hydro storage, superconducting magnetic energy storage and thermal energy storage.

Batteries are a group of electrochemical storage solutions. Batteries are generally suitable for relatively short storage times and in most cases have a very fast response time. The most important characteristics of functional battery technology are the combination of power and discharge duration and the energy density per unit mass or volume, as this affects the required battery sizes.

Batteries can be divided into three main categories according to their technology:

- 1) conventional cell batteries containing two electrodes (e.g. lead acid, lithium ion, nickel cadmium),

³⁴ <https://www.demontaza.lv/>

³⁵ <https://www.wind-energie.de/english/statistics/statistics-germany/>

2. high temperature batteries that store electricity in molten salt (e.g. sodium sulphur NaS), and
- 3) flow batteries using electrolyte liquids in tanks (e.g. Zn/Br reduction, Fe/Cr reduction).

Lithium-ion batteries are one of the fastest growing battery technologies and are likely to remain the most approved battery technology over the next 20 years. The advantages of this technology include:

- 1) high energy density,
- 2) relatively low running costs,
- 3) fast charging capability (response time),
- 4) low self-discharge and long shelf life,
- 5) sufficient working life.

Shortcomings may include:

- 1) relatively high capital investment,
- 2) poor performance at high and low temperatures,
- (3) specific requirements for protection schemes and climate control, including in relation to fire hazard and performance.

Stationary electric battery energy storage systems are built on the principle of modulation. A key factor for a modular system is said to be reliable, cost-effective systems that are easy to configure with the latest storage component technologies and allow storage systems from 1 MW to more than 500 MW.

Individual *cells* or *blocks* are contained in a single battery module, which in turn forms *packs* or *arrays*. The battery cabinets are fully equipped with a battery management system (BMS) and the necessary safety systems - temperature maintenance and air ventilation, as well as a fire alarm and extinguishing system. In addition to batteries, energy management systems (EMS) and storage management systems (SMS), converters (inverters/rectifiers) and transformers for power conversion, low and medium voltage distribution, air handling solutions (HVAC) systems are installed. All equipment, except the transformer, is usually in sea containers at a safe distance from each other. A single container can hold batteries with a total capacity of up to 2.8 MWh, while inverters could have a capacity of 1-2 MW.

The battery configuration is selected depending on the application. Frequency regulation requires a high converter power, but not a high energy capacity (1 MW / 0.5-1 MWh). On the other hand, for arbitrage and balancing of a WPP/Solar Power Plant (hereafter SES), a large energy capacity (1 MW / 2-4 MWh) is important. In the Valmiera-Valka WPP park, the main function of BESS will be balancing.

The efficiency of the batteries is typically around 96% (4% losses), but the efficiency of the BESS must take into account the process electricity consumption and losses in other equipment (transformer, cables, converters and auxiliary systems). This could result in an overall round trip efficiency (RTE) of 88%-90%.

Lithium-ion modules have an average lifetime of 10 years or 5,000 charge/discharge cycles, which means an average of 500 cycles per year and 1.5 cycles per day. However, BESS operators intend to use them for longer by reducing the number of cycles per day and by

reducing the depth of charge/discharge of the batteries, i.e. only charging the batteries to 90% and not discharging them below 10% of the total BESS capacity, thus extending the normal working life. In the later stages of BESS use, faster battery degradation (i.e. reduction in battery capacity) or replacement of individual battery modules should be planned. Therefore, the total working lifetime of BESS is usually calculated at 20 years. Battery degradation is characterised by the so-called State of Battery Performance (SOH) and depends on the frequency of use and the depth of charge/discharge. Partial replacement of the battery modules should be carried out when the SOH drops to 70%-80%. The more a battery is charged/discharged, the faster it degrades.

Starting from maximum power:

$38 \text{ WPP} \times 8 \text{ MW} = 304 \text{ MW}$, which is the maximum capacity that the Valmiera-Valka WPP park can develop in one hour, generating 304 MWh.

One container can hold a BESS equivalent to $\sim 2.8 \text{ MWh}$. $160 / 2.8 = 57$ containers maximum. 1 ha of land is sufficient to accommodate them. The WPP fleet is expected to operate on average 1.5 cycles per day.

1 cycle of BESS is 2-4 h; 1.5 cycles \times 4 h = 6 h per day of BESS.



Figure 4.4.1. Close-up of BESS containers (illustration by: Kristīne Eglīte)



Figure 4.4.2. BESS layout on the site (illustrative image, author: Kristīne Eglīte)

4.5. Operational characteristics of the WPP

After commissioning, the daily operation, monitoring and control of the WPPs is managed remotely via a SCADA system, ensuring continuous monitoring of operational parameters and electricity production.

Maintenance or fault rectification of the WPP will be carried out by specialised service personnel under contract with the WPP manufacturer. Information signs will be installed at the WPP and the area around the WPP will not be physically cordoned off.

Information signs about the wind park and the preferred safety measures will be installed on the roads passing through the area.

During the operation of the WPP, economic activities outside the WPP site will not be restricted, and it is expected that property holders will continue to use the adjacent areas for their existing uses after construction of the WPP.

The WPP fleet is managed and monitored throughout its lifetime to ensure its sustainability. The following elements of the monitoring system can be identified:

- Monitoring of operating parameters and electricity production;
- Monitoring of ornithology and natural values and an active prevention system that stops the wind turbine during specific conditions (radar or camera and machine vision technological solutions);
- Technological (shadow monitoring of equipment parameters) with a sensor system to detect risks of wear or failure of equipment well before the risk of failure occurs;
- Accounting for potential losses of nature values according to the monitoring scope defined by the EIA ornithology and bat experts;
- Field surveys to assess the spatial impact on specific species, in line with guidance from species and habitat experts.

Specific proposals will be developed for each group of monitoring systems, based on guidance from the EIA's environmental and nature experts or solutions proposed by the technology manufacturer.

In accordance with the requirements of Cabinet of Ministers Regulation No 570 of 21 July 2008 "Regulations on marking and equipping objects with protective lights", each WPP in the area of the Proposed Operation shall be equipped with two protective lights (mounted on the WPP nacelle) so that their position in the horizontal plane provides the pilot of the aircraft with a view of at least one protective light from any direction and the area of the protective light is 360°. As the height of the constructed WPPs will be more than 150 m, they will be equipped with Type A safety lights.

5. Expected by-products, emissions, risks

5.1. Waste management

The EIA takes into account the requirements of the regulatory enactments listed in Chapter 2 when assessing waste management.

Both municipal and construction waste will be generated **during the construction of the WPP**. Household waste will be collected and temporarily stored in containers, in an area for temporary storage of machinery and materials. The collected municipal waste will be handed over to waste managers who have obtained waste management permits for that type of waste.

No maintenance or repair of technical equipment will be carried out in the construction area, except in the event of an accident, hazardous waste such as oil, products, oils, etc. may be generated. Hazardous waste (used containers of chemicals/mixtures, spills from equipment/filling, machinery, etc.) will be collected, separated and stored in accordance with the requirements for the storage of hazardous waste. Hazardous waste will be transferred to a licensed hazardous waste contractor for further management.

Construction waste will be managed in accordance with the applicable national and municipal legislation. Construction waste will be collected using suitable bins, containers and vehicles. Construction waste will be accounted for in accordance with the procedures set out in Cabinet Regulation No 113 of 18 February 2021 "Procedure for Accounting for Waste and its Shipment".

Some of the assembly areas constructed during the construction of the WPP (part of each area) will be dismantled during the final phase of construction. Although all necessary precautions will be taken during the construction process to avoid contamination of the ground, the machinery used may cause contamination of the site with petroleum products. Prior to dismantling the assembly site, soil contamination will be assessed and, if found, will not be used for its intended purpose without remediation: contaminated soil will be transferred to waste managers who have obtained permits for the type of waste concerned.

The above information confirms that during the construction works, the surrounding environment (site, ground, etc.) will be protected from pollution by construction waste, petroleum products and other chemicals, and spills from machinery will be prevented.

No waste is expected to be generated **during the operation of the WPP**, except for waste generated during maintenance (WPP equipment that has reached the end of its useful life and needs to be replaced). Waste collection and disposal during operation of the WPP will be carried out by waste management operators that have obtained waste management permits for the relevant waste types.

Waste management in **the post-operational phase of the WPP**: Solutions already exist for the re-use of metal materials used in the construction of WPPs, and the concrete used for the foundations can be re-used in the event of dismantling. WPP wings made of composite materials are considered to be a material group with limited recyclability. Both WPP manufacturers and organisations involved in the wind energy industry are now actively seeking

solutions for the re-use of polymer materials related to the wind energy industry. For example, a publication prepared by *Wind Europe, the European Composites Industry Association* and the *European Chemical Industry Council* in 2020³⁶ analyses a range of technologies available for the recycling of WPP wings, looking for the best solutions to promote the reuse of composite materials used in the construction of VPPs. As mentioned in chapter 4.3.9, in 2021 the wind industry called for a Europe-wide ban on landfilling of WPP wings and committed to reuse, recycle or recover 100% of used wings by 2025³⁷. WPP manufacturers have set the goal of fully recyclable wings and have developed solutions for wing recycling. For example, *Siemens Gamesa Renewable energy* has already announced that they can produce turbine wings for commercial use that are 100% recyclable³⁸. Other major European and US turbine manufacturers are also working to bring this solution to their turbines.

5.2. Possible effects of WPPs on human health, assessment of electromagnetic radiation and permissible levels

Potential impacts from the operation of the WPP are related to localised physical effects: sound levels, including in the infrasonic and low frequency range, vibration, flicker effects and electromagnetic radiation. Transient environmental impacts are also expected during the construction of the WPP (noise, air pollution), but these are not specific to the construction of the WPP and are similar to any other construction activity. The EIA takes into account the requirements of the regulatory enactments listed in Chapter 2.

Chapter 7.2 of the EIA report provides a detailed assessment of the acoustic pollution from the proposed WPPs at different frequencies, and Chapter 7.3 of the EIA report further discusses the impact of the flicker effect.

As regards electromagnetic radiation, studies have shown³⁹ that the electromagnetic fields generated by WPPs are negligible and are unlikely to cause adverse effects on public health, unless a person is in close proximity to the WPP (up to 10 m from the mast of the WPP) at all times. In 2010, within the framework of the EIA for the planned WPP park in Ventspils, the Institute of Physical Energy of the Academy of Sciences of the Republic of Lithuania, commissioned by TCK Ltd, carried out calculations of the electromagnetic field generated by the WPP, and found that the magnetic field generated by the power plant at a distance of 150 m from the WPP is 0.70 A/m or 80 times lower than the Earth's magnetic field (55.7 A/m), so even at a short distance it does not affect human health⁴⁰.

³⁶ <https://windeurope.org/newsroom/press-releases/repowering-wind-farms-a-major-opportunity-for-europe/#:~:text=In%202021%20the%20wind%20industry,and%20developed%20blade%20recycling%20solutions>

³⁷ <https://windeurope.org/newsroom/press-releases/repowering-wind-farms-a-major-opportunity-for-europe/#:~:text=In%202021%20the%20wind%20industry,and%20developed%20blade%20recycling%20solutions>

³⁸ RecyclableBlade (<https://www.siemensgamesa.com/global/en/home.html>)

³⁹ https://ast.lv/sites/default/files/editor/att-projekti/IVN_Zinojums_22_aprilis.pdf

⁴⁰ <https://www.vpvb.gov.lv/lv/media/2779/download?attachment>

Similar studies have been carried out for high-voltage power lines⁴¹. According to the widely used classification of electromagnetic waves, the 50 Hz frequency is part of the so-called very low frequencies (ELF) and is characteristic of Latvia's electricity supply, including both the power generated by WPPs and the power carried by high-voltage networks.

Wherever electricity is used, electric and magnetic fields are generated which, at low frequencies, can only exist in close association with the source of the electric or magnetic field, and decrease rapidly with distance from that source. Frequencies of the order of ~30 kHz can already produce an electromagnetic wave, which can separate from its source and propagate over long distances. These frequencies are 600 times higher than 50 Hz⁴².

Cabinet Regulation No 637 of 16.10.2018 "Regulations on the assessment and limitation of exposure of the general public to electromagnetic fields" sets the limits for electromagnetic field radiation shown in Table 5.3.1 (0 Hz to 300 GHz), which correspond to the values recommended in EU Recommendation 1999/519/EC.

Table 5.2.1. Electromagnetic field radiation limits (0 Hz to 300 GHz)

Frequencies	[Induced] current density in torso, head, mA*m ⁻² , rms	SAR whole body, W/kg	SAR local to head, torso, W/kg	SAR local to hands, feet, W/kg	power density, W/m ²
Up to 1 Hz	8	-	-	-	
1-4 Hz	8/f	-	-	-	
4 Hz-1 kHz	2	-	-	-	
1-100 kHz	f/500	-	-	-	
100 kHz-10 MHz	f/500	0,08	2	4	
10 MHz-10 GHz	-	0,08	2	4	
10 GHz-300 GHz	-	-	-	-	10

At 50 Hz, the reference value for the electric field is 5000 V/m and for the magnetic field 100 µT. These values are not threshold values that must not be exceeded, but they are levels that indicate the need to check that the basic limits (threshold levels) are being met. Calculations using the method according to the standard LVS NE 50499 "Procedure for assessing the exposure of workers to electromagnetic fields" have shown that the actual values of exposure to external fields must be significantly higher for the induced body currents to reach the value specified in the basic limit. A summary of the results for the reference limit at 50 Hz, the reference levels and the field values corresponding to the reference limit is given in Table 5.3.2.⁴³

⁴¹ https://ast.lv/sites/default/files/editor/att-projekti/IVN_Zinojums_22_aprilis.pdf

⁴² Estonia-Latvia third electricity interconnection from Sindi (Kilingi-Nõmme) in Estonia to Salaspils Environmental Impact Assessment, *SIA Eiropojekts, 2019*

⁴³ Environmental impact assessment: Estonia-Latvia third power grid interconnection from Sindi (Kilingi - Nõmme) in Estonia to Salaspils (or Riga CHP-2) substations in Latvia, "Eiropojekts" Ltd, 2016

Table 5.2.2. *Calculated values of the electric and magnetic fields corresponding to the reference limit, as well as the reference limit and reference levels at 50 Hz*

Basic restriction: 2mA m-2 in the central nervous system	
Magnetic field	Electric field
Reference level: 100 μT The external field required to achieve this field strength in a human: 360 μT	Reference level: 5 kV/m The external field required to achieve this current density in a human: 9,2 kV/m

On a 50 Hz power line, even with a voltage of 330 kV and a current of 2000 A, the magnetic field at a height of 1 m above the ground directly below the power line is 4-5 orders of magnitude lower than the reference values in the Council of Europe Recommendation and the values given in Table 5.3.1. In Latvia, measurements made by JSC Latvenergo under existing 330 kV lines show that at a distance of 30 m from the edge of the line, the value is 0.02 μT , while directly under the lowest point of the transmission line (hereinafter - EPL), the value is 0.23 μT , which is practically zero (Figure 5.3.1).

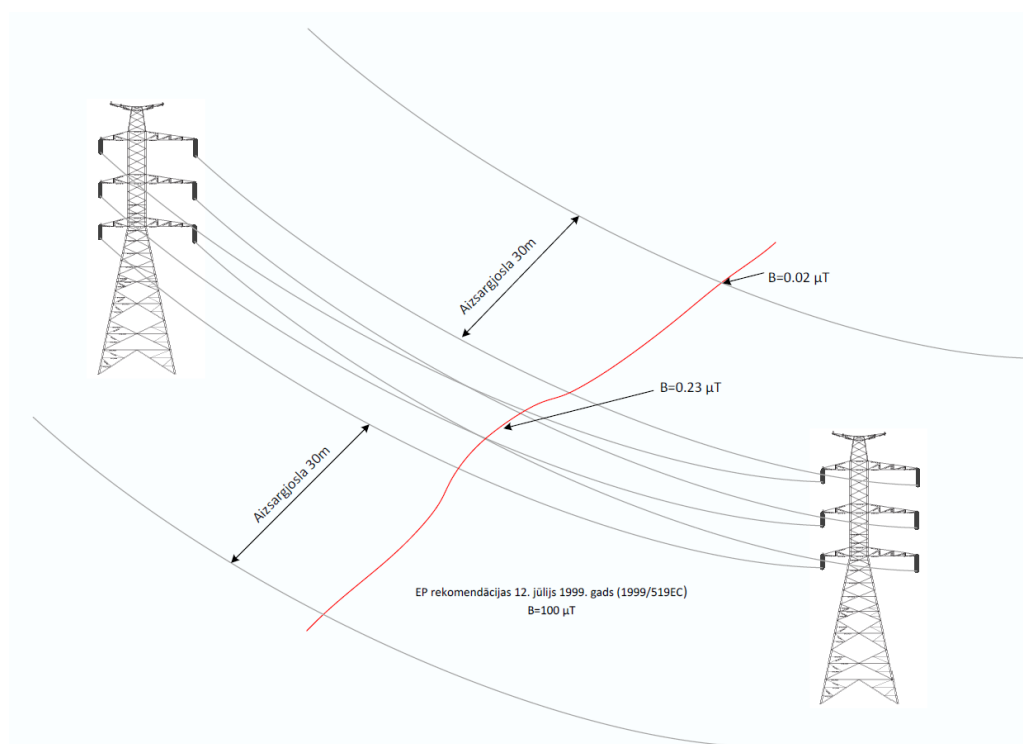


Figure 5.2.1. *Results of magnetic field measurements of PPAs in Latvia*

Magnetic field measurements were carried out in 2014 on the newly built PPA in Kurzeme by the laboratory⁴⁴, which provides services in the field of diagnostics and expert assessment of the technical condition and characteristics of electrical safety equipment, electrical systems and equipment, and in the field of environmental parameter testing. The laboratory is accredited by the Latvian National Accreditation Bureau LATAK in accordance with LVS EN ISO 17020 as a Type C inspection body (LATAK-I-248) and LVS EN ISO/IEC 17025 as a testing

⁴⁴ Environmental impact assessment: Estonia-Latvia third power grid interconnection from Sindi (Kilingi - Nõmme) in Estonia to Salaspils (or Riga CHP-2) substations in Latvia, "Eiropojekts" Ltd, 2016

laboratory (LATAK-T-166), which confirms compliance with international standards and the quality of the services provided. Measurements of electric field strengths under 330/110 kV lines show that they are below the value of 5 kV/m set in EU Recommendation 1999/519/EC.

As measured in other European countries such as Germany and the UK⁴⁵, electric fields under 110 kV and 400 kV overhead PPAs can range from 2000 V/m to 5000 V/m, while magnetic fields can reach 40 μ T. The electromagnetic fields ("EMF") are much lower under medium- and low-voltage PPAs: electric fields can range from 100 V/m to 400 V/m and magnetic fields from 0.5 μ T to 3 μ T, respectively. As the distance from the centreline of the high-voltage PPA increases, the EMF exposure levels decrease accordingly. All these conclusions apply to voltages of 100 times or more the output voltage of a WPP, up to 1 kV.

The magnetic field density directly above the electric cable lines is significant, but decreases rapidly as you move away from the cable line. Electric fields are completely eliminated by cable insulation. Table 5.3.3 summarises the UK calculated magnetic field values at various distances from the cable centreline⁴⁶.

Table 5.2.3. Magnetic fields, μ T, off-centre

Transmission lines, kV	Distance from centre line			
	0 m	5 m	10 m	20 m
132 kV	5,01	1,78	0,94	0,47
33 kV	1,00	0,29	0,15	0,07
11 kV	0,75	0,22	0,11	0,06
400 V	0,50	0,14	0,07	0,04

All these data on high voltage transmission lines allow extrapolating that both the WPP generators themselves with voltage < 1 kV and their 20 kV substations and cables from the WPP to the substations and from the substations to the transmission line will not cause significant electromagnetic fields in the nearest built-up areas.

5.3. Forecasting accident risks and emergency situations

5.3.1. Natural disasters

According to the Cabinet of Ministers Regulation No 563 of 19 September 2017 "Procedures for Identification and Determination of Objects of Increased Danger, as well as for Planning and Implementation of Civil Protection and Disaster Management", power generation facilities with an installed capacity exceeding 100 MW are classified as Category C objects of increased danger and require a Civil Protection Plan.

Both technogenic and natural disasters can threaten the operation of WPPs.

⁴⁵ Environmental impact assessment: Estonia-Latvia third power grid interconnection from Sindi (Kilingi-Nõmme) in Estonia to Salaspils (or Riga CHP-2) substations in Latvia, "Eiropojekts" Ltd, 2016

⁴⁶ Environmental impact assessment: Estonia-Latvia third power grid interconnection from Sindi (Kilingi-Nõmme) in Estonia to Salaspils (or Riga CHP-2) substations in Latvia, "Eiropojekts" Ltd, 2016

Among the natural disasters that could potentially affect the operation of the Valmiera-Valka wind farm, the most significant are: storms, lightning, forest fires and icing.⁴⁷

The operation of the Valmiera-Valka Wind Farm is located entirely in the forest land area, therefore there are no other objects of increased hazard, objects of public importance or residential houses in its vicinity that may affect the implementation of the Proposed Action in the selected alternatives A, A` and B, B`.

The accumulated statistics summarise several decades of operation of plants of different capacities and sizes. The main potential threats are⁴⁸:

- falling ice chunks from icy WPP rotor wings in the surrounding area,
- Mechanical damage or collapse of the WPP, which may cause the spread of debris in the surrounding area,
- WPP rollover.

Increased wind speed

According to the international insurance company *FM Global* (USA), increased wind speeds and loads can contribute to WPP malfunctions. Wind speed combined with erroneous wind measurements (e.g. wind speed or direction) or malfunctions in the wind turbine control or safety system (e.g. blade pitch, yaw or rotor brake) can cause the rotor to exceed its technical parameters, which can lead to damage. Excessive wind speed can cause damage to the rotor blades or overturn the turbine, causing the support tower to buckle or damaging the tower foundation.⁴⁹

Risk mitigation measures

Equipping the WPP with a safety system that safely stops the operation of the WPP during high winds.

Icing

Ice build-up on the rotor blades can unbalance the rotor and cause vibrations and dynamic loads that can damage the blades as well as other mechanical components.

There is also a risk of ice on the rotor blades melting and being thrown off while the rotor is spinning, or of ice falling off if the rotor is stopped.

Ice build-up on anemometers can cause erroneous wind speed or wind direction readings, which can result in the turbine remaining in operation or restarting when the wind speed exceeds the cut-off speed or with a significant yaw error, which can damage the WPP.⁵⁰

Potential for human exposure to falling ice chunks⁵¹:

⁴⁷ <https://fireprotectionsupport.nl/wp-content/uploads/2022/08/FMDS1310-2022-07-Wind-Turbines.pdf>

⁴⁸ In the EU, many countries do not have clear rules on reducing the risk of turbine icing

⁴⁹ <https://fireprotectionsupport.nl/wp-content/uploads/2022/08/FMDS1310-2022-07-Wind-Turbines.pdf>

⁵⁰ <https://fireprotectionsupport.nl/wp-content/uploads/2022/08/FMDS1310-2022-07-Wind-Turbines.pdf>

- 40-60 J can cause serious injuries by hitting the head;
- >80 J serious injury to the body is possible.

The impact energy depends on the density, mass and velocity of the ice. By comparison, an effect of 40 J can be applied to a 200 g piece of ice falling from a height of 30-50 m, or 500 g of ice falling from a height of 5-6 m.

When a chunk of ice hits a vehicle, 10% of the time the windscreen can be damaged: it takes 140 J to break and puncture it.

Latvian legislation does not specify a methodology for assessing the risk of WPP icing, but other countries do.

In Canada, the probability of ice fall as a function of distance from the WPP up to 140 m is shown in Figure 5.3.1 of⁵²: 10^{-4} (one ten-thousandth) to 10^{-6} (one millionth) per 1m^2 .

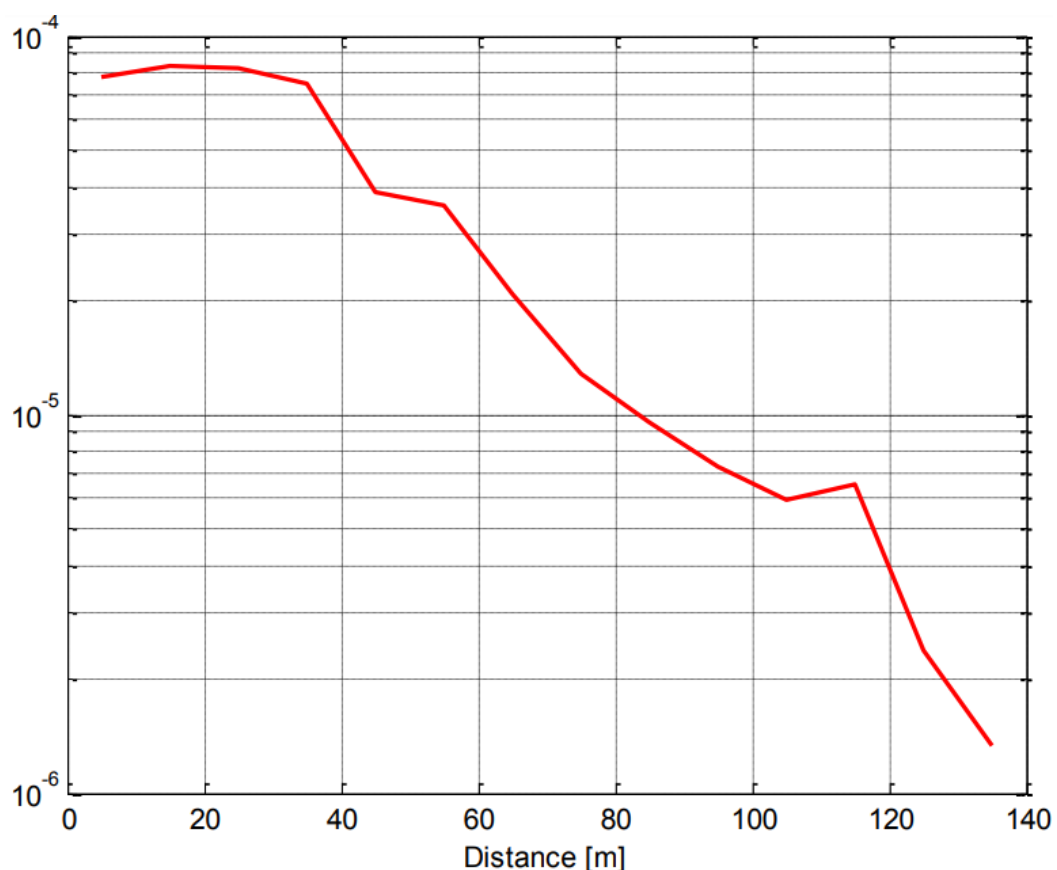


Figure 5.3.1. Probability of an ice chunk falling 1 m^2 based on fieldwork calculations⁵³

By contrast, the probability of an ice chunk falling further than 220 m from the WPP is less than 10^{-8} (one hundred millionth) per 1m^2 , the average fall distance is 100 m and the mass of ice

⁵¹ https://windren.se/WW2015/WW2015_39_521_Refsum_Lloyd_Ice_throw_evaluating_risk.pdf

⁵² Recommendations for risk assessment of ice throw and blade failure in Ontario - Canadian Wind Energy Association, 2007

⁵³ <https://iea-wind.org/wp-content/uploads/2021/09/Lehtomaki-et-al.-2018-Available-Technologies-for-Wind-Energy-in-Cold-Climates-report-2-nd-edition-2018.pdf>

chunks is less than 1 kg, but much less on average (tiny splinters that still break up in flight). The Canadian study⁵⁴ investigates WPPs with 80 m mast height and 80 m rotor diameter: both 2.5 times smaller than in this EIA. To extrapolate these findings to a 200 m mast height and 200 m rotor diameter, we first need to consider that from the largest WPP, ice chunks can fly on average from 2.5 times the height and at 2.5 times the speed, so will fly ~2.5 times farther or ~550 m, which can be rounded up to the 600 m calculated above (as a maximum precaution, since in reality the air resistance will act longer in the longest flight and will not allow the distance to be so large). A square metre at 2.5 times the distance is 2.5^2 or 6.25 times more, while the area of a wing 2.5 times longer (if both wings are proportional) is also 2.5^2 or 6.25 times more, so the one hundred millionth probability from the Canadian study can be maximised for this EIA at 600 m (although in reality air resistance will stop it earlier). This probability increases at shorter distances, there is no methodology to calculate it precisely for this EIA, but it is clear in which range of numbers this probability remains: it reaches about the values shown in Figure 5.3.1, only at longer distances, up to $\sim 140 \times 2.5 = 350$ m. However, it should be stressed that this is the probability of being hit by flying ice chunks/splinters in situations where the wings are iced. The overall probability of risk is obtained by multiplying this tiny probability by the rather small probability, or small fraction of the total time of the year, when there is any risk at all of wing icing: such rather specific weather conditions could be on the order of 1% of the total time of the year, so the resulting probabilities are still divisible by 100.

The minimum distance between a wind turbine and people or objects proposed in Germany is set out in the recommendation of the European Commission report⁵⁵: $1.5 * (\text{mast height} + \text{rotor diameter})$ ⁵⁶. This criterion is in the list of technical provisions of the German Building Regulations, so if a wind turbine does not meet this minimum distance and is located in a region with a high risk of icing, additional measures must be taken: a site-specific risk assessment report, mainly based on regional icing frequency, complemented by an assessment report on the detection of ice on the wind turbine.

The minimum distance recommended in Sweden is also $1.5 * (\text{mast height} + \text{rotor diameter})$, taken from the European Commission report reviewed by the Swedish Energy Agency through the ICETHROWER project⁵⁷, but with the additional conclusion that the minimum distance can be reduced to $1.0 * (\text{mast height} + \text{rotor diameter})$, as an impact beyond this distance is significantly less likely to cause injury than other societal injury risks. Although this report has no formal regulatory framework, it is used as a guide for wind energy project developers and permitting authorities in Sweden.

⁵⁴ Recommendations for risk assessment of ice throw and blade failure in Ontario - Canadian Wind Energy Association, 2007

⁵⁵ <https://op.europa.eu/lv/publication-detail/-/publication/9cde4269-9b53-4fd7-b064-5b3caf85aabf>

⁵⁶ <https://windeurope.org/summit2016/conference/allposters/PO337.pdf>

⁵⁷ https://winterwind.se/wp-content/uploads/2015/08/3_2_13_Lunden_ICETHROWER_%E2%80%93_mapping_and_tool_for_risk_analysis_Pub_v1-1.pdf

Another regulation affecting the use of wind turbines in icy climatic conditions is Directive 2006/42/EC of the European Parliament and of the Council⁵⁸, which aims to ensure a uniform level of safety for all machinery placed on the market or put into service in all Member States. This Directive requires a manufacturer to carry out a risk analysis and assessment of its product and its intended use, covering design, manufacture, production and use, as part of the conformity assessment process under the EU Directives.

Several regulatory authorities require manufacturers and operators to take specific measures to reduce the risk of harm or injury to people, property and the environment. Specific recommendations for manufacturers for cold climates include a range of features including heating systems, as well as special materials and lubricants for low temperatures. Operators should plan a risk mitigation strategy that includes control options such as capacity optimisation, preventive shutdowns, load reduction, anti-icing systems and ice ejection risk reduction⁵⁹.

In this context, in some countries, such as Austria and Germany, wind farm licensing authorities may require wind turbines to be systematically shut down during icing to reduce the risk in the vicinity of WPPs. For this purpose, several icing detection methods have been developed that can automatically stop the WPP and restart it when the icing has stopped.

Icing is more likely to occur on stationary rotors than on rotating rotors⁶⁰, while ice chunks can only be expected to break off the blades or mast of a stationary rotor in very high winds and at short range.

The distance over which ice chunks can fly from a stationary rotor shall not exceed 50 m more than the wing length⁶¹. A wider area of risk is expected in the event of icing of the blades of an operational WPP, when the high-speed wings sweep ice chunks much further away. Icing also degrades the aerodynamic properties of the wing and increases vibration, reducing the efficiency of the WPP, which in turn is the basis for safety systems: today, WPPs are equipped with automatic vibration sensors that shut down the plant at a certain vibration level caused by icing on the rotor blades. However, such equipment cannot completely eliminate the risk of falling ice chunks.

A study at Uppsala University in Sweden⁶² has found a correlation between wind speed and the flying distance of ice debris.

⁵⁸ <https://eur-lex.europa.eu/eli/dir/2006/42/oj/?locale=LV>

⁵⁹ <https://iea-wind.org/wp-content/uploads/2021/09/Lehtomaki-et-al.-2018-Available-Technologies-for-Wind-Energy-in-Cold-Climates-report-2-nd-edition-2018.pdf>

⁶⁰ Garrad Hassan for Canadian Wind Energy Association, "Recommendations for risk assessment of ice throw and blade failure in Ontario", 2007

⁶¹ Recommendations for risk assessment of ice throw and blade failure in Ontario - Canadian Wind Energy Association, 2007

⁶² Joakim Renström, Modelling of Ice Throws from Wind Turbines Modellering av iskast från vindkraftverk, Uppsala University 2015

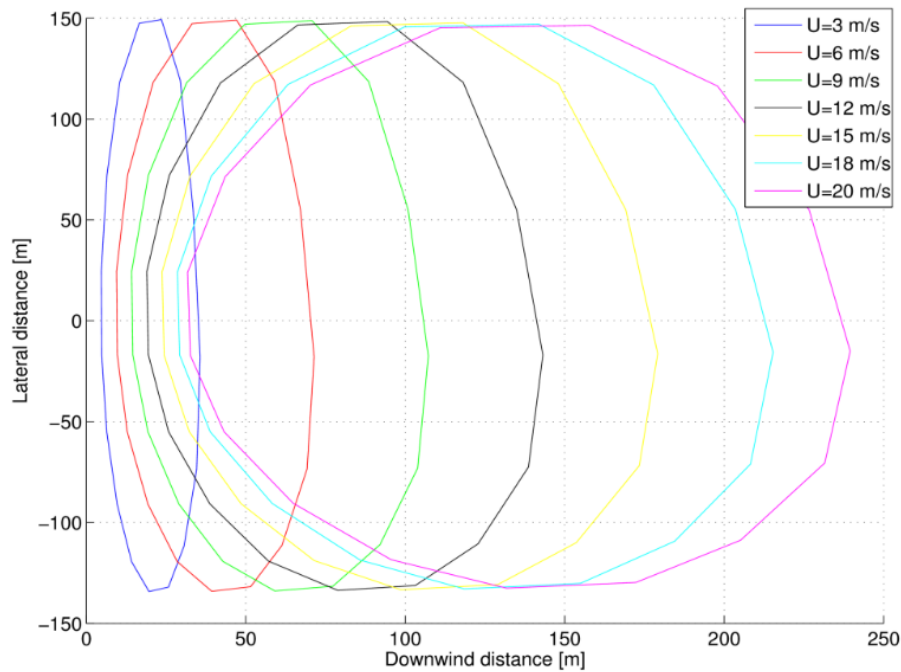


Figure 5.3.2. Ice debris flying distance (modelling data) vs. wind strength (WPP rotor height 125 m, wing height 180 m)⁶³

In order to assess the potential range and impact on the surrounding area of ice chunks caused by icing of the rotor blades, calculations for different rotor operating positions have been carried out in the recommendations published by the International Energy Agency Cooperation Project "Wind Energy in Cold Climates"⁶⁴.

As already pointed out, ice forms on the WPP blades when the WPP is not running, but detaches and falls off when the WPP starts moving again. The following equations are used to estimate the ice debris fall distance:

- operating WPPs

$$d_d = (D + H) \times 1,5]$$

- at the time the WPP starts operation:

$$d_u = v \frac{\left(\frac{D}{2} + H\right)}{15}$$

Where

$d_{d,u}$ - maximum distance of ice chunks falling from the station during operation or when the rotor starts moving (m),

⁶³ Joakim Renström, Modelling of Ice Throws from Wind Turbines Modelling av iskast från vindkraftverk, Uppsala University 2015

⁶⁴ <https://iea-wind.org/wp-content/uploads/2021/09/Lehtomaki-et-al.-2018-Available-Technologies-for-Wind-Energy-in-Cold-Climates-report-2-nd-edition-2018.pdf>

- D – rotor diameter (m),
- H – mast height (m),
- v – wind speed at mast height (m/s).

As can be seen, the falling distance of ice debris is influenced by the height of the WPP, the rotor diameter and the wind speed: as these increase, the area of influence increases. The maximum ice debris fall distance for the WPP assessed in this EIA according to the formula is as follows:

- $d_d = 600 \text{ m}$ (WPP h = 300 m)
- $d_u = V \times 20 \text{ m}$, maximum $23 \times 20 = 460 \text{ m}$ (WPP h = 300 m)

Probability of an event

The probability of icing may vary with climatic conditions, as well as with annual weather variability, and vertically with the absolute and relative height of the WPP.

There are no studies on the frequency of WPP icing in Latvia. Several important studies on WPP icing have been carried out in Norway and Sweden, see Figure 5.3.3. Latvia's terrain is generally lower in elevation than Sweden or Norway, and Latvia is further south with a warmer climate, so the average number of hours of icing is likely to be significantly lower.

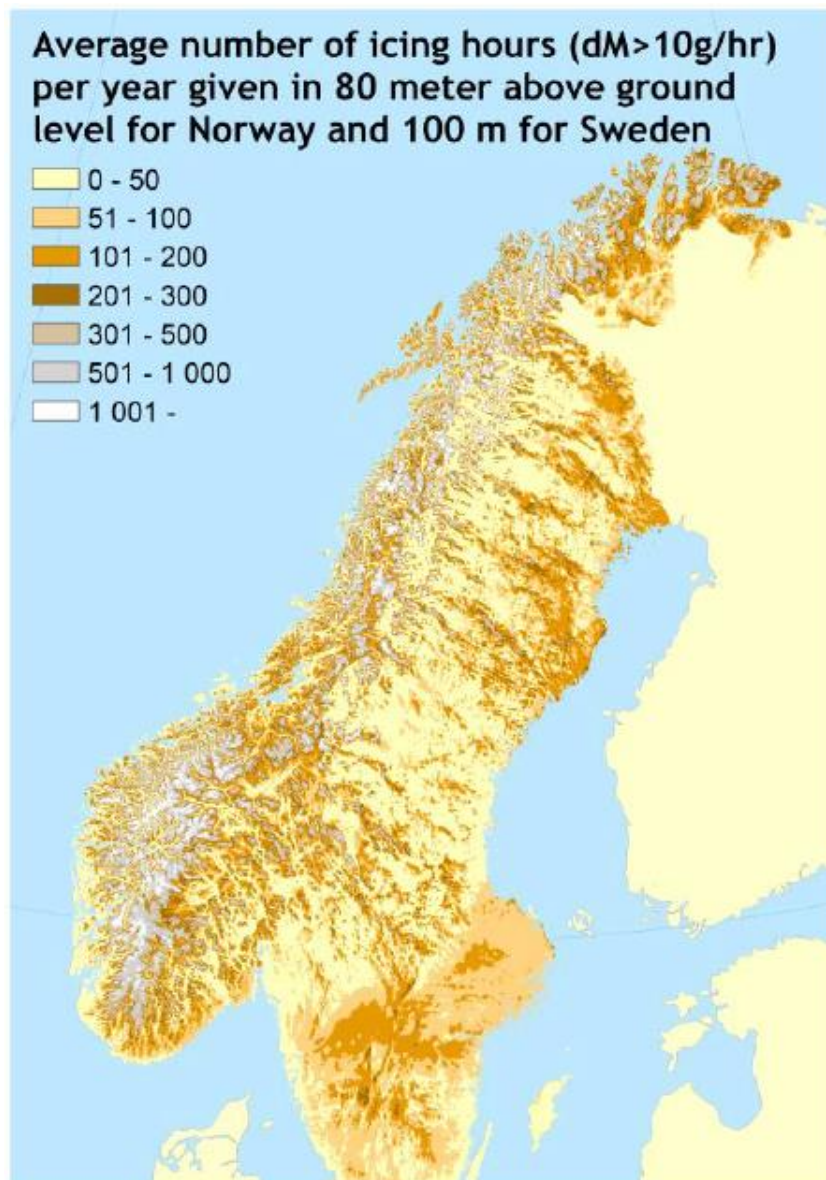


Figure 5.3.3. Average number of hours of icing per year in Sweden and Norway⁶⁵

Risk mitigation measures

In the EU, many countries do not have clear rules on reducing the risk of WPP icing. In Norway, for example, the operation of WPPs during the winter months is dealt with under general rules, with no specific legal framework. Wind farm operators can also be fined and criminally liable for the damage caused.

⁶⁵ <https://iea-wind.org/wp-content/uploads/2022/09/Task-19-Technical-Report-on-International-Recommendations-for-Ice-Fall-and-Ice-Throw-Risk-Assessments.pdf>

A survey conducted by the International Energy Agency in 2019 concluded that, in most countries, restrictions related to mitigating the risk of ice fall are implemented at the permitting stage and are governed by general laws and regulations on infrastructure safety.

In Germany and Austria, WPP ice detection systems are required if public roads or buildings are located in the calculated ice debris zone. These countries have a production cap: WPP must stop when icing conditions are present. If ice detection systems are reliable and sensitive enough, the potential danger is more likely to be from falling ice than from smaller chunks being thrown over a greater distance.⁶⁶

The risk of icing and ice fall is usually concentrated on short periods during the year. Predicting and controlling icing⁶⁷:

- based on meteorological forecasts;
- installing WPP ice sensors.

Risk mitigation measures to prevent icing hazards to third parties:

- posting clearly visible warning signs in the potentially affected area;
- fencing off the area, blocking access with gates, barriers;
- restrict social activities
- rerouting of footpaths, location of ski slopes, etc.

Risk reduction measures for service staff:

- protective grilles, roofs or tunnels
- personal protective equipment.

Lightning discharge

Damage to a WPP caused by lightning is a common cause of property damage in wind farms. Lightning damage can occur to WPPs and important parts of the wind farm's electrical system. Direct lightning strikes can cause damage to the WPP blades (most common) and the nacelle, and sometimes ignition. Direct or indirect lightning strikes can also cause damage to electrical systems. Transients or surges caused by nearby lightning strikes can cause gradual damage to the entire electrical system.⁶⁸

Risk mitigation measures

Equipping a WPP park with lightning protection equipment.

Forest and grassland fires (types of fires, conditions contributing to their origin and spread, techniques for assessing and predicting the development of fires)

Fires can cause thermal radiation damage in onshore WPP parks, especially collector substations, and can also damage rotor blades, which are usually made of fibre-reinforced

⁶⁶ <https://iea-wind.org/wp-content/uploads/2022/09/Task-19-Technical-Report-on-International-Recommendations-for-Ice-Fall-and-Ice-Throw-Risk-Assessments.pdf>

⁶⁷ https://windren.se/WW2015/WW2015_39_521_Refsum_Lloyd_Ice_throw_evaluating_risk.pdf

⁶⁸ <https://fireprotectionsupport.nl/wp-content/uploads/2022/08/FMDS1310-2022-07-Wind-Turbines.pdf>

plastic. There are no known cases of structural damage to the turbine support towers, which are usually made of steel or sometimes concrete.

Forest areas are characterised by planting, maintaining and harvesting of forest stands when they reach the age of the main cut. The forest has the necessary infrastructure for forest management: roads, natural tracks, stiles, etc.

In forest areas, there is a risk of fire, which increases during the warm season of the year. The degree of danger (forest fire danger) of forest fires originating from a potential ignition source and spreading depends on:

- the conditions characterising the forest and peat area, or the type of growing conditions (natural fire risk);
- meteorological conditions (fire risk as determined by meteorological conditions).

The number of recorded forest fires and their main causes are reflected in the statistics (see Figure 5.3.4). The main causes of forest fires in Latvia are not natural disasters, but careless handling of fire, arson and economic activity, and to a much lesser extent, fires of natural origin caused by lightning.

The risk of fire exists both in forest areas and in WPP parks, so these risk factors should be taken into account when planning WPP parks and measures should be taken to mitigate the risk of fire that may arise from the interaction of the two types of economic activity.

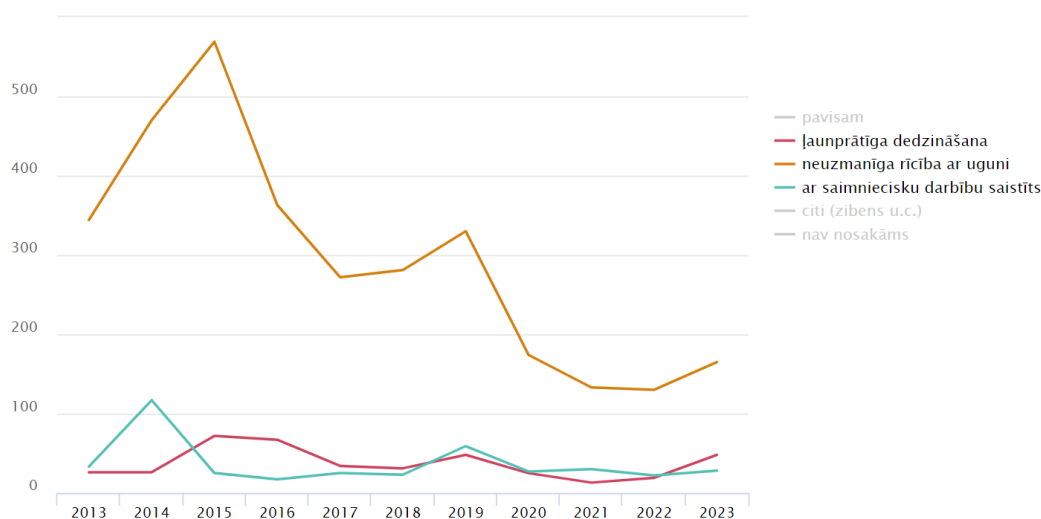


Figure 5.3.4. Number of forest fires by cause Latvia total⁶⁹

The total area of forests in Latvia is 3.305 million ha (2023). Based on forest fire statistics over the last 10 years, the average size of a forest fire is up to 1.09 ha.

Table 5.3.1. Number of forest fires and total area of fires in Latvia in the last 10 years⁷⁰

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
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⁶⁹ <https://stat.gov.lv/lv/statistikas-temas/noz/mezsaimnieciba/8673-meza-ugunsgreki>

⁷⁰ <https://stat.gov.lv/lv/statistikas-temas/noz/mezsaimnieciba/8673-meza-ugunsgreki>

Number of fires	698	704	641	423	972	1110	581	466	391	653
Fire area, ha	591	540	467	265	2864	822	309	505	221	637

Based on the above data, the probability of a forest fire occurring in the vicinity of the WPP can be estimated at $2.18 \times 10^{-4}/\text{ha/year}$, or 1 ha of the 4577.24 ha forest area per year.

Risk mitigation measures

External sources of fire are relatively more dangerous for small WPPs, whose rotor and blades are closer to combustible sources. The lower the WPP, the greater the fire safety distances. In comparison, the US insurance company *FM Global*, which assesses and summarises the various risks around WPPs, recommends a 150 m tree-free zone, or 60 m if the area is scrub or grass.⁷¹

It should be noted that the length of some tree species in the USA can reach about 100 m, while in Latvia the length of the largest trees is about 40 m. Consequently, the required tree-free zone in Latvia, if the recommendations of the insurance company are taken into account, should be proportionally smaller: about 60 m, which is recommended to be specified and agreed with forest owners and fire-fighting organisations (SFRS, State Forest Service, etc.).

Another international organisation, *The Confederation of Fire Protection Associations Europe*, recommends that, in order to prevent the risk of a forest fire from the consequences of a WPP fire, the area around the WPP tower should be cleared of brush and grass within 25 m of the tower site, which could contribute to the spread of fire in the ROW.⁷²

5.3.2. Risk assessment of mechanical damage to WPP

The quantitative risk assessment method has been selected for the risk assessment of accidents at the Valmiera-Valka WPP Park, which provides a more detailed assessment of the consequences and probabilities of an event.

There are no methodological guidelines or a uniform approach to risk assessment in Latvia, so the experience of other countries has been used: the risk assessment is based on the experience of other countries (the Netherlands, Belgium) that have already developed methodologies for risk assessment of wind farms.

The most severe possible accident with a very low probability of a WPP overturning. A partial collapse of a WPP, with debris falling or flying, is also considered an extreme event. In the Netherlands, the statistical average probability of mechanical failure of a WPP has been calculated by analysing accident statistics from the Netherlands, Germany and Denmark, and a methodology for risk assessment of wind turbines has been developed. In accordance with this risk assessment methodology, the risk scenarios listed in Table 5.3.2 are considered for the assessment of mechanical damage.⁷³

⁷¹ <https://fireprotectionsupport.nl/wp-content/uploads/2022/08/FMDS1310-2022-07-Wind-Turbines.pdf>

⁷² https://cfpa-e.eu/app/uploads/2022/05/CFPA_E_Guideline_No_21_2021_F.pdf

⁷³ <https://omgeving.vlaanderen.be/sites/default/files/2022-12/2022%2012%2001%20-%20IWT%20-%20handboek.pdf>

Table 5.3.2. Risk probabilities of mechanical damage to WPP

Type of damage	Probability (per year)	Single probability
Breaking off the entire rotor blade	$8,4 \times 10^{-4}$	1200 years
Rotor blade part breaking off	$8,4 \times 10^{-4}$	1200 years
Wind station collapses due to mast failure	$1,3 \times 10^{-4}$	7700 years
Rotor and/or nacelle breakage	$4,0 \times 10^{-5}$	25000 years

The guidelines define the maximum possible radius of the zone of influence within which the effects of the risks listed in Table 5.3.2 should be assessed, according to the class and type of WPP. The radius of the zone is equal to the maximum height of the WPP.

The Danish study *Risk assessment of wind turbines close to highways* (2012)⁷⁴ assesses the probability of a car travelling on a highway with a WPP every 500 m along its entire length (60 m away) directly adjacent to it having a fatal collision with parts of a fully or partially collapsed WPP. The resulting probability per kilometre of road was 5×10^{-12} , or one part in two hundred billion. By comparison, the overall probability of a car suffering a fatal collision on a Danish motorway per kilometre of road was (2009) 2×10^{-9} , or one five hundred millionth, or 400 times higher.

The risk assessment methodology develops mathematical equations for accident scenarios to determine the maximum exposure distance and the level of risk, which includes the probability and consequences of an event. The assessment assumes that the effects of an accident are equally likely in all directions around the WPP.

The calculated individual risk distances are defined and visualised with isolines around each WPP.

The most important parameters that, according to the risk assessment methodology, influence the consequences of accidents in determining the overall level of risk posed by a WPP are:

- Total height of WPP (m),
- rotor diameter (m),
- gondola dimensions - length, height and width (m),
- the diameter of the mast at its top and bottom (m),
- mass of the equipment (t),
- rotor speed (rpm, nominal);

A specific model has not yet been selected for the proposed operation, so the risk assessment uses data and assumptions that are representative of the largest possible installation that could be built in the NPPF (Table 5.3.3). Figure 5.3.5 shows that the productivity and size of WPPs in Europe and elsewhere in the world are continuously increasing with technological advances and accumulated operating experience.

⁷⁴https://backend.orbit.dtu.dk/ws/portalfiles/portal/7903618/Risk_assessment_of_wind_turbines.pdf

Table 5.3.3. Input data (assumed in calculations)

VES height, m	250	275	300
Mast height, m	150	175	200
Rotor diameter, m	200	200	200
Gondola dimensions			
Length, m	15	15	15
Width	7	8	9
Height, m	5	6	7
Total weight of equipment, t	800	840	880
Upper diameter of mast, m	6	6	6
Lower diameter of mast, m	9	10	11
Rotor speed (max), times min.	8–12	8–12	8–12

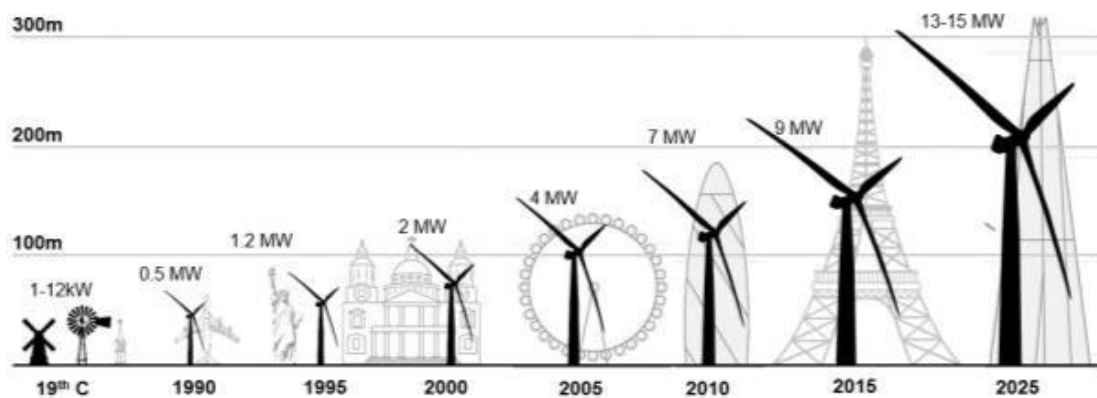


Figure 5.3.5. WPP development in recent decades and outlook⁷⁵

To assess the potential impact of the WPP in the event of an accident, baseline data for accident consequence assessment have been compiled. The assumptions of the calculation output data are based on the world's largest built WPPs (e.g. Vestas V164-8.0 Haliade-X (*General Electric*), V236-15.0 (*Vestas*), SG 14-236 DD (*Siemens Gamesa*), MySE 16.0-242 (*MingYang Smart Energy*)), interpreting the data on WPPs envisaged in the EIA and their planned technical parameters (capacity, WPP height, rotor diameter).

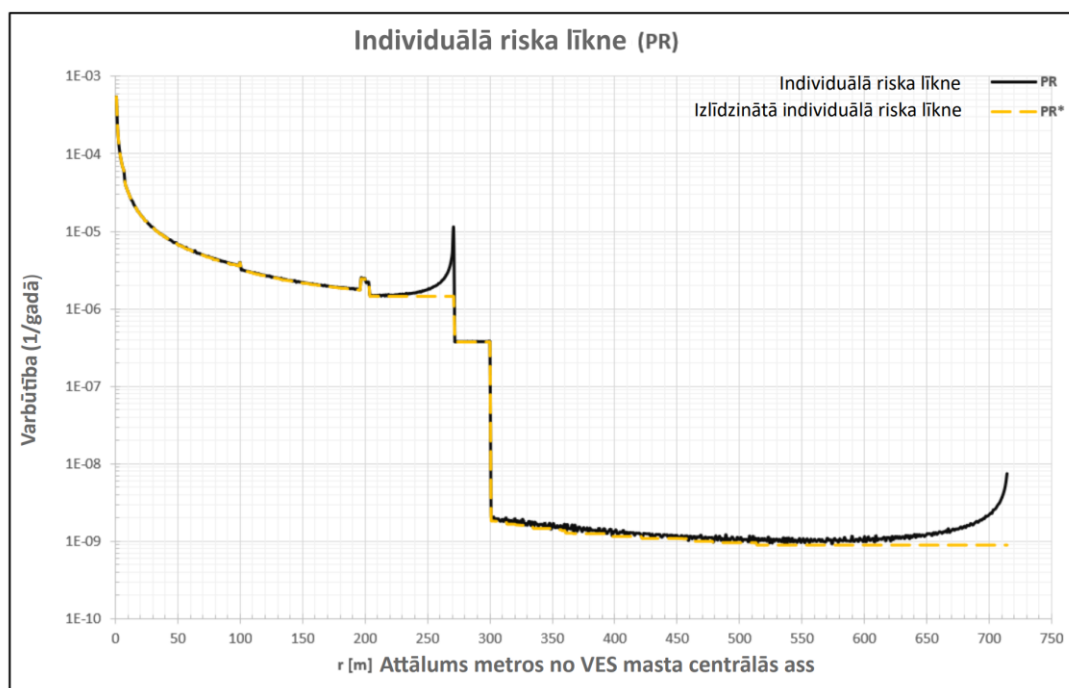
The EIA uses calculation sheets developed in Belgium, resulting in individual risk distances around the stations, as well as safety distances to be determined for the location of the WPP in relation to other facilities. The results of the calculations for all station modifications are summarised in Table 5.3.4 above. See Figure 5.3.6 for a plot of the worst case scenario for a WPP with a height of $h=300$ m.

⁷⁵ Input of advanced geotechnical modelling to the design of offshore wind turbine foundations, Federico Pisanò, Norwegian Geotechnical Institute

Table 5.3.4. Calculated individual risk and zone distance in metres for different types of WPPs for alternatives A, A` and B, B` of the Valmiera-Valka wind farm

Individual risk level	Individual risk zone size for different WPP modifications (distance in metres from the WPP)		
	WPP h=250m	WPP h=275	WPP h=300
1x10 ⁻⁵ /year	37	35	34
1x10 ⁻⁶ /year	246	260	272
1x10 ⁻⁷ /year	251	276	301

Windturbine | Locatie: Valmiera-Valka (h=300m) (8000. kW)



Notes.

PR individual risk curve (the two 'spikes' in the PR curve are related to the rotor blade flying distance at nominal operating mode and at operating conditions where the rotor speed is 2× the nominal rotational speed).

PR` smoothed individual risk curve According to the Belgian NPS risk assessment manual, these curve jumps can be smoothed to read the determined risk distances.

Figure 5.3.6. Individual risk curve for the worst case scenario of a WPP accident (WPP height h=300m)

Calculated according to the Belgian methodology *HANDLEIDING REKENBLAD WINDTURBINES Handleiding voor en verduidelijking bij het gebruik van het rekenblad Versie 2.0 dd. 01/10/2019*⁷⁶ for the effects of WPP accidents, depending on the technological parameters of the installation, not only the individual risk level but also the safety distances between the WPP and other objects in the vicinity of the WPP parks (sensitive objects, critical infrastructure

⁷⁶ https://omgeving.vlaanderen.be/sites/default/files/2021-10/2019%2010%2001%20-%20WT%20-%20handleiding%20rekenblad_0.pdf

objects, public and individual buildings, etc.) applicable in the above-mentioned EU Member State have been defined (Table 5.3.5.).

Table 5.3.5. Restrictions on the use of the site

Individual risk level	Restrictions on the use of the site	Notes
1x10 ⁻⁵ /year	Work area with more than five permanent outdoor workplaces	-
1x10 ⁻⁶ /year	Minimum distance to residential area	Minimum 800 m in Latvia
1x10 ⁻⁷ /year	Minimum distance to sensitive, vulnerable objects	-

In Latvia, the level of risk around industrial facilities and the resulting measures to mitigate the risk in the surrounding area are not specified in the regulatory enactments.

If any of the restrictive parameters for the use of the surrounding area in Belgium are different from those applicable in Latvian legislation, the national legislation shall prevail and the restrictions applicable in other countries shall be of a recommedative nature.

The calculated individual risk level for the worst case scenario comprising alternatives A` and B` is visualised in Figure 5.3.7. As the result shows, the increased individual risk is concentrated in the immediate vicinity of the WPP, where there is currently an area of forest land with adequate infrastructure, and does not directly affect other economic activities.

To ensure that the surrounding area of a WPP is used according to the risk level, which includes the probability and consequences of an event, the safety distances used in Belgium for the design and construction of new WPP parks have been calculated.

In addition, calculations have been made for the flying distance of ice debris, taking into account the technical parameters of the WPP. The data are summarised in Table 5.3.6 and visualised in the cartographic material in order to assess their spatial impact on the surroundings of the WPP under different alternatives for the implementation of the proposed action.

In addition to the mechanical risks from flying debris, oil leakage is also a possibility in the event of a WPP accident, given that a turbine can contain between 600-1500 l of oil. Without appropriate secondary containment measures, leakages from WPPs can be released into the environment. Against this, secondary containment liner systems have been developed with a geomembrane around the perimeter of the containment area around the WPP to reliably contain leakages. The geomembrane allows water from rain or snowmelt to flow through unhindered, but hardens in the event of an oil leak. The membrane has a non-woven geotextile construction that uses an oil curing compound to instantly prevent oil from leaking through (see example⁷⁷).

⁷⁷ <https://www.basicconcepts.com/news/secondary-containment-solutions-for-the-green-energy-industry/>

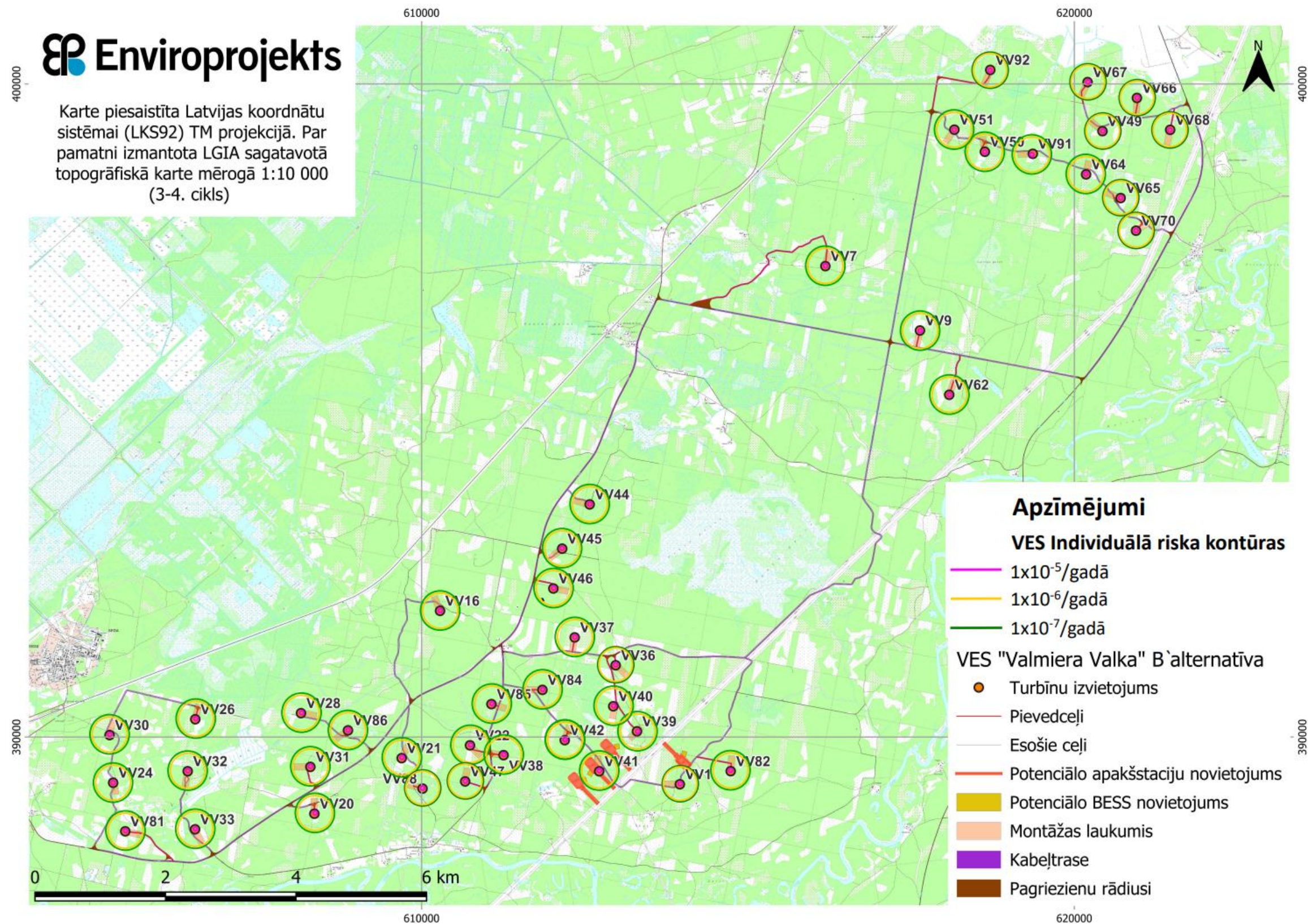


Figure 5.3.7. Individual risk zoning for Alternative B of the Valmiera-Valka Wind Farm

Table 5.3.6. *Calculated safety distance in metres for different types of WPPs for Alternatives A, A` and B, B` of the Valmiera-Valka Wind Farm*

Object	Calculated safety distance in metres for different types of WPP			Locating another site in the potential area of influence
	WPP (h=250 m)	WPP (h=275 m)	WPP (h=300 m)	
Sites covered by the SEVESO Directive	747	767	786	Not detectable
Liquefied natural gas (LNG) filling station, Compressed natural gas (CNG) filling station, Liquefied petroleum gas (LPG) filling station, LNG bunkering stations	747	767	786	not detectable
Hydrogen filling stations	747	767	786	Not detectable
Aboveground transport pipelines (hazardous chemicals)	747	767	786	Not detectable
Natural gas supply infrastructure facilities (gas regulation stations)	747	767	786	Not detectable
Underground transport pipelines (hazardous chemicals)	179	204	229	Not detectable
Underground pressure vessels	202	233	263	Not detectable
Public outdoor space where more than 10 people can gather and be endangered at the same time	676	696	715	Not detectable
Public area facilities where people stay indoors	179	204	229	Not detectable
Main national roads	250	275	300	Not detectable
High-voltage transmission infrastructure objects (lines)	700	700	700	VES - VV39, VV41, VV1, VV68, VV70
Nuclear objects	2000	2000	2000	Not detectable
Flying distance of ice debris	525	562,5	600	High-voltage transmission facilities, woodland, local road V260, regional road P24, main road A3, forest roads

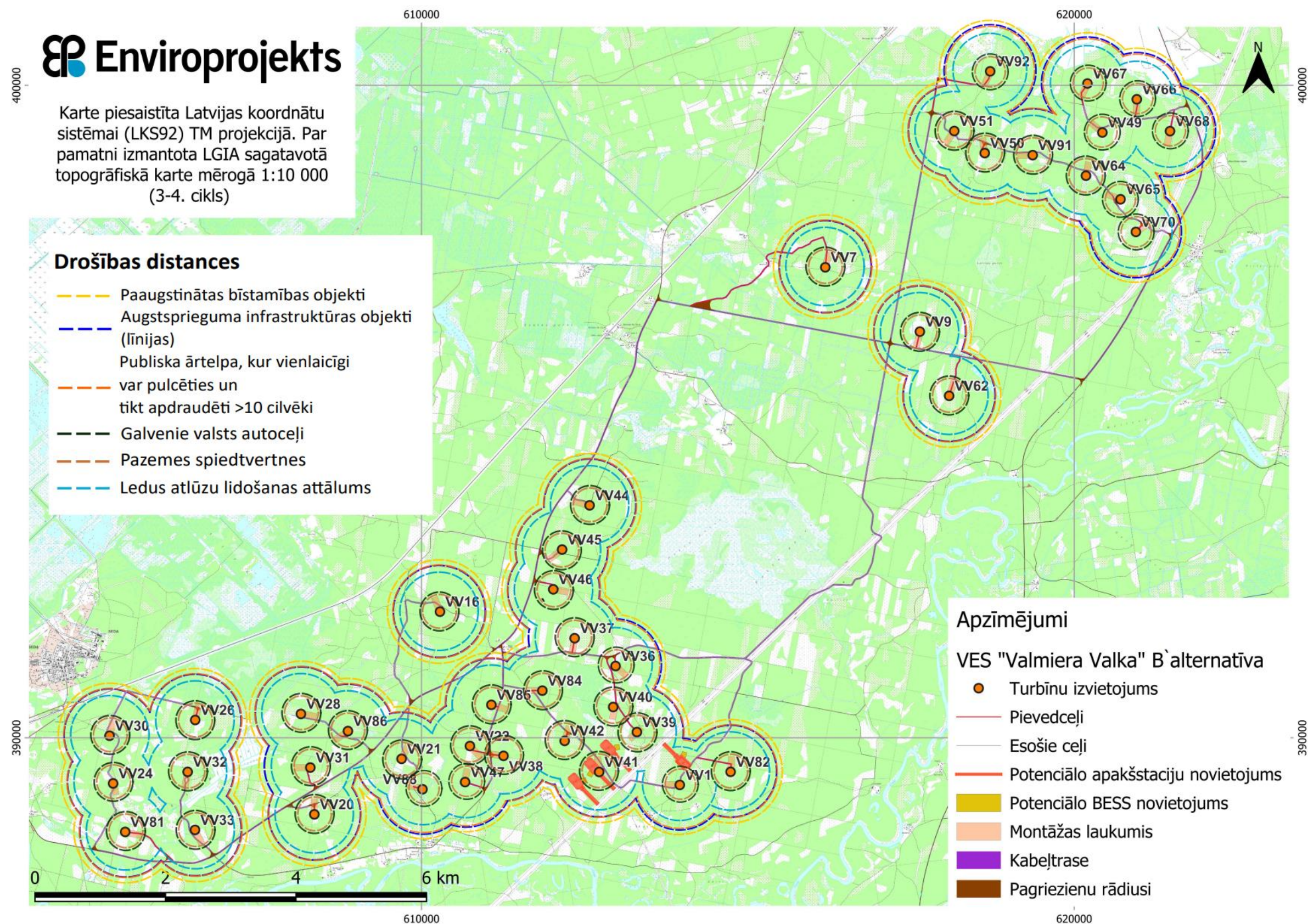


Figure 5.3.8. WPP recommended safety distances and calculated ice debris fall distance zone for Alternative B

Fire

Other possible incidents of technogenic origin associated with the operation of WPPs include ignition of WPPs.

In Denmark, for example, a total of 67 incidents involving the ignition of WPP were recorded between 2010 and 2014. Of these 67 incidents, only 10 involved WPPs with a capacity of more than 1 MW, while two thirds involved WPPs installed in households.⁷⁸

The risk of fire in a WPP can be caused by external factors such as weather, equipment or human error. Maintenance is crucial for fire prevention, as many fires are caused by the failure of worn devices that should be replaced or repaired in time to avoid the risk of accidents leading to ignition (Figure 5.3.9).

Looking at the statistics compiled, there were around 200 000 WPPs in operation worldwide in 2011. According to a report by *the International Association for Fire Safety Science*, one in every 1,710 turbines caught fire in 2011. According to statistics, the probability of a wind turbine catching fire is $5.85 \times 10^{-4}/\text{year}$.⁷⁹

Another internationally accredited company, DNV GL, estimates that the occurrence of a WPP fire is 1 in 2000 per year. DNV GL analysis examines WPP fires regardless of whether the fire results in a total loss of the WPP. Probability of ignition of WPP $5 \times 10^{-4}/\text{year}$: quite similar to the previous figure.

A 2020 article in *Wind Power Engineering Magazine* also estimates that 1 in 2,000 WPPs catch fire every year.

Gondola fires cause total loss or significant damage in 90% of cases.

If a fire breaks out, you usually have to wait for it to burn out. Without fire suppression, significant structural damage and total loss of the WPP occurs in almost all cases (90%), see Figure 5.3.9.

There are no data on WPP ignition incidents in Latvia.

⁷⁸ <http://www.vindmoellegodkendelse.dk/media/1097/egv-%C3%A5rsrapport-2014-jnr-64036-0025.pdf>

⁷⁹ Fei You ^a, Sujan Shaik ^a, Md. Rokonzaman ^b, Kazi Sajedur Rahman ^c, Wen-Shan Tan Fire risk assessments and fire protection measures for wind turbines: A review, *Heliyon* 9 (2023) 19664



Figure 5.3.9. Damage to WPP caused by fire⁸⁰

Causes of fire

Possible sources of ignition of WPP are:

- lightning discharge;
- flying sparks during the application of the mechanical brakes;
- short circuit;
- hot surfaces such as bearings, brake discs;
- spontaneous ignition from dirty cleaning cloths (e.g. oil, solvents).

In order to avoid the above potential sources of ignition, components of a WPP shall be designed and operated in such a way that no combustible material is ignited in the event of normal operation or malfunction. To ensure this, demising slabs must be installed: sheets of non-combustible material. Electrical equipment must be insulated. Staff must pick up dirty cleaning rags when leaving the WPP gondola.⁸¹

Today, WPPs are equipped with lightning detectors and special temperature sensors that automatically stop the equipment when it reaches a certain temperature. This equipment significantly reduces the risks of ignition of WPP⁸². However, if a fire does start, the damage caused is usually relatively small, as the station is in close proximity to access roads and

⁸⁰ <https://www.windsystemsmag.com/wind-turbine-fire-risk-the-time-to-act-is-now/>

⁸¹ https://cfpa-e.eu/app/uploads/2022/05/CFPA_E_Guideline_No_21_2021_F.pdf

⁸² <https://www.wa.gov.au/system/files/2022-04/PB-67-%20Guidelines-for-wind-farm-development-2004.pdf>

squares, which not only slows the spread of the fire, but also allows the fire brigade to start extinguishing work quickly.

Safety distances, Infrastructure, other objects in the vicinity of the proposed activity

Residential buildings

In accordance with the requirements of the Cabinet of Ministers Regulation No.240 of 30.04.2013 "General Regulations on Spatial Planning, Use and Construction", the distance from the nearest planned WPP and wind park boundary to residential and public buildings, which in case of planned capacity is more than 2 MW, is at least 800 m, measured from the wind park's outermost WPP tower.

Roads, railways

Major infrastructure facilities in the vicinity of the planned WPPs and distances to them:

- Riga-Valka railway line-0.69 km (to the nearest planned WPP);
- main road A3 *Inčukalns-Valmiera-Estonia border (Valka)* -0.375 km (to the nearest planned WPP);
- regional road P24 *Smiltene-Valka* - 0.43 km (to the nearest planned WPP);
- local road V260 *Egļi-Oļiņas-Bērzs* - 0.145 km (to the nearest planned WPP);
- JSC Latvijas Valsts Meži roads are built in forest areas.

The Danish guidelines⁸³ state that WPPs can be sited at a distance of 1-1.7 times the maximum height of the WPP in relation to major roads and railways. Given the maximum height of the WPP of 300 m, the maximum safety distance to roads under the Danish approach is 510 m.

Based on the Belgian method, the safety distance to national roads is 300 m.

The Guidelines for the Preliminary Environmental Impact Assessment of Wind Power Plants in Latvia⁸⁴ state that the minimum recommended distance from a WPP to the State (main roads (A), regional roads (P), local roads (V)) and public railway lines is **300 m**.

Based on the level of individual risk of a technogenic catastrophe, the national main road A3 (E264) is within the acceptable individual risk zone of $1 \times 10^{-7}/\text{year}$; for comparison, a road user is killed (includes all road users: pedestrians, cyclists and drivers) In Latvia, the risk of injury is $7 \times 10^{-5}/\text{year}$, or 100 times higher than from the operation of a WPP.

Some local and forest roads are in the individual risk zone of 1×10^{-5} to $1 \times 10^{-6}/\text{year}$, but the traffic volume on these sections is low, so the risk of injury to a road user is significantly lower and acceptable according to the *Latvian Risk Management Association guidelines (2017)*.⁸⁵

⁸³ <https://www.retsinformation.dk/api/pdf/229524>

⁸⁴ <https://www.vvd.gov.lv/lv/jaunums/izstradatas-vadlinijas-veja-parku-ietekmes-uz-vidi-sakotnejo-izvertejumu-veiksanai>

⁸⁵ https://lvafa.vraa.gov.lv/faili/materiali/petijumi/2016/LVPA_133/Vadlinijas_LVPA_F240217.pdf

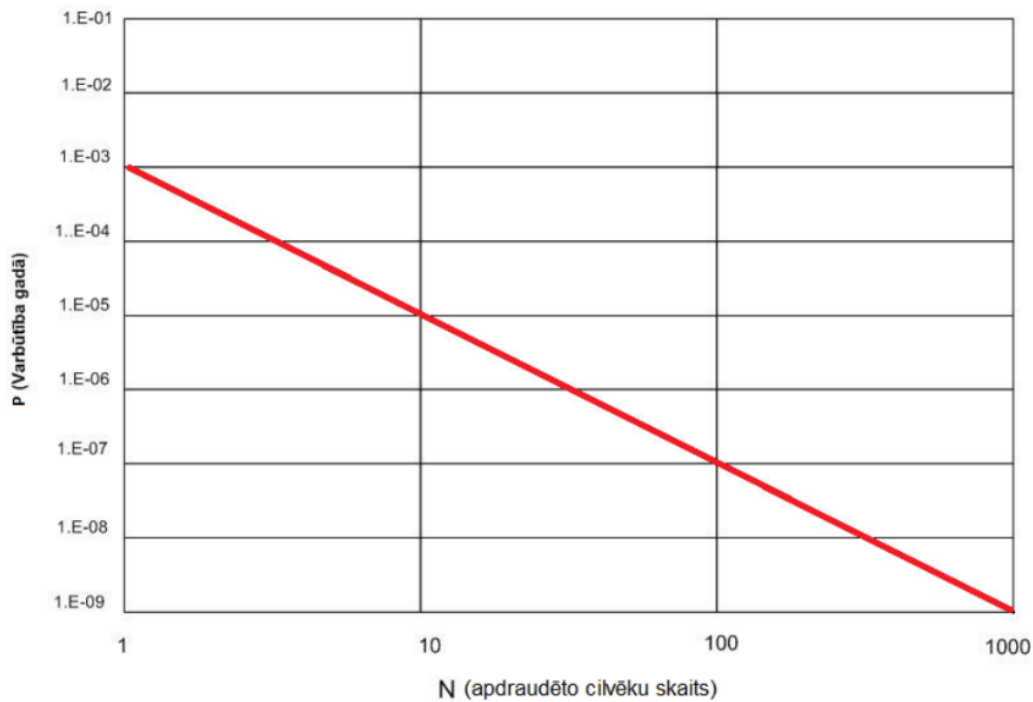


Figure 5.3.10. Acceptable social risk curve⁸⁶

Impacts on electricity transmission facilities (lines, etc.)

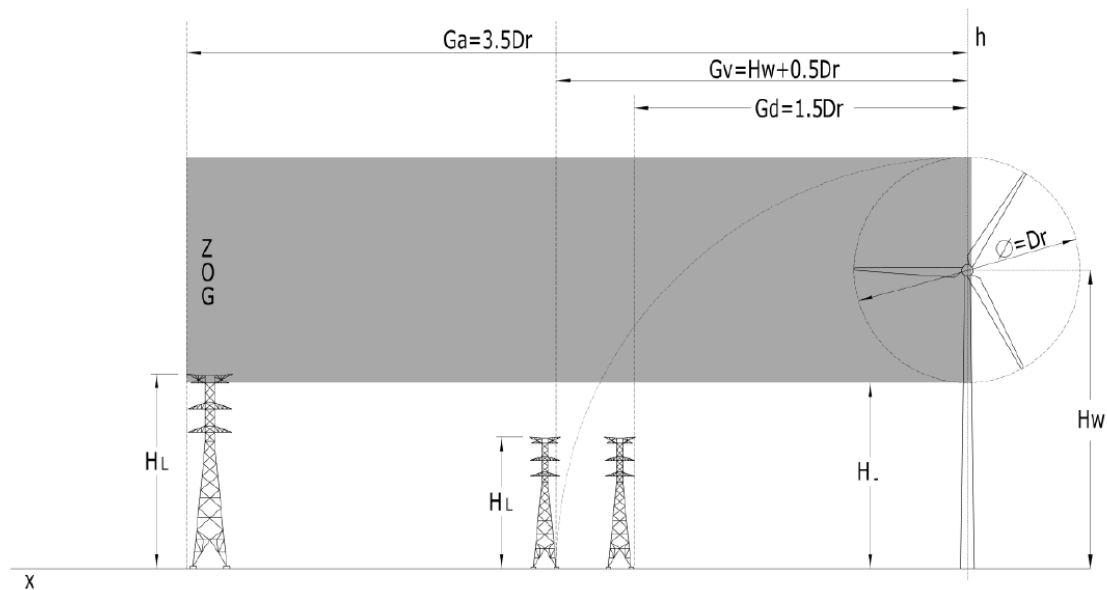
In Latvia, there are no criteria or restrictions for assessing the impact of NPSs on transmission lines. Some other countries have requirements for the location of WPPs on transmission lines.

Belgian electricity grid operator *Elia* points out that wind turbines can have an impact (e.g. vibration) within a radius of 500 metres. WPPs can also pose a risk to high-voltage power lines, pylons and substations: for example, a WPP may tip over, a wing of a WPP may break, or ice debris may be thrown. The operator has developed criteria for assessing the risk of new build WPPs to the electricity transmission infrastructure.⁸⁷

If any of the criteria set out in the methodology are met, the proponent must seek the opinion of the transmission infrastructure owner before installing the wind turbine, and must seek approval or refusal if the risk to critical infrastructure is unacceptably high. The operator shall determine the actual risk that a new WPP may pose using an approved methodology that includes risk matrices.

⁸⁶ https://lvafa.vraa.gov.lv/faili/materiali/petijumi/2016/LVPA_133/Vadlinijas_LVPA_F240217.pdf

⁸⁷ <https://www.elia.be/en/infrastructure-and-projects/safety-around-our-infrastructure/working-near-high-voltage-facilities>



GA = recommendation limit = 3,5 DR = minimum distance value (L) for which no consultation with the Transmission Infrastructure Company is required

Hv = Gv = Downside risk limit = HW + 0,5 DR

GD = "air movement" limit = 1,5 DR = minimum distance according to international studies below which wind turbine induced air movement can cause undesired movement of high voltage line conductors with risk of damage (including breakage) in the long term.

Zone of Influence (ZOG) = a cylindrical area behind wind turbines where turbulence can occur in the air layers and cause vibrations on high voltage line conductors

HL = height of the upper high voltage conductor/guard cable(s)/rail(s) in the area of influence.

H- = HW-0,5 x DR lower limit of the wind turbine rotor influence zone

Hw = height of the wind turbine rotor axis relative to the ground

Figure 5.3.11. Criteria used for assessing the impact of WPP and for coordination with the TSO, Belgium⁸⁸

The Swedish Transport Agency's recommendations⁸⁹ state that wind turbines and masts with attachments with a total height of less than 50 metres should be placed at least 100 metres away from power lines. Wind turbines and masts with supports having a total height of more than 50 metres shall be located not less than 200 metres from the power line. The distance is calculated from the periphery of the WPP rotor. If the rotor diameter is 100 metres or more, the distance between the tower and the line must be greater than 250 metres.

As can be seen from the above, the approaches are different. Belgium uses a risk-based approach, taking into account the risk of both high-voltage infrastructure and WPP. In Sweden, there are safety distances depending on the mast height.

Taking into account the fact that several WPP (VV39, VV41, VV1, VV68, VV70) are located within the safety distance zone (700 m) of a high voltage infrastructure object (one 110 kV and two 330 kV lines), as calculated by the methodology above, it is recommended that the Proponent of the Proposed Action consult with JSC Sadales tikls on the assessment of potential

⁸⁸ https://www.elia.be/-/media/project/elia/elia-site/infra-and-projects/safety_around_our_infrastructure/working-near-high-voltage-facilities/fr/procedure-elia---avis-eoliennes-fr-v20240201.pdf

⁸⁹ <https://www.svk.se/en/stakeholders-portal/community-planning/when-wind-power-is-planned/>

impacts at a specific critical infrastructure section to assess the significance of the impacts, if necessary, providing for compensatory measures.

Measures to reduce the risk of accidents at WPPs

In general, industrial accident risks are associated with areas located in woodland. Consequently, no other economic activity or residential and public housing sites are affected.

Given that, according to Forest Law, natural persons are allowed in the forest area without technical measures to reduce the risk, public information, installation of warning signs, restrictive barriers or fencing, where necessary, play an important role.

The causes of accidents in WPPs are studied by designers, manufacturers, insurers and users of WPP equipment, so that the equipment is continuously improved and its safety level is progressively increased.

Risk reduction measures include:

- maintenance and repairs to prevent equipment failure;
- installation of automated safety systems (e.g. switching off the equipment automatically if the maximum permissible wind strength is reached, or if vibration has occurred);
- equipping WPPs with automatic fire detection and alarm systems
- fire-fighting systems and equipment
- continuous monitoring of the plant, etc.

The presence of roads in the area of potential ice debris fall requires comprehensive risk mitigation measures at WPP:

- the A3 national trunk road: VV81, VV33, VV31, VV20, VV86, VV21, VV85, VV44, VV45 and VV46,
- regional road P24: VV70, VV68,
- local road V260: VV47, VV38, VV22, VV85,

This includes equipping WPPs with sensors to detect icing, shutting down equipment when there is a risk of icing and equipping stations with anti-icing systems.

According to Article 2 of the Law on Roads, "the use of roads may be temporarily prohibited or restricted due to adverse road or weather conditions, or in other cases where driving on roads becomes dangerous". Such rights could be used to reduce risk where there is a risk of falling ice chunks, for example temporarily on sections of forest roads.

There are also organisational measures to be taken: an international group of experts has issued a technical report⁹⁰, which identifies possible measures to reduce the risk of falling ice, taking into account the actual risk (Table 5.3.6).

⁹⁰ <https://iea-wind.org/wp-content/uploads/2022/09/Task-19-Technical-Report-on-International-Recommendations-for-Ice-Fall-and-Ice-Throw-Risk-Assessments.pdf>

Table 5.3.7. Measures to reduce the risk of falling ice and their effectiveness⁹¹

Security measures	Degree of risk reduction	Suitable for
Warning signs for ice-fall conditions	1 to 10	Local roads and paths
Warning by light equipment connected to WPP ice detection system in combination with warning signs	10 to 100	Local roads and paths
Rerouting, diversion, detouring, security-monitored diversion to protect against high-risk events	10 to 100	Local roads and paths
Physical barriers (regional road closures) and signs	10 to 100	Roads and official and frequently used tourist hiking routes

5.3.3. Impact of the WPP on air traffic, navigation equipment

Wind turbines are signal reflectors that are larger than the radars they transmit to, so their presence can hide weaker signals from smaller targets. In addition, rotating wings create a shift in the echo frequency compared to stationary objects. As current radars are not designed to identify and filter wind turbine signals, they can cause interference to radar information in the vicinity of the wind farm.⁹²

The Ministry of Defence (MoD) said in a statement that the construction of new wind turbines in the vicinity of National Armed Forces (NAF) radars could adversely affect air and maritime surveillance capabilities. In order to facilitate the approval process for the construction of wind farms and to show where in Latvia the construction of wind farms is allowed, assessed or not allowed, the Ministry of Defence is developing a map of the territory of Latvia, divided into three sectors, marked with different colours. In the green zone, construction of WPP parks is allowed and supported, subject only to the approval of the Ministry of Defence. In the yellow zone, the construction of WPP parks is under consideration, but the operator will have to take into account compensatory solutions, such as the purchase of new radars. In the red zone, construction of WPP parks will be prohibited, as it would significantly interfere with national defence tasks.

The Valmiera-Valka WPP is located in the green area of the map (see Figure 5.3.12), therefore the impact on air navigation capabilities is negligible and permissible, requiring only the approval of the Ministry of Defence.

⁹¹ <https://iea-wind.org/wp-content/uploads/2022/09/Task-19-Technical-Report-on-International-Recommendations-for-Ice-Fall-and-Ice-Throw-Risk-Assessments.pdf>

⁹² Impact analysis of wind farms on telecommunication services, Angulo, D. de la Vega, I. Cascón, J. Cañizo, Y. Wu D. Guerra, P. Angueira "Renewable and Sustainable Energy Reviews", Volume 32, April 2014, Pages 84-99

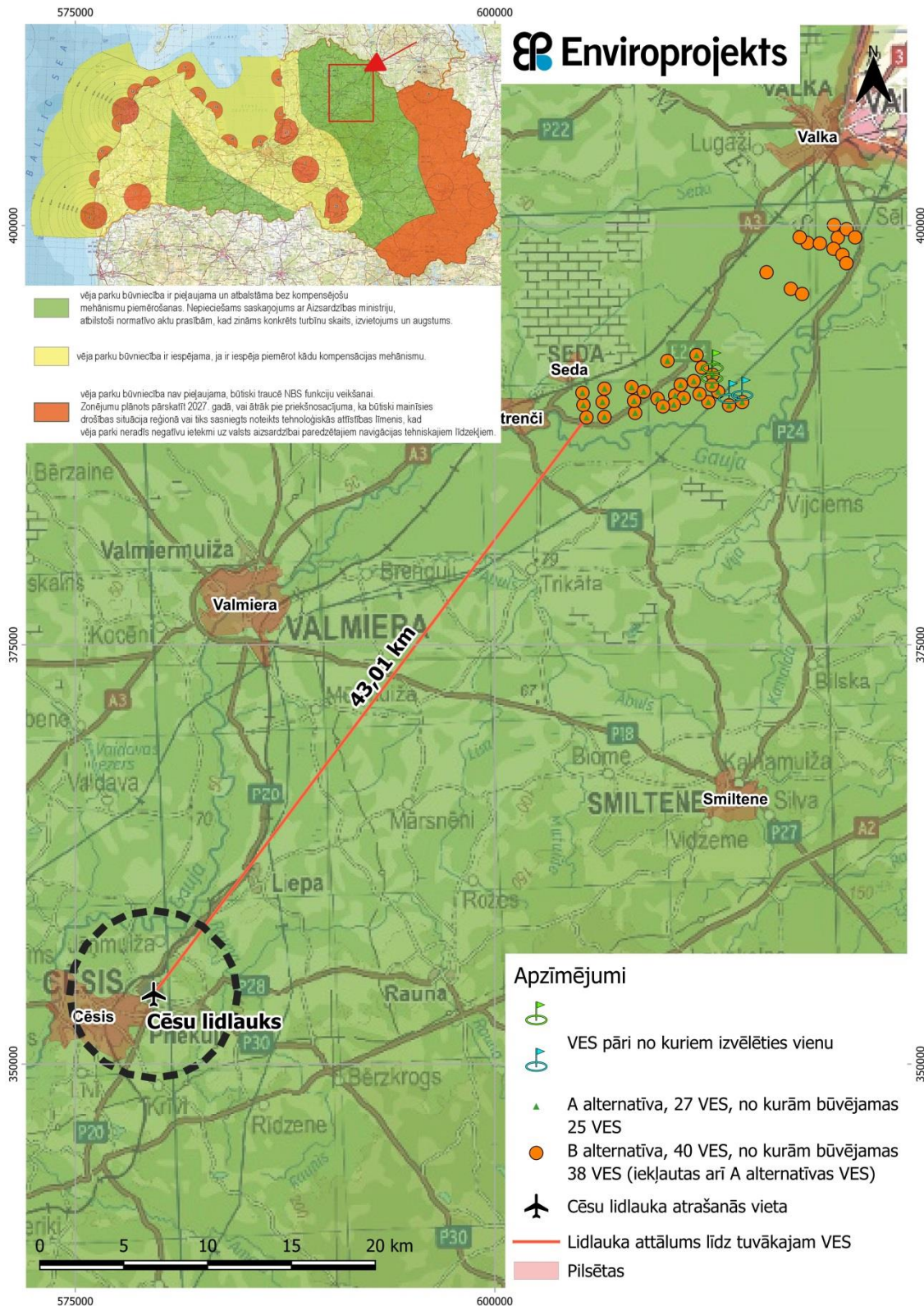


Figure 5.3.12. Location of military navigation facilities and their possible influence on each other in relation to wind farm location

Civil air navigation services in the Republic of Latvia are provided using ground-based communication, navigation and surveillance equipment, as well as global navigation satellite systems.

The nearest civil aviation aerodrome to the Valmiera-Valka VPP Park is Cēsis Aerodrome, address: Forest Owners Consultative Centre Ltd, "Lidlauks", Priekuļu municipality, Cesis region, LV-4126. The airport is located 43 km from the Valmiera-Valka wind farm. This aerodrome is home to the DME (*Distance Measuring Equipment*) radionavigation instrument - *DME Raiskums*.

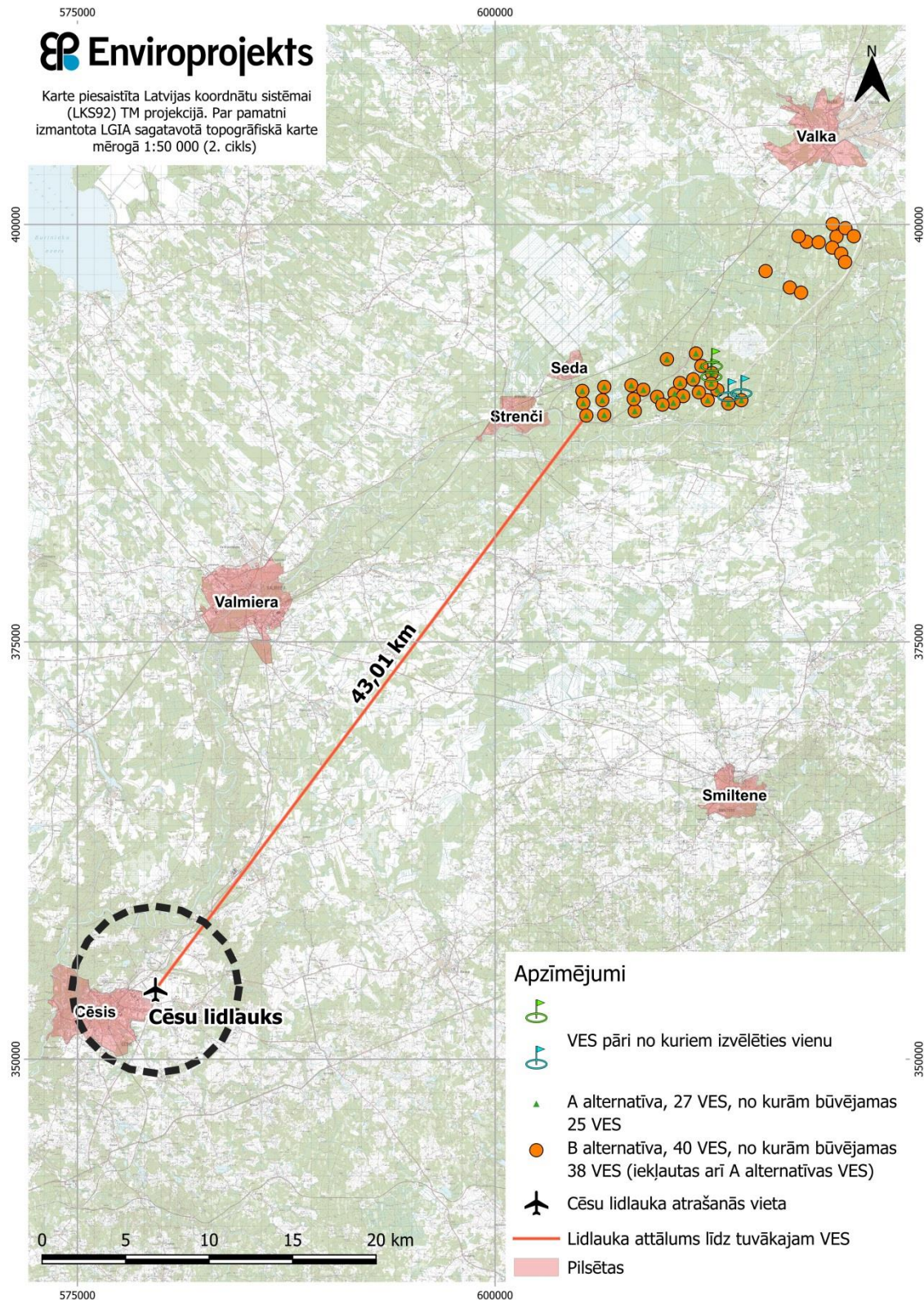


Figure 5.3.13. Location of Cēsis aerodrome in relation to the Valmiera-Valka wind farm

The second nearest airfield is Vidrižu Atvari Ltd: 66 km from the Proposed Action, (address "Atvari", Vidrižu pagasts, Limbažu novads, LV-4013). According to Latvijas gaisa satiksme⁹³, there is no radio navigation equipment at the aerodrome.

See Figure 5.3.13 for the location of radionavigation equipment in Latvia according to Latvian air traffic data.

To assess the potential impact of the wind farm on the radio-navigation shown on the map, the guidelines of the professional organisation EUROCONTROL were used. EUROCONTROL is a European civil-military organisation dedicated to supporting European aviation.

According to the criteria specified in the Methodology, 4 zones and impact assessment requirements have been defined for the relation of the location of the WPP to the radio navigation aids, see Table 5.3.7. The Valmiera-Valka WPP is located three times further than 15 km from the PSR (*Primary Surveillance Radar*) radionavigation sites, so its impact does not need to be assessed.

Table 5.3.8. Assessment requirements depending on the position of the wind farm in relation to the PSR and SSR (Secondary surveillance radar) radar⁹⁴

Zone	Zone 1	Zone 2	Zone 3	Zone 4
Description	0-500 m (PSR and SSR system radars)	500 m-15 km (PSR and SSR system radars)	Beyond 15 km, including radar visibility and range (PSR radars only)	Outside the radar's field of view and range (PSR and SSR system radars)
Assessment requirements	To be protected	Detailed assessment	Simple assessment	Not to be judged

Risk mitigation measures

The Valmiera-Valka WPP is not expected to pose any risk to the operation of the radio navigation equipment, and it is therefore recommended to obtain the official approval of JSC Latvijas gaisa satiksme confirming this fact (Figure 5.3.14). In accordance with consultations with JSC Latvijas gaisa satiksme letter No VI-AD/JPN-03/2024/676 (attached as Annex 2), there is no objection to the further progress of the WPP Park project. In addition, a map of JSC Latvijas gaisa satiksme is attached, confirming that there are no air traffic radionavigation facilities closer to Latvia than those already assessed.

⁹³ <https://www.airspace.lv/lgs>

⁹⁴ <https://www.pagerpower.com/news/eurocontrol-radar-wind-turbine-guidelines-v1-2/>

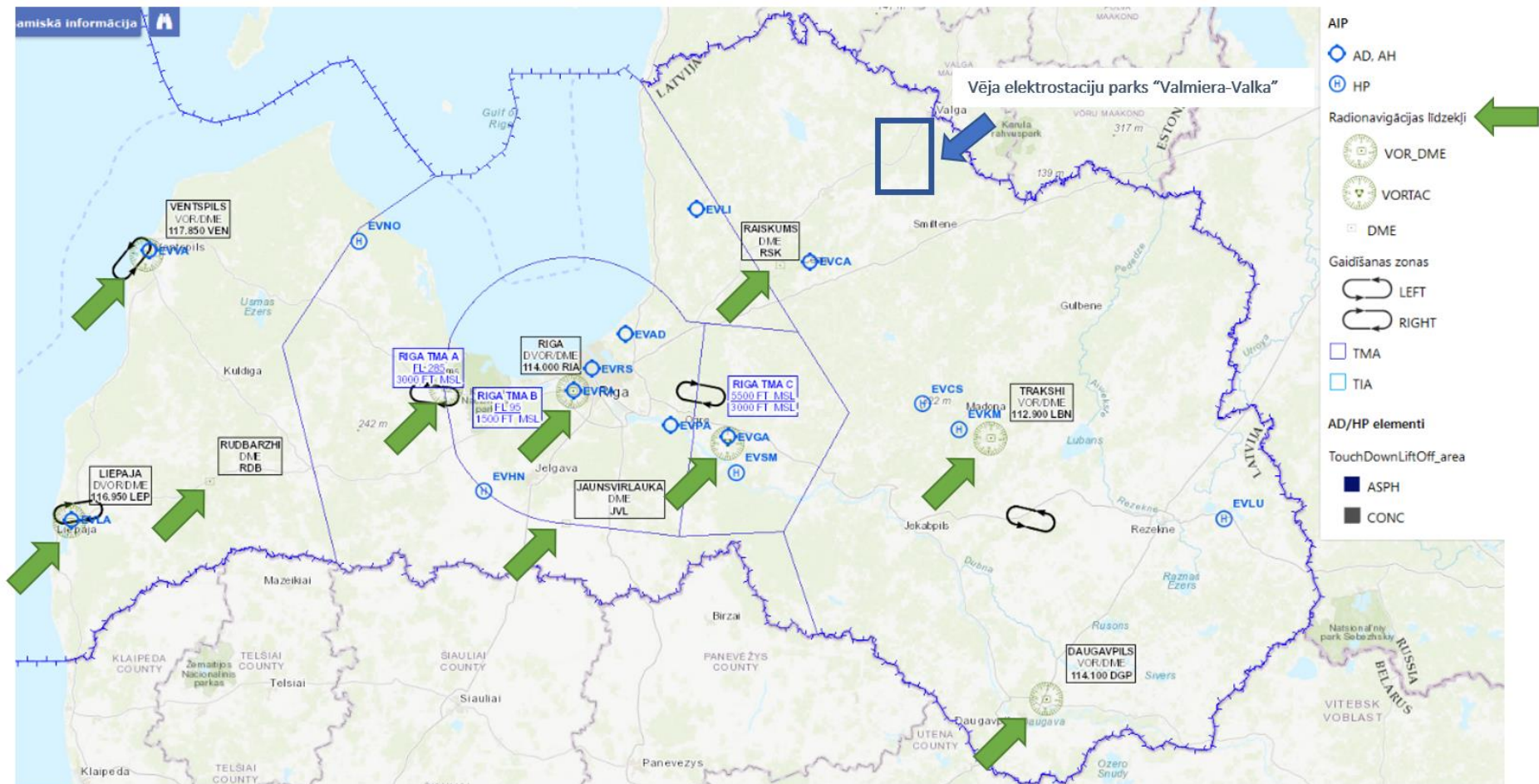


Figure 5.3.14. Location of radio navigation aids in Latvia and their position in relation to the Valmiera-Valka wind farm⁹⁵

⁹⁵ <https://www.airspace.lv/lgs>

5.3.4. BESS container accident risk

BESS (*battery energy storage system*) battery cells are usually arranged in modules on racks and can be interconnected to increase energy capacity and meet a specific electricity demand at a given time. Modular arrays are usually housed in a room or external container that can vary in length, typically between 6 and 18 m. There are several types of batteries:

- lithium ion,
- lead-acids,
- nickel-cadmium,
- sodium-sulphur,
- flows (*Vanadium Redox*).

The most common batteries in the BESS market are lithium-ion, followed by lead-acid and flow batteries.

Fire hazards

The primary hazards of BESS are related to their operation and include electrical failures, electrocutions, flammable gas emissions, explosions, etc., usually associated with battery charging systems. Battery failure also affects the operation of battery-powered equipment.

If lithium-ion batteries are used in the BESS, there is a potential hazard caused by thermal leakage under certain conditions (damage, etc.) resulting in ignition. Such a chemical reaction can occur during charging or recharging of batteries as current flows through the cell, raising the cell temperature, which in turn increases the current with a subsequent rise in temperature.

Causes of fire that can lead to lithium-ion battery fires:

- mechanical abuse/damage caused during transportation, assembly or operation,
- manufacturing defect - can cause conditions that may lead to short-circuiting of specific battery packs during use,
- Overcharging: lithium-ion batteries are prone to overheating, which can occur when batteries are left in their chargers for too long a period of time during which the charger exceeds its protection limit or fails,
- short circuits, which can occur for a number of reasons, including poor installation, product defect, and physical damage.

Risk mitigation measures

The safety precautions to be observed when operating BESS equipment are provided by the equipment manufacturer in the operating instructions.

Additional information on fire safety requirements for BESS is also provided in the US Professional Firefighters' Organization document *NFPA 855 "Standard for the Installation of Stationary Energy Storage Systems"*⁹⁶. The above document covers systems that can reduce the fire risk associated with battery energy storage and provides industry best practices that all new BESS installations in the USA should follow. The document summarises information on safety systems for BESS construction, safety distances between BESS containers, fire compartments, ventilation systems, detectors, fire extinguishing systems, etc.

⁹⁶ <https://www.nfpa.org/codes-and-standards/nfpa-855-standard-development/855>

5.4. Information on climate change impacts

This chapter presents the impacts of installing and operating a WPP over its entire life cycle, including both negative impacts (increased GHG emissions and reduced removals) and positive impacts (reduced GHG emissions and increased removals). A detailed calculation is attached in Annex 5.

The calculations in this chapter are for the potential WPPs to be built, which correspond to the Valmiera-Valka park location alternative A with 27 WPPs and location alternative B with 40 WPPs. For the public consultation version of the EIA report, an assessment of physical impacts (flicker, landscape impact), a calculation of climate change impacts and a calculation of socio-economic benefits were carried out for these alternatives for the location of the WPP park. It is envisaged that during the public consultation of the EIA report, the WPPs that are currently recommended for construction may be refined, taking into account the proposals submitted by the public and other institutions and the results of the public consultation. In the updated version of the EIA report, which will be submitted to the NEB for its opinion, the calculation of climate change impacts will be updated according to the number of recommended WPPs.

CO₂ emissions from deforestation

The forest ecosystem is an important factor in climate, especially in terms of greenhouse gas emissions. The mechanism of climate forcing in this context is based on the ability of trees to sequester atmospheric carbon dioxide through photosynthesis and to store CO₂ in the trunks, branches and root system of the tree. The carbon sequestered in photosynthesis by a growing tree is "taken out of circulation" and no longer contributes to the production of greenhouse gases that are harmful to the climate.

The necessary deforestation and land transformation will be carried out for the construction of the WPP infrastructure. Deforestation will release the CO₂ associated with the trees in these areas.

The total impact of the project is calculated (see Annex 5) over a 50-year period, taking into account GHG emissions and CO₂ sequestration from deforestation and afforestation. After the project, GHG emissions will continue to increase for the next 15-17 years and then decrease due to CO₂ sequestration in woody biomass and other carbon sinks in the afforested areas. The differences between the calculations with and without the biofuel substitution effect appear after the first coppicing 20-25 years after establishment.

Total GHG emissions generated in the deforested area in 50 years within **Alternative A** amount to 37.2 Gg CO₂ eq. (see Annex 5). The offsetting effect of afforestation with substitution effect will reduce GHG emissions from deforestation by 19.1 Gg CO₂ eq., while the calculation without substitution effect will reduce GHG emissions by 17.8 Gg CO₂ eq. The residual GHG emissions from deforestation in the 50th year after the start of the project in the substitution scenario are 18.1 Gg CO₂ eq. (51% reduction in emissions from deforestation) and 19.4 Gg CO₂ eq. (48% reduction in emissions from deforestation).

Table 5.4.1. Increase in GHG emissions over 50 years as a result of the project under Alternative A

Indicator	Unit	With substitution effect	Excluding substitution effect
GHG emissions from deforestation	tonnesCO ₂ eq.	37225	
GHG emissions from afforestation	tonnesCO ₂ eq.	-19148	-17810
Increase in GHG emissions from the project	tonnesCO ₂ eq.	18077	19416

Total GHG emissions generated in the deforested area in 50 years within **Alternative B** amount to 66.4 Gg CO₂ eq. (see Annex 5). The offsetting effect of afforestation with substitution effect will reduce GHG emissions from deforestation by 32.3 Gg_{CO₂} eq., while the calculation without substitution effect will reduce GHG emissions by 30.1 Gg_{CO₂} eq. The residual GHG emissions from deforestation in the 50th year after the start of the project in the substitution scenario are 34.1 Gg_{CO₂} eq. (48% reduction in emissions from deforestation) and 45.2 Gg_{CO₂} eq. (45% reduction in emissions from deforestation) (see Annex 5).

Table 5.4.2. Increase in GHG emissions over 50 years as a result of the project under Alternative B

Indicator	Unit	With substitution effect	Excluding substitution effect
GHG emissions from deforestation	tonnes _{CO₂} eq.	66429	
GHG emissions from afforestation	tonnes _{CO₂} eq.	-32381	-30050
Increase in GHG emissions from the project	tonnes _{CO₂} eq.	34047	36379

The cumulative value of GHG emissions of Alternative A and Alternative B 50 years after the start of the project differs on average by 88%. Scenario B is associated with higher emissions, which is natural as more WPPs require more deforestation. In both alternatives, existing forest roads and drainage systems will also be affected, so the actual area to be deforested and afforested will be smaller than in this calculation, so this should be considered a conservative estimate.

CO₂ emissions as a result of the operation of the WPP

The operation of a WPP, including the production of the necessary equipment and components and the construction of the WPP, is linked to CO₂ emissions. According to the website of the international consultancy ICF, the life cycle CO₂ emissions of a WPP are broken down as follows⁹⁷:

- CO₂ emissions from the production phase of WPP: 89,00%;
- CO₂ emissions during the installation phase of a WPP: 4,00%;
- CO₂ emissions from the operational phase of a WPP: 7,00%⁹⁸.

The following assumptions have been used to calculate the life cycle CO₂ emissions of a WPP:

- Total electricity produced by the WPP:
 - For alternative "A": 18 125 GWh;
 - For alternative "B": 26 875 GWh.
- Average CO₂ emissions from operation of a WPP, 20 g_{CO₂} eq./ kWh⁹⁹.

For alternative "A", the total increase in CO₂ emissions from the operation of the WPP, including production and construction, is calculated to be 362 500 t_{CO₂}eq., which can be broken down as follows:

⁹⁷ <https://www.icf.com/insights/energy/recycling-initiatives-carbon-considerations-wind-energy>

⁹⁸ <https://www.icf.com/insights/energy/recycling-initiatives-carbon-considerations-wind-energy>

⁹⁹ <https://www.ipcc.ch/site/assets/uploads/2018/03/Chapter-7-Wind-Energy-1.pdf>

- Total_{CO2} emissions during the production phase of WPP: 322 625 t_{CO2 eq} ;
- Total_{CO2} emissions during the installation phase of the WPP: 14 500 t_{CO2 eq} ;
- Total_{CO2} emissions during the operational phase of the WPP: 25 375 t_{CO2 eq} .

According to the authors' calculations, the total increase in_{CO2} emissions from the operation of the WPP, including production and construction, under alternative "B" would be 537 500 t_{CO2 eq} ., broken down as follows:

- Total_{CO2} emissions during the production phase of WPP: 478 375 t_{CO2 eq} ;
- Total_{CO2} emissions during the installation phase of the WPP: 21 500 t_{CO2 eq} ;
- Total_{CO2} emissions during the operational phase of the WPP: 37 625 t_{CO2 eq} .

GHG emission reductions from substitution

The development of WPPs is planned to replace fossil-fuel-based electricity with energy produced by WPPs, which is characterised by lower GHG emissions from electricity generation. As a result, the substitution of electricity used for consumption will avoid the GHG emissions that would have been produced if fossil fuels were used for energy generation.

The calculation of GHG emission reductions as a result of the substitution was carried out in accordance with the methodology set out in Annex 1 to Cabinet of Ministers Regulation No 42 of 23 January 2018 "Methodology for Calculation of Greenhouse Gas Emissions", using the following assumptions:

- Amount of electricity produced by renewable energy technologies for grid feed-in, MWh/year for grid feed-in:
 - For alternative "A": 725 000 MWh/year;
 - For alternative "B": 1 075 000 MWh/year.
- CO₂ emission factor for electricity in accordance with paragraph 1 of Annex 1 to Cabinet of Ministers Regulation No.42 of 23 January 2018 "Methodology for Calculation of Greenhouse Gas Emissions" (average for the period 2016-2023, calculated according to the methodology of the above mentioned Cabinet of Ministers Regulation¹⁰⁰): 0.0735 t CO₂ eq./MWh;
- CO₂ emission factor for the transmission of electricity in the electricity grid in accordance with paragraph 1 of Annex 1 to Cabinet of Ministers Regulation No 42 of 23 January 2018 "Methodology for Calculation of Greenhouse Gas Emissions": 0.0070 t CO₂ eq./MWh.

The total amount of substitution of GHG emission reductions resulting from the operation of the WPP is calculated as follows:

- For alternative "A": 1 205 313 t_{CO2 eq} ;
- For alternative "B": 1 787 188 t_{CO2 eq} .

GHG emission reductions from successive afforestation of deforested areas

¹⁰⁰ <https://www.kem.gov.lv/lv/siltumnicefekta-gazu-emisiju-aprekina-metodika>

At the end of the WPP development (preparation and construction) phase, a partial afforestation of the area required for the WPP development is planned, which will result in additional_{CO2} emissions¹⁰¹.

According to the calculations (Annex 5), the total_{CO2} emission reductions from successive afforestation of the deforested area required for the WPP development will be as follows:

- For alternative "A": 7 223 t_{CO2 eq};
- For alternative "B": 12 278 t_{CO2 eq}.

See Table 5.4.3 for a summary of the GHG savings impact of the WPP.

Table 5.4.3. Summary of the GHG savings impact of the WPP park

CO₂ emission savings	Alternative A: GHG emission reductions, tonnes CO₂ eq.	Alternative B: GHG emission reductions, tonnes CO₂ eq.
Deforestation of the WPP development area	-36 760	-65 180
Partial afforestation of the WPP development area	7 223	12 278
CO ₂ emissions during the WPP production phase	-322 625	-478 375
CO ₂ emissions during the installation phase of a WPP	-14 500	-21 500
CO ₂ emissions during the operational phase of a WPP	-25 375	-37 625
Electricity substitution	1 205 313	1 787 188
CO₂ emissions	813 275	1 196 785

Overall, each alternative delivers significant GHG savings, with the largest savings in Alternative B with a higher number of WPPs, which overall is a testament to WPPs as a green energy source with GHG emission reductions as one of its main objectives.

The projected GHG emission reductions of the Valmiera-Valka wind farm represent approximately 0.5% (for Alternative A) or 0.7% (for Alternative B) of the GHG emission savings in the energy sector projected in the National Energy and Climate Plan 2021-2030 for 2030¹⁰².

5.5. Information on the climate resilience of the Proposed Activity and the potential impacts of climate change on the Proposed Activity

WPPs are designed to withstand both extreme weather conditions and to be resilient in the long term. Choosing a suitable wind class ensures that the WPP can withstand extreme wind speeds (extreme heat and torrential rain/hail are also predicted as major climate extremes in

¹⁰¹ Greenhouse gas (GHG) emissions from the implementation of the Valmiera-Valka wind farm and related infrastructure project in the Plani municipality of the Valmiera region and the Vīciems and Valka municipalities of the Valka region and changes in GHG emissions from the construction and operation of the wind farm, Dr. silv. Andis Lazdiņš, 20.07.2024

¹⁰² Updated National Energy and Climate Plan 2021-2030, approved by Cabinet Order No 573 of 12 July 2024, available at: <https://likumi.lv/ta/id/353615-aktualizetais-nacionalais-energetikas-un-klimata-plans-20212030gadam>

Latvia, but it is wind that could threaten the WPP). No significant potential effects of climate change on the WPP in the area of the proposed activity have been identified.

Based on the results of the wind condition characterisation, the area of the Proposed Action is suitable for the siting of WPPs designed for areas with low wind speeds (average speed at mast height of at least around 7.5 m/s). According to the standard, they are Class III turbines¹⁰³.

6. Assessment of the existing environmental status of the site

6.1. Hydrogeological conditions

The proposed activities and the surrounding area are located in the eastern part of the Baltic artesian basin. According to the intensity and chemical composition of water exchange, the artesian basin is divided into: active (free) water exchange or freshwater, slow water exchange or saltwater and passive or slow water exchange (saltwater) hydro-geochemical zones, which are isolated by two regional caged layers throughout Latvia and the study area - the Middle Devonian Narva Suite (D2nr) and the Silurian-Ordovician aquifer (S-O). Both aquifers are composed of water-impermeable, dense sedimentary rocks, which makes interaction between the two aquifers very difficult, although small amounts of water transfer are possible in tectonic fracture zones.

The active water exchange (freshwater) zone includes Quaternary and pre-Quaternary water complexes up to the impermeable rocks of the Narva Suite (D2nr). The waters of the freshwater zone can be divided into two groups - groundwater and pressurised water. The active water exchange (freshwater) zone is 160-200 m thick.

The zone of slowed water exchange lies between the interbeds of the Narva Suite and the Silurian-Ordovician aquifers and includes the Kemerī-Pärnu aquifers (D1km-D2pr), which contain fresh waters. Saline waters unsuitable for water supply occur in most of Latvia's territory in the distribution area of the Kemerī and Pärnava aquifers.

The mineral waters are mined at depths of 350-550 m in the stagnant (very difficult) water exchange zone - the sandstones of the Cambrian system. According to the groundwater classification criteria, the mineral waters of the Cambrian aquifer are considered to be saline, as their degree of mineralisation in the territory of the municipality probably does not exceed 20-30 g/l. These waters are stably separated from higher-lying fresh waters by the Ordovician-Silurian regional aquifer.

According to the LEGMC database "Boreholes" and cartographic information, groundwater aquifers associated with Quaternary sediments and rocks of the Upper Devonian, Middle Devonian and Lower Devonian sedimentary complex are distributed in and around the area of the proposed WPP (Table 6.1.1).

Table 6.1.1. *Stratification of the hydrogeological section in and around the area of the proposed activity*

Hydrogeological zone	Water aquifer complex	Water aquifer	Water-bearing sediments
Active water	Quaternary	Swamp (<i>bQ4</i>) sediment aquifer	turf

¹⁰³ <https://i-windenergy.com/content/popularity-class-iii-wind-turbines>

Hydrogeological zone	Water aquifer complex	Water aquifer	Water-bearing sediments
exchange (freshwater) zone	sediment complex (Q)	Undivided aquifer of alluvial (aQ4-aQ3ltv), eolian (vQ3ltv), glaciolluvial (glQ3ltv) and glaciofluvial (gfQ3ltv) sediments	sand, gravel, pebbles, aleurite, loamy sand
		Sporadically irrigated aquifer of intermontane sediments (gfQ3ltv)	moraine sandy loam with interbeds of sand-gravel-clay sediments
	Upper Devonian horizon	Gauja (D3gj) aquifer	Sandstone with interbeds of clay and aleurolite
	Middle Devonian horizon complex	Arukila-Burtnieku (D2ar+br), aquifer	Sandstone with interbeds of clay and aleurolite
Slow water exchange zone	Middle Devonian and sub-Devonian horizon complex	Ķemeri-Pērnavas (D1km-D2pr) aquifer	Sandstone with interbeds of clay and aleurolite

In general, the area is well supplied with underground freshwater, with the right amount of water available at different depths and in different places.

The majority of the area of the proposed activity is located in the artesian water transit zone, which defines zones of medium pollution risk, or in areas of upward flow of pressurised water, i.e. zones of low pollution risk. Small areas in Plani municipality are at high risk of pollution (pressure water recharge areas). Groundwater used for individual water supply in rural areas, on farms, is relatively protected or moderately protected against surface pollution in most of the county. A small area around Strenči, as well as the Seda river, is poorly protected against surface pollution. The chemical status of all groundwater aquifers (Arukil-Gauja and Ķemeri-Pērnavas) in the area is good.

The groundwater aquifer in most of the area of the proposed activity is associated with the sandy sediments of the Baltic Ice Lake (glQ3ltvb). Its thickness varies. The thickness of the aquifer and groundwater flow are locally influenced by the presence of poorly permeable clay and aleuritic layers and lenses. At most of the WPP turbine sites, the water table is 0-2 m below the ground surface. Only in places does the water table reach depths of 5-25 m (Figure 6.1.1).

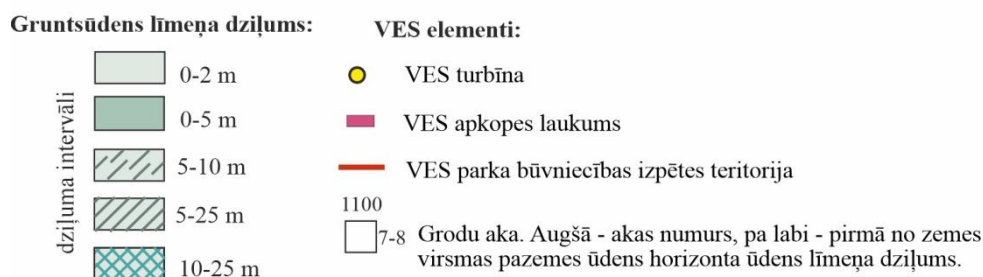
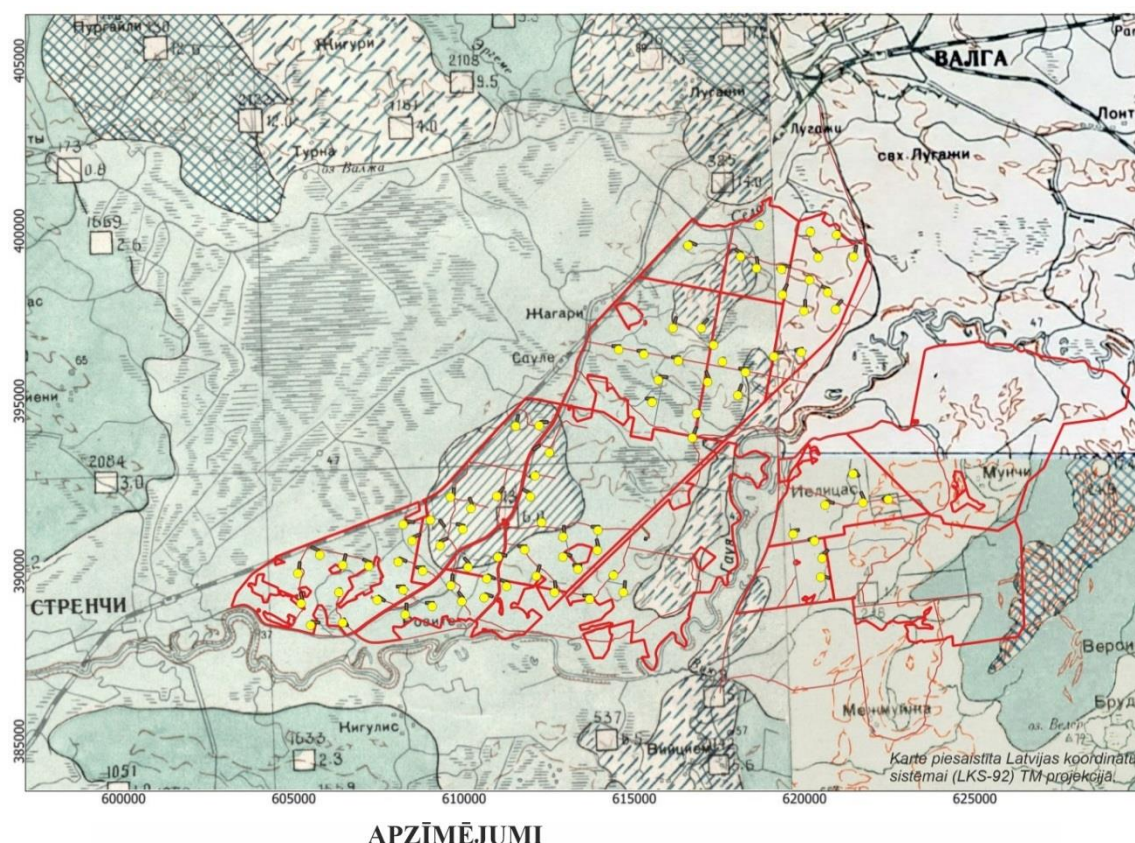
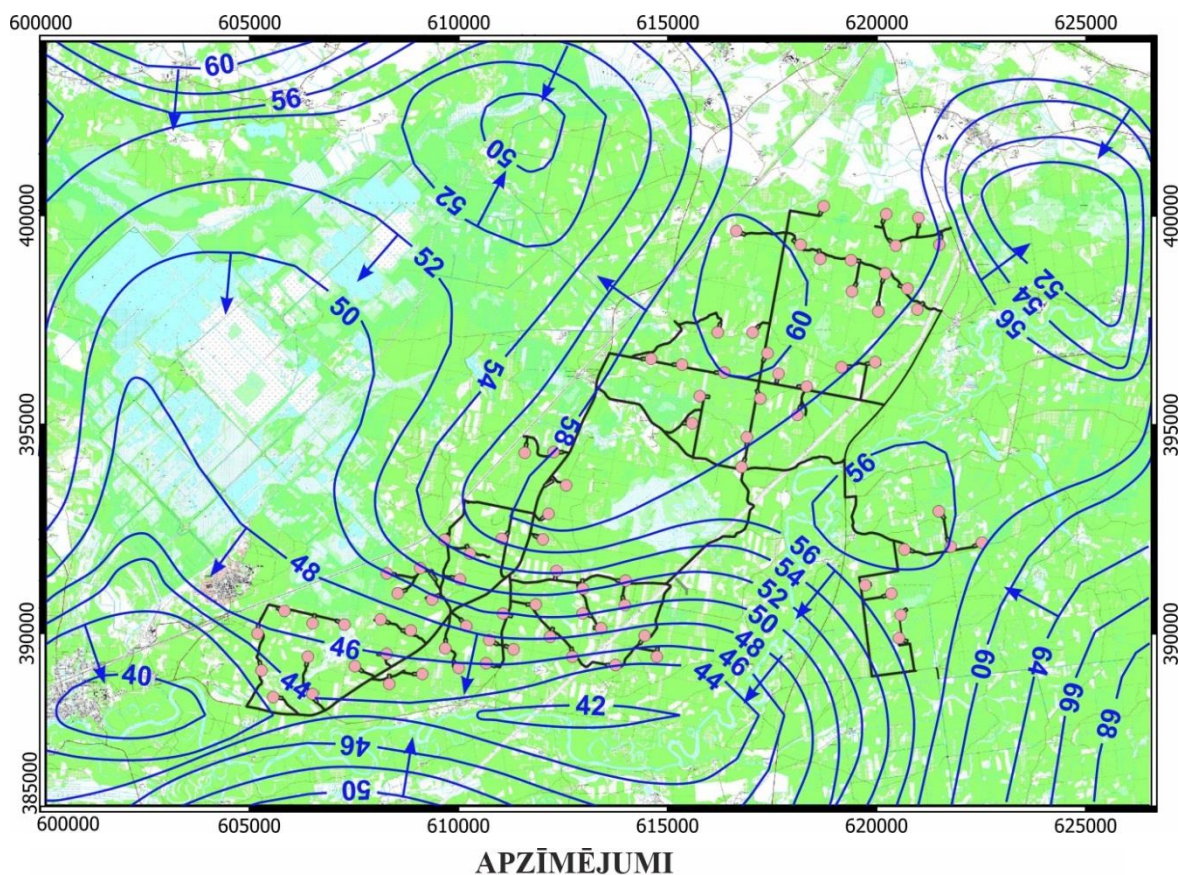


Figure 6.1.1. Extract from a schematic map of the depths of the first aquifer water table from the surface¹⁰⁴

Groundwater flow in the study area is quite complex. The direction of groundwater flow is influenced by the Gauja River, which is a regional groundwater recharge area. Drainage is also influenced by the Seda and Seda Moors, which are considered to be localised groundwater recharge areas.

The groundwater map (Figure 6.1.2) is derived from the Latvian Regional Hydrogeological Model (LAMO) of the Riga Technical University (RTU) Environmental Modelling Centre (EMC). Available geological and hydrogeological information has been used to develop this groundwater level and flow direction model. Unfortunately, lack of data makes it impossible to assess more accurately the impact of rivers and drainage systems on groundwater levels and flow direction. The groundwater depth pattern in the WPP study area is shown in Figure 6.1.3.

¹⁰⁴ Tracevski G., Jushkevich V., Poļivko J. et al. Report on 1:200 000 scale complex geological and hydrogeological mapping in the southern part of sheet O-35-XXI (Northern Latvia mapping group), 1962-1964 (Valka/Valga). LVGMC ĢF Nr.4154; Tracevski G., Jushkevich V., Poļivko J. Report on 1:200 000 scale complex geological and hydrogeological mapping in the territory of sheet O-35-XX (North-Latvian mapping group), 1962-1964. (Valmiera-Strenči) LVGMC ĢF Nr.5870).



- | | | | |
|--|--|--|---------------------|
| | Gruntsūdens līmeņa hidroizohipsa, m (LKS-92) | | VES turbīna |
| | Gruntsūdens plūsmas virziens | | VES apkopes laukums |

Figure 6.1.2. Groundwater level hydro-isohips map¹⁰⁵

During the operation of the WPP park, potential impacts on hydrogeological and hydrological conditions are related to the possible drainage effect of the side ditches.

The drainage effect of side ditches depends on the type of side ditch and its depth. Shallow (not exceeding the thickness of the aeration zone) non-runoff ditches (swales), which provide for the collection of the surface runoff part of the rainfall, do not affect the hydrogeological and hydrological conditions of the site. Ditches that reach the water table can affect the hydrology of the adjacent area and the wet habitats adjacent to the site. In order to accurately determine the area of influence of the ditches, the interactions between the various influencing factors must be assessed and detailed engineering studies must be carried out, which will be carried out at the design stage.

¹⁰⁵ Riga Technical University (RTU) Environmental Modelling Centre (EMC) LAMO hydrogeological model

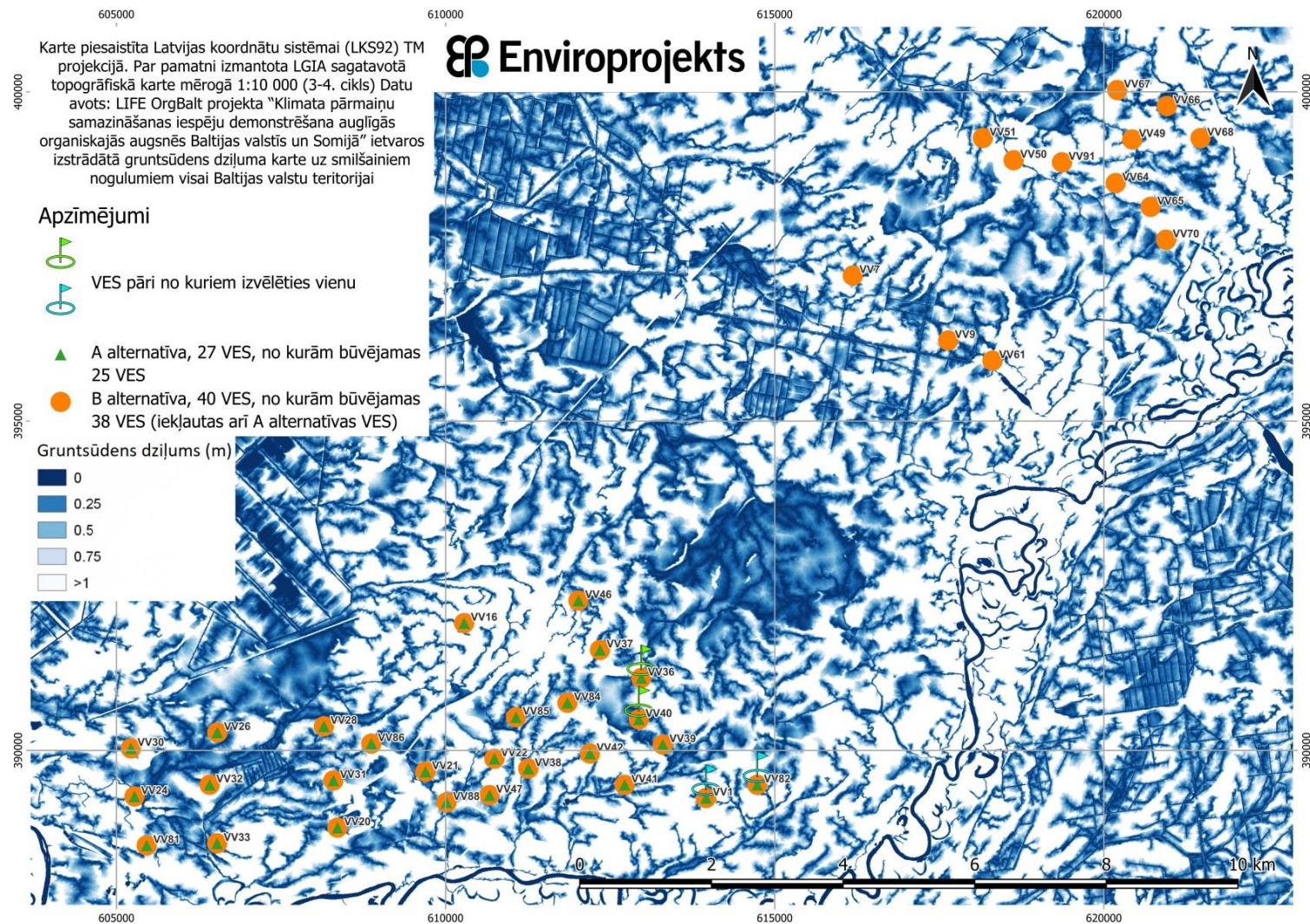


Figure 6.1.3. Groundwater model in the WPP study area, map for areas dominated by sandy sediments

Analysis of the groundwater model data developed for the Depth-to-water project ¹⁰⁶ in the area of the proposed activity shows that the groundwater table in the potential turbine locations is on average 2-5 m. Up to 2 m deep in some places.

No significant adverse effects on the water quality of groundwater, surface water, groundwater and water abstraction points are expected from the proposed operation. Because there are no contaminated or potentially contaminated sites in the area of the Proposed Action, and construction works are being monitored during construction.

6.2. Hydrological conditions

6.2.1. Surface water bodies

In accordance with the Water Management Act The area of the Proposed Action falls within the Gauja river basin district. The Gauja catchment covers 8900 km² and has a higher proportion of forests than other large river basins (47%).

According to the information from the drainage cadastre of the State Enterprise "Real Estate of the Ministry of Agriculture" and the Cabinet Regulation No 397 of 3 July 2018 "Regulations on the Classification of Water Management Districts", the territory of the Proposed Action is located in two large basin areas: The Gauja (large catchment area code 52) and the Gauja-Salaca (large catchment area code 54), which are divided into several catchment areas. The catchment areas are shown in Figure 6.2.1.

According to the Gauja River Basin District Management Plan (GRBD) for 2022-2027, the area of the Proposed Action falls within 4 surface water bodies (SWBs) - SWB Gauja_8 (SWB code G274), SWB Gauja_9 (SWB code G275), SWB Seda (SWB code G316) and SWB Vija_1 (SWB code G228), see Figure 6.4.

Under GUBA, the existing water quality of water bodies is assessed in relation to the requirements of the EU Water Framework Directive (EU Water Framework Directive, 2000). Water quality in water bodies is assessed mainly on the basis of three criteria - chemical, biological and hydrological water quality. The chemical quality of water bodies is assessed by whether the annual average concentrations of hazardous and particularly hazardous substances exceed the limit values laid down in laws and regulations.

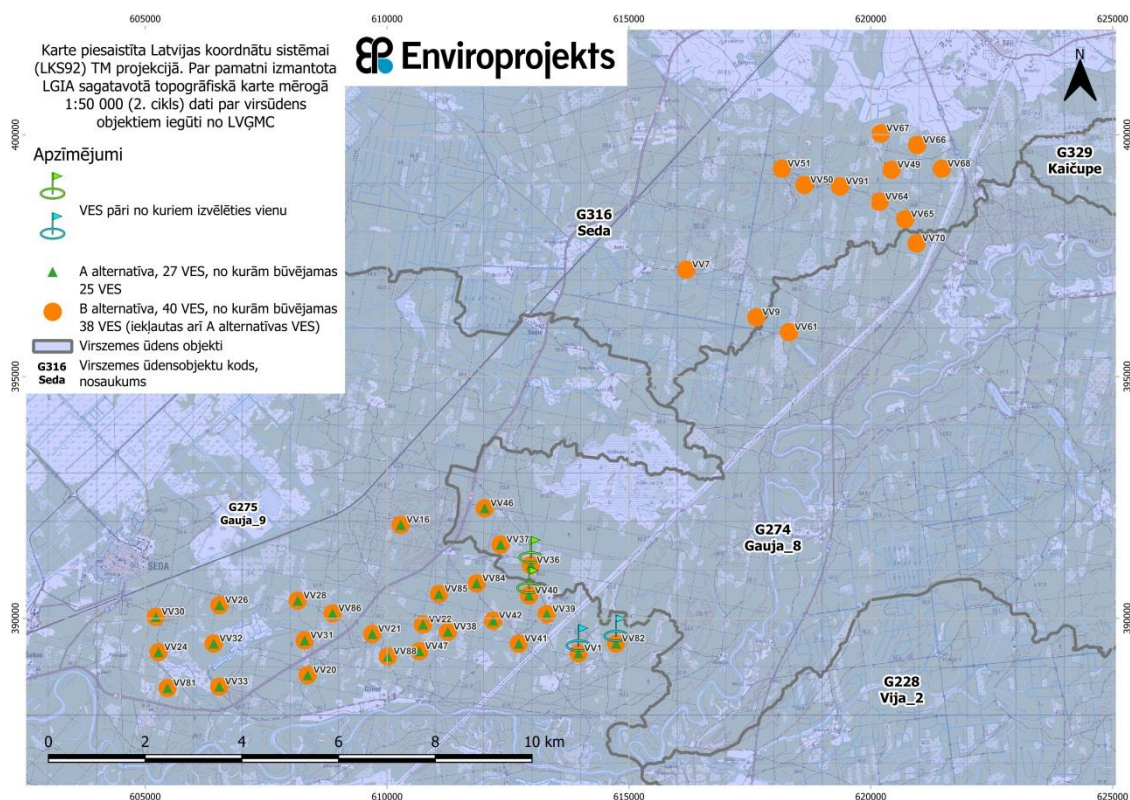
Water body Gauja_8 (water body code G274) from the mouth of Mustjegi to the mouth of Vija (G274). Transboundary water body (with Estonia). Natural bed with many old rivers. The water body has a surface area of 241.96 km² and a catchment area of 4 791.58 km². The catchment area is rich in drained forests (78%) and raised bogs. There is little agricultural land, the population is very small and anthropogenic pressures are minimal. There is a monitoring station "Gauja, downstream of Kāršupīte". The ecological quality of the water is good. The SPA is located in the Ziemeļgauja Special Protection Area. The waters of the Gauja_8 MPA are priority carp waters.

Water body Gauja_9 (water body code G275) from the mouth of the Vija to the mouth of the Strenčupīte (G275). The water body has a surface area of 195.40 km² and a catchment area of 5415.59 km². In general, the catchment area is dominated by forests (75%) and high marshes (9%), with more agricultural land and livestock farming in the catchment area of the left-bank tributary of the Wadzupīte. There may be a negligible impact from the Seda NAI. The preliminary ecological quality of the water is medium. The SPA is located in the Ziemeļgauja Special Protection Area. The waters of the Gauja_9 MPA are priority waters for carps.

¹⁰⁶ [Depth-to-water maps for the Baltics: modelling of distribution of organic soils and wet areas. \(lbtu.lv\)](http://lbtu.lv)

Seda (Water Code G316). The water body has a surface area of 424.23 km² and a catchment area of 575 km². The river has been straightened for almost its entire length. A typical slow river of the plains. In the upper and lower reaches of the catchment area, the predominant land cover is agricultural, in the middle reaches very large areas are occupied by marshes, including developed ones, and forests (75% of the catchment area). There are several small settlements in the catchment area, such as Daksti and Seli, whose impacts are not considered significant, but the precautionary principle is retained. The Ošupīte tributary was once the site of a hydroelectric power plant, which is no longer in operation. There is a monitoring station "Seda, estuary". The ecological quality of the water is good. Part of the SPA is located in the North Vidzeme Biosphere Reserve. The Seda waters of the MPA are priority waters for carpids.

Water body Vija_1 (water body code G228) from the source to the mouth of the Kamaldas (G229). The water body has a surface area of 193.48 km² and a catchment area of 222.16 km². The river is straightened along most of the length of the OO, except for a small upstream section. The catchment area is heavily forested (55%), with agricultural land downstream. And the monitoring station "Vija, upstream of Kamaldas". The ecological quality of the water is medium. The waters of Vija_1 are priority waters for carpids.



6.2.1. Image. Catchment basins in the area of the Valmiera-Valka Wind Park

Under Directive 2007/60/EC101 of the European Parliament and of the Council, flood risk areas have been identified for each river basin. According to the "Flood risk and flood hazard maps" prepared by the LEGMC, the territory of the proposed activity is not located in flood risk areas of national importance. The nearest flood risk area is located 1.5 km to the west of the proposed activity area - Gauja floodplain near Strenči¹⁰⁷ (see Figure 6.2.2).

¹⁰⁷ [Flood risk and flood hazard maps \(lvgmc.lv\)](http://lvgmc.lv)

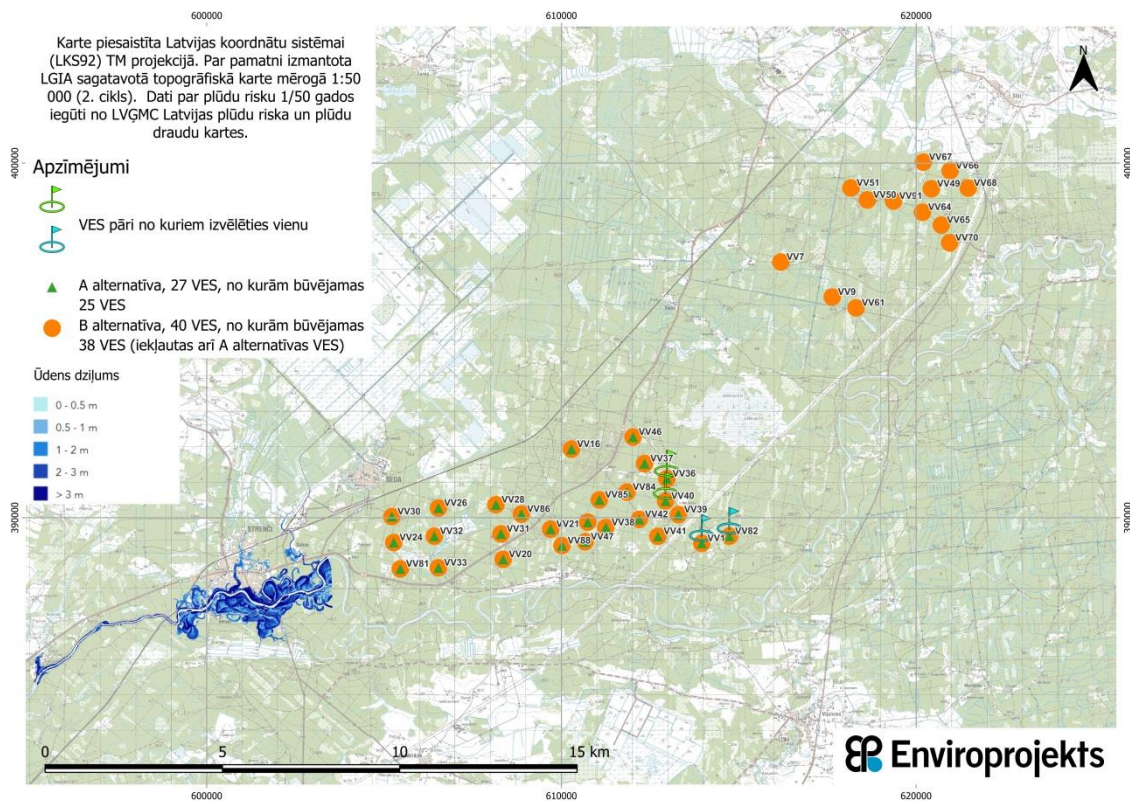


Figure 6.2.2. Location of the flood risk area of national importance "Gauja floodplain near Strenči" in relation to the location of the Proposed Action.

6.2.2. Drainage systems

The WPP Park study area is largely located in an area used for forestry purposes, with a dense network of shared watercourses and drains¹⁰⁸, which provide groundwater recharge and enable economic activities to take place in these areas. The lifetime of the drainage system network and structures is expected to be up to 50 years. During this period, the drainage network and structures must be regularly maintained, renovated and reconstructed.

There are 2 peat deposits in the vicinity of the area of the proposed action: "Sedas purvs" and "Taures purvs", where peat extraction takes place. To enable mining, a network of drainage ditches and mapping ditches has been constructed in these areas, as well as fire basins.

The location of drainage and ditches and watercourse systems in the area surrounding the WPP can be seen in Figure 6.2.3., Figure 6.2.4.

¹⁰⁸ <https://www.melioracija.lv>

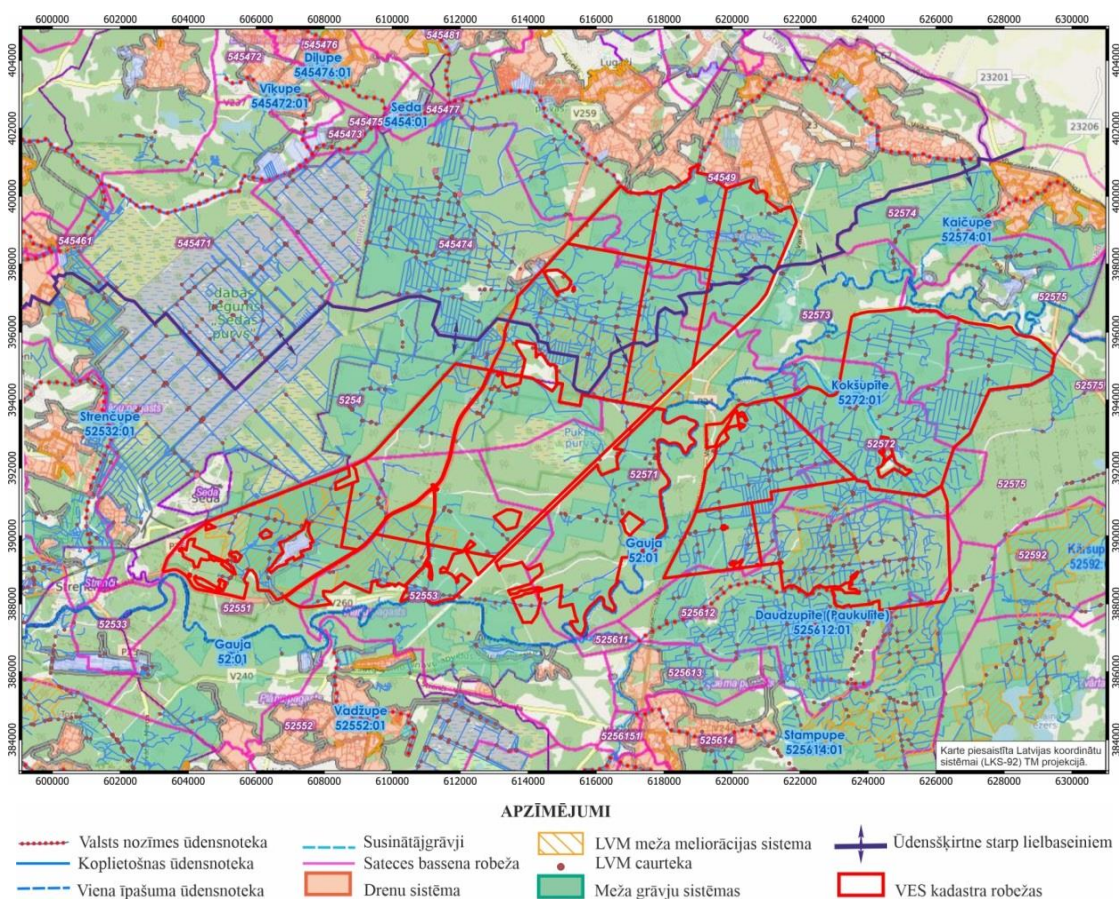


Figure 6.2.3. River catchment areas and reclaimed land in the vicinity of WPP¹⁰⁹

According to the publicly available information of JSC LVM, in the near future (3 or 5 years) in the area of the Proposed Action it is/is not planned to carry out the rehabilitation of drainage systems (look at the publicly available data in LVM geo, there they publish 3 or 5 year plans for roads and drainage).

¹⁰⁹ <https://www.melioracija.lv>

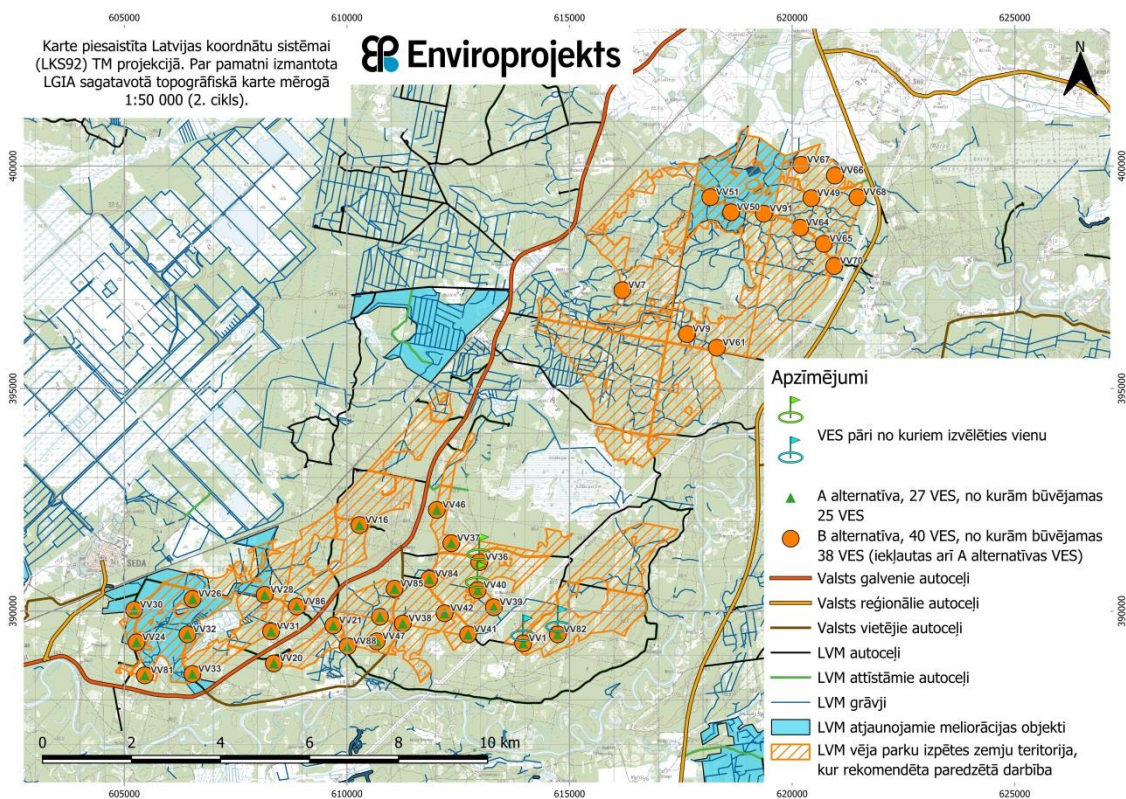


Figure 6.2.4. Forest drainage system areas to be restored and forest roads to be developed

6.2.3. Protection zones for watercourses, existing drainage and drainage facilities

The protection zones for surface water bodies in the vicinity of the proposed development are summarised in Table 6.2.1.

6.2.1. Table Watercourse protection zones in the vicinity of the area of the proposed activity

Name of the watercourse*	Protection zone in the village** m	Rural buffer zone** m
IN THE MUNICIPALITY OF JĒRCENI AND THE TOWN OF SEDA		
Gauja	Not less than 30 m (from the top edge of the embankment to the right-of-way)	500 m or variable, up to the A3 road protection zone measured from the top of the embankment
Strenčupīte	20	50 m
Seda	-	100 m
Purgaile	-	50 m
IN THE TOWN OF STREŅČI		
Gauja from the reinforced concrete bridge (Trikātas Street) to the railway bridge, taking into account the existing density of development	15 m (the nearest building plot to the River Gauja is ~ 15 m) or the full width of the floodplain, determined from the upper edge of the bank	-
Gauja from the reinforced concrete bridge to the eastern administrative	300 m or the full width of the floodplain	-

Name of the watercourse*	Protection zone in the village** m	Rural buffer zone** m
boundary of the city - forest land		
Gauja tributary	20 m	-
Strenčupīte	20 m	-
Stakļupīte	10 m to existing buildings 50 m in the rest of the territory	-
IN PLANES PARISH		
Gauja	At least 500 m including tributaries and old rivers with their protective zones, determined from the upper edge of the channel	-
Vija	100 m	-
Vadžipīte (upstream of Vadžupīte)	10 m	-

Protective zones around bogs are established to preserve biodiversity and stabilise the moisture regime in the interface (transition) zone between forests and bogs.

In the territory of the proposed activity and its surroundings, the minimum widths of the protection zones around the marshes are determined by the TIAN of Valmiera and Valka municipalities¹¹⁰:

1. For areas of 10 to 100 hectares, a 20.0 metre strip;
2. For areas larger than 100 hectares, a 50.0 metre strip in forest vegetation types on dry, drained, wet mineral soils and drained peat soils - at least a 100.0 metre strip in forest vegetation types on wet peat soils.

There are three swamps in and around the area of the proposed action: Seda swamp, Taures swamp and Pukši swamp. Information on the buffer zones of these swamps is given in Table 6.2.2.

Table 6.2.2. Marshes around which protection zones have been established in accordance with Article 7.1 of the Law on Protection Zones

Name of swamp (in brackets other names of the site)*	Location - municipality	Area, ha	Protection zone m
Taures swamp *	Municipality of Plāni	861	100
Sedas swamp*	Jerceni municipality	7582 (total)	not determinable**
Pukši swamp*	Municipality of	464	not determinable**

¹¹⁰ Strenči Municipality Spatial Plan 2012-2023. Land use and building regulations. Strenči, Strenči region, 2011; Spatial plan of Valka region 2016-2027. Land use and building regulations. Valkas novads dome. <https://geolativija.lv/geo/tapis>

	Plani		
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Notes: * Information taken from the website of the State Agency "Latvian Geospatial Information Agency"¹¹¹, Place Names Database.

** according to consultations with the Nature Conservation Agency, no protection zone should be established, as protection is guaranteed by the individual protection regulations of the Northern Gauja SPA and the ZVBR and these are nature reserve areas.

6.3. Geological structure and engineering geological conditions

6.3.1. Pre-quaternary sediments

The geology of the area is relatively well known. Complex geological and hydrological 1: 200 000 scale mapping within which extensive drilling, hydrological, geological and mineral prospecting work was carried out¹¹².

According to regional tectonic zonation schemes, the territory is included in the Valmiera-Lokno outcrop, which sharply separates the southern slope of the Baltic Shield from the Latvian saddle. On its southern edge, the Valmiera-Lokno outcrop is adjacent to the Liepāja-Saldus-Rīga-Apes-Pleskava fracture zone. The Baltic Shield escarpment is characterised by an incomplete vertical geological section of the sedimentary cover and a relatively low thickness compared to other regions of Latvia. However, the age, composition, folding conditions and physical properties of the rocks in the vertical section also show three distinctly different complexes: the lower - the crystalline basement, the middle - the pre-Quaternary sedimentary cover and the upper - the Quaternary formations.

The surface of the crystalline basement rock is around 500-550 m below sea level. absolute altitude marks. The total thickness of the sedimentary cover varies from 380 to 400 m.

The middle complex, the pre-Quaternary sedimentary cover, is mainly composed of chemical deposition and classic (clastic) rocks. The sedimentary cover consists of Cambrian, Ordovician, Silurian, Devonian and Quaternary rocks.

Cambrian sediments were deposited in the coastal zone of a shallow sea basin by strong wave and current action more than 500 million years ago. The sediments, white fine-grained, weakly cemented quartz and quartz-glaucinitic sandstones with interbeds of aleurolite and aleuric clays, vary in thickness from 13 to 30 m, reaching their surface at 315-320 m a.s.l. absolute altitude. Both the minimum and maximum thicknesses were found in the area near Strenči.

The overall thickness **of Ordovician** rocks is highly variable and, in the Northern Vidzeme region, is closely linked to the partial denudation (washing away) of sediments of this age. For example. In Jērceni, the thickness of sediments in the southern part of the parish is about 40 m, while at the northern boundary of the parish it could reach 50-80 m. Only sub-Ordovician sediments (marls, clays, limestones, sandstones, siltstones, siltstones, gravelites) are found in Plani municipality.

Silurian sediments are not widespread in the area, as they have been washed away.

¹¹¹ <http://map.lgia.gov.lv/>

¹¹² Yushkevich V, Polivko I, Tracevski G. Report on 1:200 000 scale complex geological and hydrogeological mapping in the southern part of sheet O-35-XXI (North-Latvian mapping group), 1962-1964. Geological Survey, Riga, 1964. Yushkevich V, Polivko I, Tracevski G. Report on 1:200 000 scale complex geological and hydrogeological mapping in the territory of sheet O-35-XX (North-Latvian mapping group), 1962-1964. Geological Survey, Riga, 1965.

Devonian sediments extend over the entire area of the proposed operation and its surroundings.

The Devonian strata are the most extensive sedimentary cover, with a total thickness of 250-340 m. The oldest sediments forming the Devonian system correspond to the sub-Devonian Gargždai series (D_{1gr}) and the Kemeris suite (D_{1km}). The Middle Devonian Pärnu Suite (D_{2pr}), Narva Suite (D_{2nr}), Arukil Suite (D_{2ar}), Burtņieki Suite (D_{2br}) and Upper Devonian Gauja Suite (D_{3gj}) deposits are higher.

The newest Devonian strata in the region, the Burtņieki (D_{2br}), Arukil (D_{2ar}) and Gauja (D_{3gj}) suites, are already exposed just below the Quaternary sedimentary cover (Figure 1.3).

The sediments of the *Gargždi series* (D_{1gr}) and the *Kemeris suite* (D_{1km}) are predominantly sandstones with interbeds of aleurolite and clay. The total thickness of the sediments of the sub-dune reaches 50-70 m.

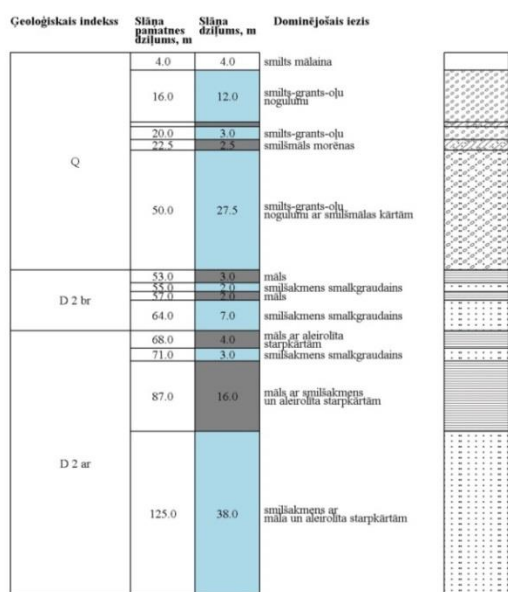
Pärnu Suite (D_{2pr}) - light grey, yellow grey sandstones, aleurolites and aleuric clays up to 40 m thick.

The *Narva Suite* (D_{2nr}) sediments are the regional confining layer that separates the freshwater aquifers from the underlying mineral waters. The total thickness of these can vary between 120-150 m.

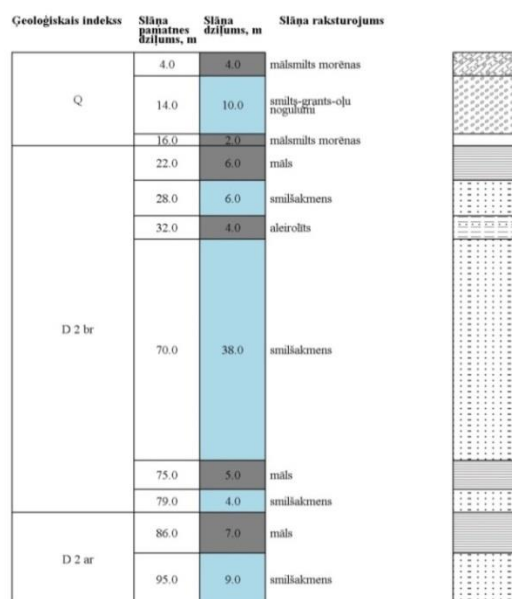
The total thickness of the *Arukil Suite* (D_{2ar}) sediments - light red-brown fine-grained sandstones, mottled red-brown aleuriferous clays - is about 50-93 m. The thickness of red-brown or yellow-brown micaceous sandstones, red-brown and mottled aleurolites and clays of the *Burtņieki Suite* (D_{2br}) varies from a few metres to 70-87 m, depending on the intensity of denudation processes. The sandstones of both suites yield abundant underground water supplies, which are considered to be a stable source of water for the entire territory of the municipality.

To the south and south-east of the Gauja valley, the bedrock relief surface is formed by Upper Devonian *Gauja Suite* (D_{3gj}) sediments. In the rest of the area, the sediments of the Gauja Suite are completely eroded. The Gauja Suite (D_{3gj}) consists of weakly cemented sandstones with rare interbeds of multicoloured siltstones and clays. The lower limit is sharply defined. It consists of a thick layer of light grey sandstones in contact with the Burtņieki (D_{2br}) clayey aleurolite sediments. The thickness of the Gauja Suite (D_{3gj}) in the vicinity of the area of the proposed operation shall not exceed 52 m.

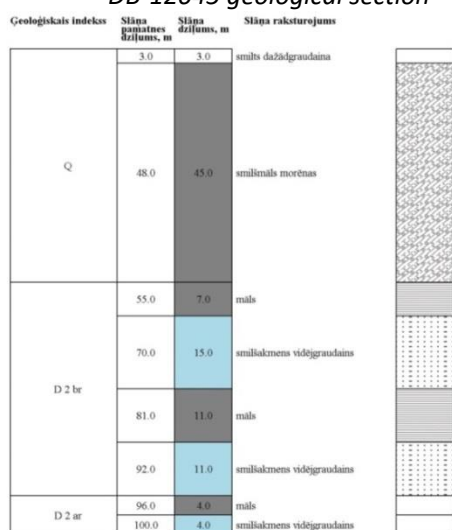
The geological structure of the area is best characterised by boreholes with LEGMC DB No 12645, 18867, 20541, 24103, 18934 and 6740, located in the vicinity of the proposed WPP park. The geological sections of the boreholes can be seen in Figure 6.3.1.



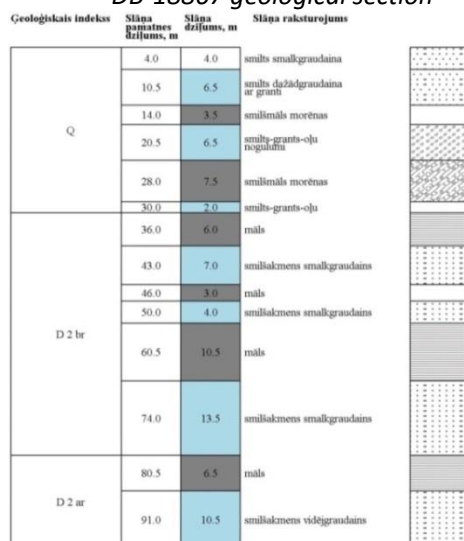
DB-12645 geological section



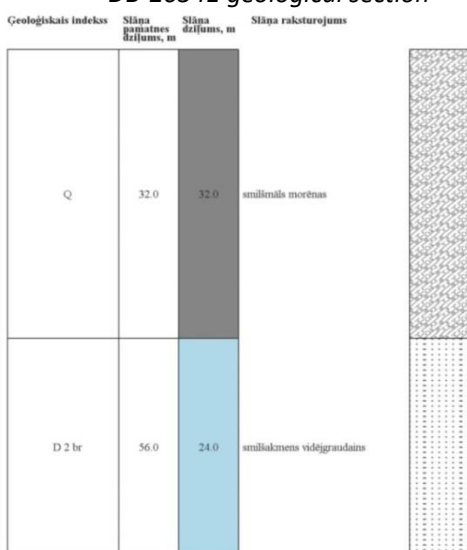
DB-18867 geological section



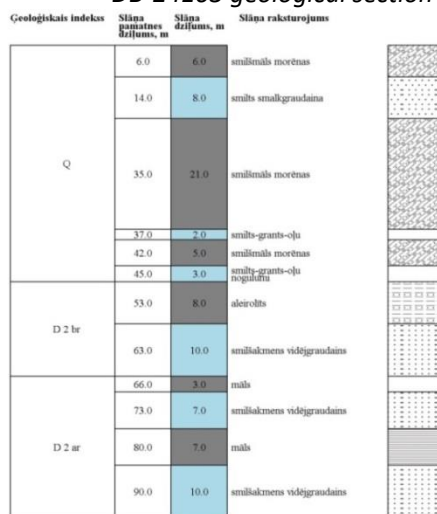
DB-20541 geological section



DB-24103 geological section



DB-18934 geological section



DB-6740 geological section

Figure 6.3.1. Geological sections of boreholes in the LEGMC DB "Boreholes"

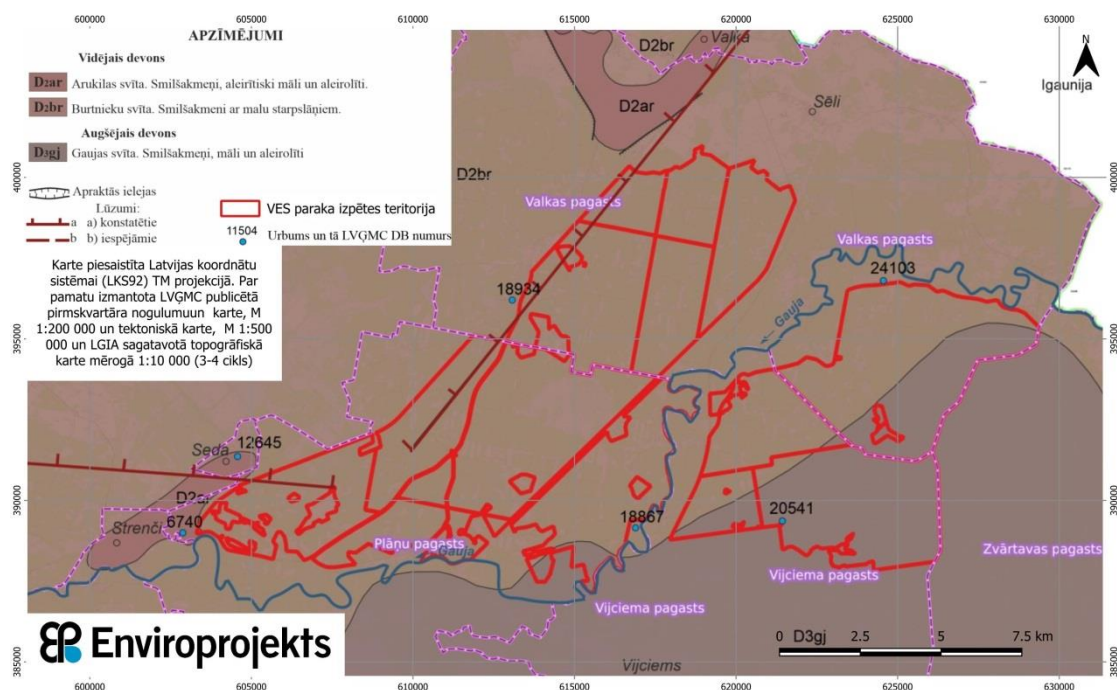


Figure 6.3.2. Map of pre-quaternary sediments of the area of the proposed activity (based on the map of pre-quaternary sediments published by the LEGMC, scale 1:200 000 and tectonic map, scale 1:500 000)

6.3.2. Quaternary sediments

The moraine is covered by the Baltic Ice Lake sediments (glQ3ltvb) - fine-grained sand, aleurotic sand, clays and aleurites. They cover almost the entire area of the proposed action. The sediment thickness of the Baltic Ice Lake (glQ3ltvb) ranges from 3-4 to 10 m. The Seda clay deposit is associated with these sediments. The sediments of the Baltic Ice Lake form the mineral deposits of the Oliņi, Pūku sand deposits.

Fluvioglacial sediments (gfQ3ltv) are found only in the construction of some drumlins and possibly also in subquaternary surface depressions, forming mostly small deposits. The sediments are composed of sand of varying coarseness, including sandy-gravelly material with pebbles. Thickness typically varies from 2-5 to 10 m. There are some sand-gravel deposits associated with these sediments, which are almost completely exploited in places.

Upper Pleistocene aeolian sediments (vQ3ltv) - fine dusty sand - occur in the WPP area. The Upper Pleistocene aeolian sediments of the Latvian suite (vQ3ltv) were deposited in relics on the shores of lakes. Sediments vary in thickness, and can be up to 10 m thick in the dunes.

Alluvial deposits (aQ3ltv) form the second and third overbank terrace of the Gauja. The alluvium of the two terraces does not differ significantly and reaches a thickness of 2-5 m. It consists mainly of sand of varying coarseness. These sediments form the overburden in parts of the Seda II gravel deposits. In places where boulders and pebbles have accumulated, there are rapids known as the Strenči rapids.

Sediments formed during the Holocene, covering the last 10,000 years of Earth's geological history. The Earth's rocks, dating back over the last 10 years, are composed of formations of different genesis.

Alluvial deposits (aQ4) occur in river floodplains. They overlie Upper Pleistocene alluvial (aQ3ltv), moraine (gQ3ltv) and Baltic glacial lake (glQ3ltvb) sediments and are generally represented by variously granular to medium-grained sands, rare gravels and interbeds of aleuric sand.

Marsh sediments (bQ4) are widespread in and around the WPP. The sediments of the marshes consist of high and low deposits, as well as transitional deposits. In general, the surroundings of the proposed WPP site are heavily waterlogged. The Seda swamp is located in the NW of the planned WPP park. Marsh sediments occur directly in the area of the Proposed Action in the Pukši Marsh area and in other small isolated areas (Figure 6.3.3). The thickness of the peat deposits varies greatly.

The Sēda bog is the fourth largest bog in Latvia (7582 ha). The average thickness of the peat layer in the Sēda bog was about 3 m, with the thickest peat layer reaching about 8 m in areas where peat of the raised bog type has accumulated. Total peat reserves are 97.6 million^{m³} (industrial reserves are 96.2 million^{m³}), most of which has already been exploited. "Sēdas purvs" is a nature reserve.

Pukši bog covers an area of 84 ha, with a maximum peat thickness of 5 m and an average thickness of 2.7 m. The territory of the bog is a nature reserve, part of the protected landscape area "Ziemeļgauja", under state protection since 1977, established to protect the biotopes of transitional bog, swamp forests and boreal forests.

Lacustrine sediments (lQ4) occur in lake depressions and terraces and underlie the peat of some large bogs. While the terraces are made up of sand of varying coarseness, muddy sand and aleurite appear in the deeper areas. The thickness of the sediment is usually 1-2 m.

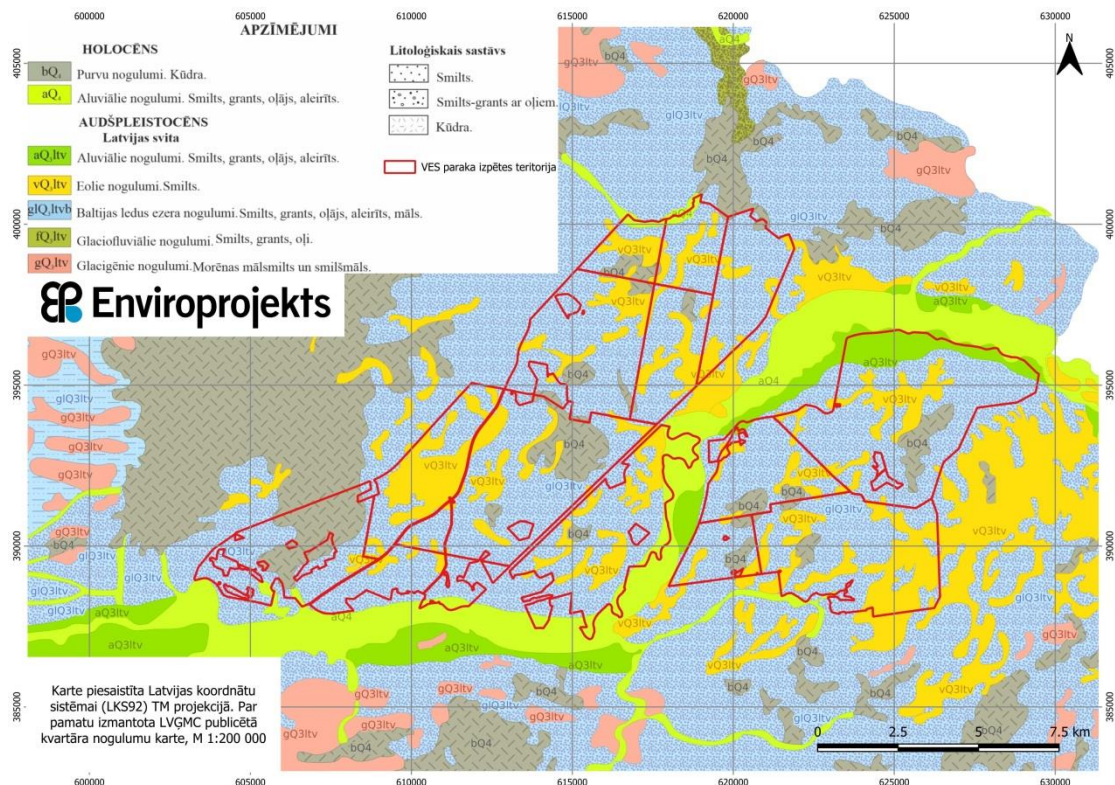


Figure 6.3.3. Quaternary sediment map of the area of the proposed activity (based on the quaternary sediment map published by the LEGMC, scale 1:200 000)

6.3.3. Engineering geological conditions and modern exodynamic processes

The engineering geological conditions of the area of the proposed operation will be assessed as a result of the engineering geological investigations to be carried out during the construction phase of the WPP. The following description of the engineering geological conditions is based on the available general geological information available at¹¹³.

The upper part of the geological section of the WPP Park is basically characterised as a complex of Quaternary soils. The surface of the ground is made up of easily compressible soils - soil, and deeper down - sand, gravel, aleurite, loamy sand, sandy clay, which is mostly water-saturated, peat found in bogs.

According to the geotechnical classification (LVS 437:2002 "Civil Engineering. Gruntis. Classification'), Quaternary soils belong to non-clayey soils without strong structural links or crumbles (sandy), non-clayey cohesive soils or clays (sandy loam and moraine loam) and weak biogenic soils (peat). The thickness of the Quaternary sediments is highly variable and, according to the literature, can reach 50 m.

The assessment of potential hazards from hazardous geological processes indicates that no hazardous modern exodynamic processes, such as karst or suffosion, landslides, slumping, gully formation or active aeolian processes, are present in the area of the Proposed Development.

The WPP area and its surroundings are subject to swamping processes and swamps are widespread. Over-watering occurs in low-lying areas, where poorly permeable sediments are exposed at the surface. As a result, these areas have little or no water runoff. The process mainly affects interfluvies, depressions of uneven accumulation and landform depressions in river floodplains.

The Puksi swamp is located in the central part of the WPP Park, covering an area of about 84 ha. Seda swamp, the fourth largest swamp in Latvia (7582 ha), adjoins the north-western boundary of the park. Taures swamp (975 ha) is located approximately 3.5 km south of the WPP site.

Several peat and sapropel deposits are located in the vicinity of the WPP site.

Potential swamping processes developed spatially, are limited and do not develop during the construction and operation of the NPPF.

Erosive or accumulative activity of the river in the area of the Proposed Action is not well pronounced and mainly affects the banks of the River Gauja, which is located beyond the territory of the WPP Park and does not pose geological risks to the WPP Park.

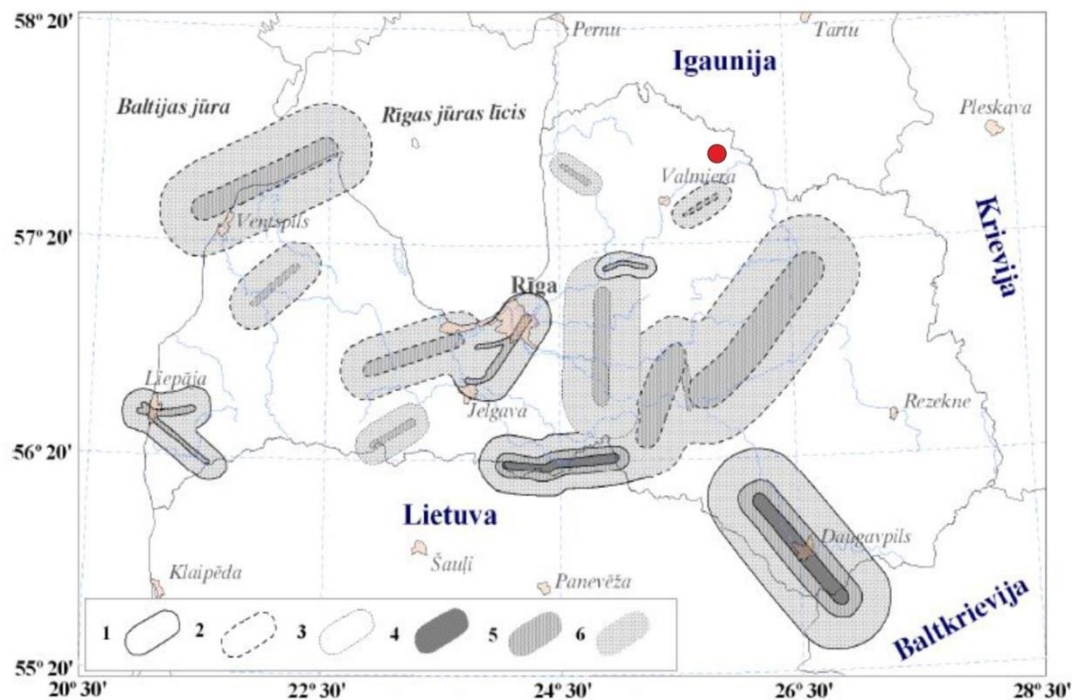
The Gauja's sharp bends and wide shores cause ice jams near Strenče in the spring, but the relatively high banks prevent excessive inflow of water into the town's land area. On the banks of the River Gauja, it is not desirable to cut down trees along erosion-prone banks or to remove them from the water after they have fallen into the river.

Small rivers tend to have poorly formed floodplain-type valleys, straightened and deepened channels. The rivers are slow-moving, as they belong to the plain rivers. The average relative drop is 0.1-0.7 m/km.

¹¹³ Yushkevich V, Polivko I, Tracevski G. Report on 1:200 000 scale complex geological and hydrogeological mapping in the southern part of sheet O-35-XXI (North-Latvian mapping group), 1962-1964. Geological Survey, Riga, 1964.

Yushkevich V, Polivko I, Tracevski G. Report on 1:200 000 scale complex geological and hydrogeological mapping in the territory of sheet O-35-XX (North-Latvian mapping group), 1962-1964. Geological Survey, Riga, 1965.

According to the latest seismic zoning of Latvia (Figure 6.3.4), the WPP Park study area is not located in a seismogenic zone where earthquakes with an epicentre intensity of 6 magnitude (MSK-64 scale) have occurred or may occur in the future (Figure 6.3.4). Earthquake origins are usually associated with active tectonic faults, such as the Liepāja-Rīga-Pskov tectonic zone, which crosses Latvia from SE to NE from Liepāja to Valmiera and continues eastwards towards Pskov. However, this tectonic zone is located to the south of the WPP Park. The earthquake hazard is therefore assessed as having a very low probability.



Designations: 1 - limit of influence of the ZCR zone; 2 - limit of influence of potential ZCR zones; 3 - limit of potential seismotectonic zones; 4 - seismic intensity 7 (MSK-64 scale); 5 - seismic intensity 6 (MSK-64 scale); 6 - seismic intensity 5 (MSK-64 scale).

Figure 6.3.4. General seismic zoning map of Latvia (LVSR-98) (the area of intended operation is marked in red)¹¹⁴

6.4. Characteristics of the natural values of the surroundings

6.4.1. Special areas of conservation and Natura 2000 sites

There are eight Specially Protected Areas (SPAs) in and around the study area, and the Proposed Development site is adjacent to the boundary of three SPAs (Figure 6.4.1).

There are differences in the total number of SPNAs in the expert reports and impact assessments of the experts involved in the EIA, who have provided opinions and assessments

¹¹⁴ Ņikuļins, V. 2007. Seismotectonic conditions and seismic hazard of Latvia. University of Latvia, Rīga, 2007.

on different topics - landscape, hydrology, habitats, etc.; the experts have not made any mistakes, as the experts have assessed the SPNAs according to the specificities of their field.

The North Vidzeme Biosphere Reserve is adjacent to and located to the north-west of the Proposed Action site; the Northern Gauja Protected Landscape Area (Natura 2000 site) is adjacent to and located to the south, east and north-east. The site of the proposed activity is completely surrounded by the micro-reserve "Bulvāra riests" (Natura 2000 site).

The nature reserve "Purgailē River Forests" is located to the west of the site of the Proposed Action. The nearest assessed VPP turbine, VV5, is located approximately 450 m from the boundary of the nature reserve.

The protected landscape area "Ziemeļgauja" crosses the study area.

In addition to the above, the study area contains SSSIs at distant locations from the proposed NPPF site:

- The nature reserve "Sēdas purvs" (Natura 2000 site) is located to the north-west of the WPP park area, 0.9 km away;
- The nature reserve "Burgas plavas" (Natura 2000 site), located to the NW of the WPP Park site, has a boundary 3 km from the nearest assessed turbine (VV2);
- The micro-reserve "Igaunijas riests" (Natura 2000 site), located to the E of the WPP site, with a boundary 8 km from the nearest turbine under assessment (VV68);
- The Natural Monument "Ramnieku smilskmens atsegumi" is located to the S of the potential WPP site, less than 1 km from the nearest planned VPP turbine VV20.

The boundary of the Vadainu purvs Nature Reserve (Natura 2000 site) is located 8.4 km from the nearest planned turbine (VV53), to the SE of the planned WPP site.

The potential WPP site is adjacent to 8 micro-reserve (MR) sites.

A total of 84 micro-reserves (MR) are located within the study area, *which includes the area of the Proposed Action together with areas likely to be affected*, of which 53 MR are closer than 5 km to the nearest proposed wind turbine site and 9 MR are closer than 1 km away (Table 6.4.1). The closest MLs to the potential turbine sites assessed are MLs coded 3149 and 444, which are designed to protect birds, at 205 m (WPP code VV2, which is not recommended for construction) and 290 m from the nearest WPP turbine (VV43, which is not recommended for construction), respectively.

Despite the fact that there are several Special Protection Areas, micro-reserves and areas designated by JSC Latvia's State Forests for bird protection in the vicinity of the study area, the area is considered poorly studied from an ornithological point of view. For the 2022 and 2023 breeding seasons, as a result of intensified research of the territory by Latvijas vēja parks LTD, the creation of 7 microreserves for Specially Protected Bird Species has been proposed (some of them have already been created). Taking into account the number of observations of species for which micro-reserves are to be established in the study area and the fact that micro-reserves have not been established in several areas designated by JSC Latvian state forest for bird protection, it is expected that the area of protected areas in the study area will further increase over time.

Table 6.4.1. *Microreserves in the study area up to 5 km from the nearest WPP*¹¹⁵

¹¹⁵ Data corresponds to DDPS "Ozols" (20.09.2024.)

ML code	ML tips	nearest WPP	WPP construction ¹¹⁶	distance, m
3149	birds	VV2	Not recommended	205
444	birds	VV43	Not recommended	290
769	birds	VV51		390
308	birds	VV3	Not recommended	440
442	birds	VV5	Not recommended	451
430	birds	VV54	Not recommended	581
1488	Biotopes	VV33		688
551	vascular plants and ferns	VV47		771
441	birds	VV5	Not recommended	783
1368	Biotopes	VV88		1041
1538	birds	VV60	Not recommended	1109
1366	Biotopes	VV82		1138
428	birds	VV60	Not recommended	1172
1490	Biotopes	VV81		1186
2983	Biotopes	VV1		1290
1491	Biotopes	VV81		1312
427	birds	VV60	Not recommended	1333
422	birds	VV53	Not recommended	1346
425	birds	VV60	Not recommended	1564
426	birds	VV60	Not recommended	1594
3148	birds	VV25	Not recommended	1597
1489	Biotopes	VV81		1643
1492	Biotopes	VV81		1643
1510	Biotopes	VV59	Not recommended	1664
1509	Biotopes	VV11	Not recommended	1667
1511	Biotopes	VV58	Not recommended	1687
550	vascular plants and ferns	VV18	Not recommended	1736
1493	Biotopes	VV82		1739
423	Invertebrates	VV59	Not recommended	1750
1496	Biotopes	VV82		1800
1494	Biotopes	VV82		1828
1495	Biotopes	VV82		1852
1512	Biotopes	VV58	Not recommended	1859
1497	Biotopes	VV82		1870
461	birds	VV68		2027
1508	Biotopes	VV82		2079
1529	Biotopes	VV59	Not recommended	2161
1516	Biotopes	VV71	Not recommended	2169
1517	Biotopes	VV70		2293
440	birds	VV60	Not recommended	2593

¹¹⁶ Additional information on the conclusions of the EIA is attached - significant environmental effects have been identified and construction of the WPP is not recommended

ML code	ML tips	nearest WPP	WPP construction ¹¹⁶	distance, m
1367	Biotopes	VV82		2604
414	birds	VV18	Not recommended	2792
552	vascular plants and ferns	VV82		2839
1826	birds	VV5	Not recommended	2870
2116	Biotopes	VV60	Not recommended	3232
436	birds	VV60	Not recommended	3255
1539	Biotopes	VV70		3383
429	birds	VV60	Not recommended	3706
439	birds	VV2	Not recommended	3806
419	birds	VV60	Not recommended	4062
1522	Invertebrates	VV68		4401
1521	Biotopes	VV70		4434
1520	Biotopes	VV70		4606

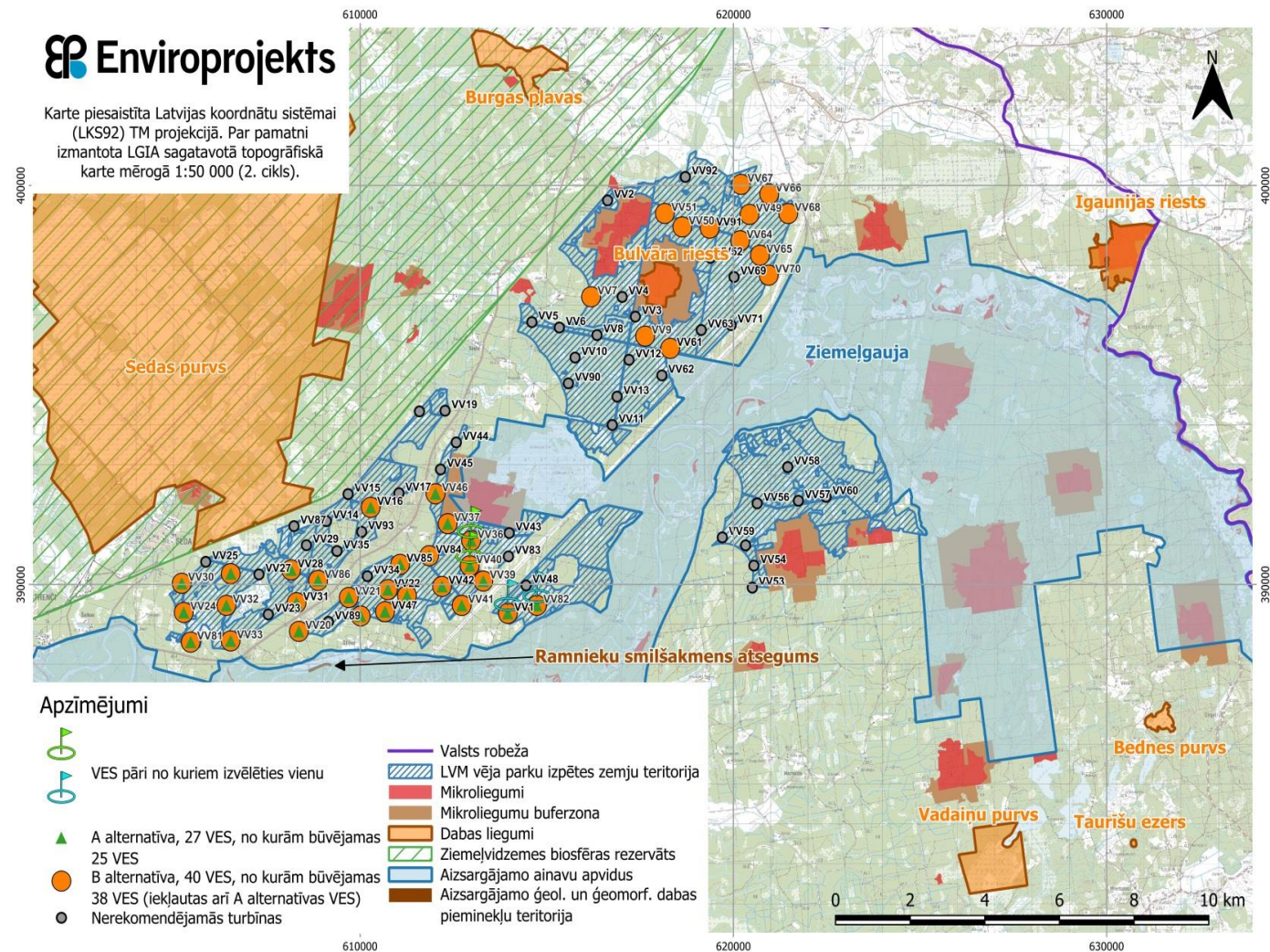


Figure 6.4.1. Protected areas in the vicinity of a potential WPP site

Characteristics of Natura 2000 sites

According to the Nature Conservation Agency's "Ozols" SWBS, the following Natura 2000 sites are located in the vicinity of the planned WPP park area:

- Protected landscape area "**Ziemeļgauja**" (territory code: LV0600700), a Latvian Natura 2000 site - a type C site established for the protection of specially protected species and specially protected biotopes;
- The nature reserve "**Sedas purvs**" (area code: LV0526800), a Latvian Natura 2000 site - type C site established for the protection of specially protected species and specially protected biotopes.
- "**Bulvara riests**" (area code: LV0830800). Natura 2000 site - a type B site established for the conservation of specially protected species (except birds) and habitats. The area almost completely overlaps with a micro-reserve created to protect a rookery.
- "**Igaunijas riests**" (area code: LV0843500). Natura 2000 site - a type B site established for the conservation of specially protected species (except birds) and habitats. The site overlaps with a micro-reserve established for the protection of a rookery.
- Nature reserve "**Purgāiles upes meži**" (territory code: LV0542000). The site was established in 2023.
- Nature reserve "**Burgas plavas**" (area code: LV0532600). Category C site, designated for the protection of specially protected species and habitats.

A summary of the objectives for the establishment and protection of the Natura 2000 sites adjacent to the study area of the Proposed Action, the patterns and interactions that determine the existence of natural values in these Natura 2000 sites, and the factors that are already adversely affecting them prior to implementation of the Proposed Action is provided in Table 6.4.2. The location of Natura 2000 sites in relation to the location of the Proposed Action is shown in Figure 6.4.2.

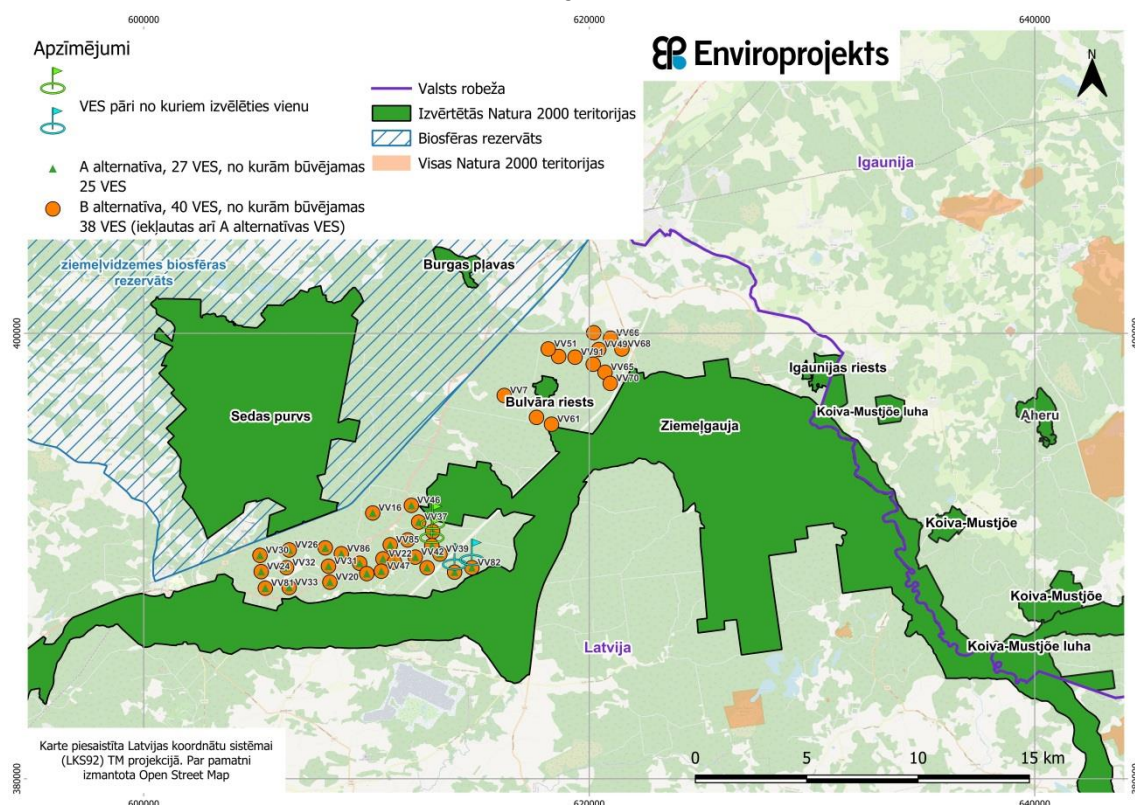


Figure 6.4.2. Location of Natura 2000 sites in relation to the proposed WPP sites

An assessment of the impact of the planned construction of the WPP, access roads, transmission lines and transformer substations on the protected natural values in the nearby Natura 2000 sites is presented in Chapter 7.9.

Table 6.4.2. Assessment of Natura 2000 sites in Latvia adjacent to the area of the proposed activity

PLA "Ziemeļgauja"	
Objectives for creation and protection (habitats)¹¹⁷	The site has been designated to protect the following habitats of EU importance: freshwater, scrub, grassland, marsh, rock outcrop and woodland ¹¹⁸ 3140, 3150, 3260, 3270, 5130, 6120*, 6210, 6230*, 6270*, 6410, 6430, 6450, 6510, 6530*, 7110*, 7120, 7140, 7160, 8210, 8220, 9010*, 9020*, 9050, 9080*, 9160, 9180*, 91D0*, 91E0*, 91F0, 91T0
Objectives for establishment and conservation (species)¹¹⁹	Stone rodent, hawfinch, white stork, white-backed stork, thick-backed pearl-bordered fritillary, brown wagtail, four-toed budworm, two-banded rowing beetle, pond noctule, yellow wagtail, crane, cuckoo, corncrake, White-tailed Eagle, Snipe, Lapwing, Lapwing, Salmon, Great Scaup, Great Newt, Lesser Eagle, Lesser Flycatcher, Woodcock, Black Stork, Black Woodpecker, Wood Pigeon, Wood Sandpiper, Wood Shrike, Reed Bunting, Osprey, Quail, Grey Woodpecker, Pintail, Broad-headed Beetle, Broad-headed Flycatcher, Barn Owl, Barn Owl, Marsh Harrier, Ruby Tit, Salchat, Silla Chickadee, Slippery Budgerigar, Sparrowhawk, Bright Swallow, Bright-eyed Junco, Stream Lamprey, Striped Warbler, Schneider's Warbler,

¹¹⁷ <https://biodiversity.europa.eu/sites/natura2000/LV0600700>

¹¹⁸ Here are the EU Habitat Codes, for detailed habitat descriptions see

https://www.varam.gov.lv/sites/varam/files/es_biotopi_latvija_rokasgramata_lv_2_izdevums.pdf

¹¹⁹ <https://biodiversity.europa.eu/sites/natura2000/LV0600700>

	Three-toed Woodpecker, Dark-eyed Owl, River Lamprey, Ursula Owl, Otter, Osprey, Osprey, Common Tern, Eurasian Wigeon, Chicken Hawk, Green Plover, Osprey, Fish Shrike
The patterns and interactions that determine the existence of natural values in these areas¹²⁰	<p>The protected area was established in 2004 to preserve the meandering middle reaches of the Gauja River with its valley and banks, the complexes of specially protected meadow, forest and water habitats and the habitats of specially protected species. The protected landscape area also includes the Cīrgali Massif - the largest inland dune massif in Latvia - and the Pukši Bog, which contains large areas of transitional bog habitats. The stability, high ecological capacity and microclimatic characteristics of the ecosystems of the Gauja and its valley are largely determined by historically established complexes of forests, oxbow lakes and meadows.</p> <p>The main natural values of the territory are the great variety of rare Latvian and EU-wide specially protected habitats, which are home to many very rare species of lichens, vascular plants, invertebrates and birds.</p>
Factors affecting nature values prior to implementation of the Proposed Action¹²¹	<ul style="list-style-type: none"> - Loss of grassland, mainly due to overgrowth, less often due to ploughing or fertilisation, and development; - over-exploitation of forests after the weakening of the protection regime along the Gauja River, privatisation of forest land and the introduction of the market economy, leading to a decline in the area of biologically old forest stands; - forestry activities during the bird breeding season; - Lack of information for citizens about the area's natural assets, how to conserve them and how to attract funding for this purpose; - unorganised and uncontrolled tourism, which, on the one hand, threatens nature values, and, on the other, prevents the use of nature tourism potential for the development of the territory.
NR "Sedas purvs"	
Objectives for creation and protection (habitats)¹²²	The site has been designated to protect the following habitats of EU importance: freshwater, grasslands, marshes and forests ¹²³ 3260, 6450, 7110*, 7120, 7140, 9010*, 9050, 9080*, 91D0*, 91E0*, 91T0
Objectives for establishment and conservation (species)¹²⁴	White Stork, White-backed Stork, White-fronted Goose, White-fronted Goose, White-fronted Goose, White-bellied Goose, White-tailed Godwit, Brown Wagtail, Crane, Corncrake, Common Eagle, Golden Eagle, Golden Eagle, Snipe, Lapwing, Great Snipe, Little Eagle, Little Swan, Little Gull, Little Osprey, Little Osprey, Little Eider, Black Stork, Black Tern, Black Woodpecker, Woodlark, Reed Bunting, Osprey, Marsh Harrier, Robin, Brent Goose, Snowy Goose, Snowy Plover, Bright Swan, Three-toed Woodpecker, River Tern, Otter, Osprey, Lapwing, Northern Swan, Osprey, Fish Eagle, Osprey
The patterns and interactions that determine the	The main value of the Nature Reserve "Sedas purvs", which led to its establishment, was its suitability as a nesting, feeding and resting area for wild bird species. The landscape, habitats, bird nesting and resting sites have been artificially altered by

¹²⁰ <https://www.daba.gov.lv/lv/ziemelgauja>

¹²¹ <https://www.daba.gov.lv/lv/ziemelgauja>

¹²² <https://biodiversity.europa.eu/sites/natura2000/LV0526800>

¹²³ Here are the EU Habitat Codes, for detailed habitat descriptions see

https://www.varam.gov.lv/sites/varam/files/es_biotopi_latvija_rokasgramata_lv_2_izdevums.pdf

¹²⁴ <https://biodiversity.europa.eu/sites/natura2000/LV0526800>

existence of natural values in these areas¹²⁵	<p>the industrial development of the marsh. The changes have taken place in a relatively short period of time, and most of the "new" ecosystems, which cover almost the entire area of the "Sedas purvs", are in a dynamic state of development.</p> <p>On the one hand, there has been a gradual flooding of the developed part of the marsh, which has attracted waterbirds both during breeding and travelling. Both the areas covered by water increased after the development of the marsh ceased and, on the other hand, the flooded areas are overgrown.</p> <p>Water clumps are gradually becoming overgrown and less useful for birds.</p> <p>"Sedas purvs" is a Site of Importance for Birds of EU Importance - IBA (site code - LV039).</p>
Factors affecting nature values prior to implementation of the Proposed Action¹²⁶	<ul style="list-style-type: none"> - Water bodies created by peat extraction attract birds. But over time, these water bodies become overgrown and unsuitable for birds. - Changes in the hydrological regime caused by peat extraction weaken stands that temporarily attract woodpeckers, but the bird fauna is mostly poor in such stands. - Species diversity is reduced by grassland overgrowth. - Peat extraction has led to the disappearance of a number of invertebrate species typical of raised bogs. - Beavers have disrupted the full functioning of drains. - The biological values of grassland habitats are threatened by overgrowth, as much of the grassland is unmanaged.
Micro-reserve "Bulvara riests"	
Objectives for creation and protection (habitats)¹²⁷	<p>The site has been designated to protect the following EU Important Habitats:¹²⁸</p> <p>7110, 9010*, 91D0, 91T0</p>
Objectives for establishment and conservation (species)¹²⁹	Mednis
The patterns and interactions that determine the existence of natural values in these areas	<p>The stands are extreme and suitable for <i>Tetrao urogallus</i>. The site's conservation regime additionally provides for forest habitats of EU importance. The micro-reserve is located in a large forest massif. The area consists of old pine stands, wet areas interspersed with marshes and woodlands on dry soils.</p>
Factors affecting nature values prior to implementation of the Proposed Action¹³⁰	Reclamation, drainage of forest land

¹²⁵ <https://www.daba.gov.lv/lv/sedas-purvs>

¹²⁶ <https://www.daba.gov.lv/lv/sedas-purvs>

¹²⁷ <https://biodiversity.europa.eu/sites/natura2000/LV0830800>

¹²⁸ Here are the EU Habitat Codes, for detailed habitat descriptions see https://www.varam.gov.lv/sites/varam/files/es_biotopi_latvija_rokasgramata_lv_2_izdevums.pdf

¹²⁹ <https://biodiversity.europa.eu/sites/natura2000/LV0830800>

¹³⁰ <https://biodiversity.europa.eu/sites/natura2000/LV0830800>

Estonian Swarm Micro-reserve	
Objectives for creation and protection (habitats)	The site has been designated to protect the following forest habitats of EU importance ¹³¹ 9010*, 91D0*
Objectives for establishment and conservation (species)	Barn Owl, Barn Owl, Common
Factors affecting nature values prior to implementation of the Proposed Action ¹³²	Litter, drainage, drainage, off-road motor traffic, changes in species composition (succession)
Nature reserve "Purgailė river forests"	
Objectives for creation and protection (habitats)	The site has been designated to protect the following forest habitats of EU importance ¹³³ 91E0*, 9080*, 9010*, 9050
Objectives for establishment and conservation (species)	Three-toed Woodpecker, White-backed Woodpecker, Barn Owl
The patterns and interactions that determine the existence of natural values in these areas ¹³⁴	The nature area was created to ensure the conservation and protection of protected forest habitats of European importance. The area contains suitable habitats for owls, woodpeckers and other specially protected bird species, including micro-reserves established to protect the three-toed woodpecker and the white-backed woodpecker. Other important bird species include the woodlark and the barn owl.
Burgas Meadows Nature Reserve	
Objectives for creation and protection (habitats) ¹³⁵	The site has been designated to protect the following grassland habitats of EU importance ¹³⁶ : 6410, 6430, 6450, 6510
Objectives for establishment	White Stork, Brown Wagtail, Crane, Corncrake, Snipe, Lapwing, Little Eagle, Lesser Spotted Eagle, Reed Bunting, Osprey, Barn Owl, Marsh Harrier, Robin, Lapwing,

¹³¹ Here are the EU Habitat Codes, for detailed habitat descriptions see https://www.varam.gov.lv/sites/varam/files/es_biotopi_latvija_rokasgramata_lv_2_izdevums.pdf

¹³² <https://biodiversity.europa.eu/sites/natura2000/LV0843500>

¹³³ Here are the EU Habitat Codes, for detailed habitat descriptions see https://www.varam.gov.lv/sites/varam/files/es_biotopi_latvija_rokasgramata_lv_2_izdevums.pdf

¹³⁴ <https://www.daba.gov.lv/lv/purgailis-upes-mezis>

¹³⁵ <https://biodiversity.europa.eu/sites/natura2000/LV0532600>

¹³⁶ Here are the EU Habitat Codes, for detailed habitat descriptions see https://www.varam.gov.lv/sites/varam/files/es_biotopi_latvija_rokasgramata_lv_2_izdevums.pdf

and conservation (species)¹³⁷	Tern
The patterns and interactions that determine the existence of natural values in these areas¹³⁸	The nature reserve has the largest known breeding population of scaup in Valka county, as well as a very high density of Corncrakes. The protected area is part of the ecosystem complex of the Seda river valley, which consists of the river and its floodplain. The area is remarkable for its open landscape and floodplain meadows suitable for the Latvian and EU protected bird species, the lapwing and the corncrake.
Factors affecting nature values prior to implementation of the Proposed Action¹³⁹	<ul style="list-style-type: none"> - The area has been adversely affected by past land reclamation and the dredging and dredging of the Seda river, which has reduced flooding and flood duration in the floodplain and contributed to the formation of shrub belts along ditches and overgrowing of grasslands. - The area has been negatively affected by the cessation of grassland management.

The northern end of the planned wind farm area is 4 km from the border of the Republic of Estonia. For a long stretch to the E of the national border of the planned wind farm area, the Natura 2000 site, the Protected Landscape Area "Ziemeļgauja" (hereafter - "Ziemeļgauja"), is adjacent to the border on the Latvian side. For a large part of this stretch, the Estonian side of the border also adjoins the Natura 2000 site **Koiva-Mustjõe** (EE0080471). This is a Natura 2000 Type A site, established for the protection of specially protected bird species. It lists 4 bird species - the kingfisher, the long-billed curlew, the corn bunting and the snipe. The site completely covers the slightly smaller Natura 2000 site **Koiva-Mustjõe luha** (EE0080421), which is a type B site - established for the conservation of specially protected species other than birds and specially protected habitats. It lists a number of species and habitats as occurring there. Together, the Natura 2000 sites of the two countries form a single complex of areas, the protection of which is aimed at the natural values of the Gauja and its tributary valleys. The nearest Estonian Natura 2000 sites - the R part - are located 8-9 km away from the nearest WPP of the planned wind farm.

About 20 km away is the Natura 2000 site "Aheru" (EE0080422), which is a type B site - established for the protection of habitat 3130 *Lakes with oligotrophic to mesotrophic plant communities*. Lake Aheru covers the entire Aheru Nature Reserve. Lake Aheri covers an area of 232.5 ha. The lake has an average depth of 3.7 m and a maximum depth of 4.5 m. The lake is 2600 m long, 1850 m wide and has a shoreline of 10128 m. Lake Aheru is surrounded by wooded marshes.

A summary of the establishment and protection objectives of the Natura 2000 sites of the Republic of Estonia adjacent to the study area of the Proposed Action, the patterns and interactions that determine the existence of natural values in these Natura 2000 sites, the factors that have already adversely affected them prior to implementation of the Proposed Action is provided in Table 6.4.3 and Figure 6.4.2 shows the location of these Natura 2000 sites of the Republic of Estonia in relation to the location of the Proposed Action.

Table 6.4.3. Assessment of Natura 2000 sites adjacent to the study area of the proposed activity in Estonia

¹³⁷ <https://biodiversity.europa.eu/sites/natura2000/LV0532600>

¹³⁸ <https://www.daba.gov.lv/lv/burgas-plavas>

¹³⁹ <https://www.daba.gov.lv/lv/burgas-plavas>

Koiva-Mustjõe	
Objectives for establishment and conservation (species)	The site was created for the protection of specially protected bird species: Grebes, Corncrake, Scaup, Fish Geese
Factors affecting nature values prior to implementation of the Proposed Action ¹⁴⁰	<ul style="list-style-type: none"> - stopping grassland management - erosion, - forestry - clear-cutting - Removing dead wood from forests, - Recreation.
Koiva-Mustjõe luha	
Objectives for creation and protection (habitats)	The site has been designated to protect the following habitats of EU importance: freshwater, heathland, grassland and woodland ¹⁴¹ : 3260, 4030, 6210, 6270*, 6430, 6450, 6530*, 9010*, 9050, 9070, 9080*, 91D0*, 91F0
Objectives for establishment and conservation (species)	Salad, Stonechat, Broadhead, River Lamprey, Salmon, Schneider's Mussel, Two-banded Rowing Beetle, Bright Swamp Dragonfly, Green Plover, Leaf Beetle, Thick-billed Pearl-bordered Fritillary, Dark-eyed Owl
Factors affecting nature values prior to implementation of the Proposed Action	<ul style="list-style-type: none"> - forestry - clear-cutting - Removing dead wood from forests, - forestry, - pollution, - trails, anthropogenic pressures, - groundwater use.
Aheru	
Objectives for creation and protection (habitats) ¹⁴²	The site has been designated for the protection of the EU freshwater habitat 3130 Lakes with oligotrophic to mesotrophic plant communities.
Objectives for establishment and conservation (species)	-
Factors affecting nature values prior to implementation of the Proposed Action	-

6.4.2. Protected habitats and species of special conservation concern

In order to assess the impact of the Proposed Action on protected habitats, the site was surveyed by visiting and/or assessing the Proposed Action area and potential impact areas - the proposed location of the WPP and the area within 350 m around it; potential access roads

¹⁴⁰ <https://biodiversity.europa.eu/sites/natura2000/EE0080471>

¹⁴¹ Here are the EU Habitat Codes, for detailed habitat descriptions see https://www.varam.gov.lv/sites/varam/files/es_biotopi_latvija_rokasgramata_lv_2_izdevums.pdf

¹⁴² <https://biodiversity.europa.eu/sites/natura2000/EE0080422>

and the area up to 150 m along them, as well as potential electricity cable routes and the area up to 20 m along them. Information on the *habitat study area* was collected in the field during the 2022, 2023 and 2024 seasons. To collect additional information in the field, the site survey used data from DDPS "Ozols", as well as data provided by JSC Latvijas valsts meži and the Nature Conservation Agency.

The site survey has been prepared in the form of an "*Opinion of certified experts in the field of species and habitat conservation on the impact of the planned activity - construction of the Valmiera-Valka WPP park in the Plani municipality of Valmiera county and the Vijciems and Valka municipalities of Valka county on protected biotopes of flowing and standing freshwater, swamps, forests and heaths and vascular plant species*", attached as Annex 6.

Consultations with the NCA as part of the assessment process (26.03.2024. No 1.6.1/1811/2024-N), it was concluded that the specially protected species of mosses and lichens are mainly small in size and therefore require special attention. The NCA has reason to believe that the knowledge of the expert on identification of specially protected moss and lichen species in nature is sufficient, but at the same time there is no certainty that the surveyed areas have been sufficiently surveyed for the presence of specially protected moss and lichen species. Therefore, at the request of the NCA, the expert re-surveyed the most critical areas of the Valmiera-Valka WPP Park, carrying out a study specifically targeting moss and lichen species.

Habitat assessment and survey was carried out according to the methodology of the project "Creation of preconditions for better biodiversity conservation and ecosystem protection in Latvia" or "Nature census" - "Methodology for the identification of distribution and quality of habitats of EU importance and organisation of works" approved by the Ministry of Environmental Protection and Regional Development and coordinated by the Ministry of Agriculture. The status of protected species and habitats has been determined in accordance with Cabinet of Ministers Regulation No 350 of 20 June 2017 "Regulations on the List of Specially Protected Habitat Types" and Cabinet of Ministers Regulation No 396 of 14 November 2000 "Regulations on the List of Specially Protected Species and Specially Protected Species of Restricted Use". Guidelines for certified experts in species and habitat conservation on the assessment of the Proposed Action for the construction of forest roads and the establishment, rehabilitation and reconstruction of forest drainage systems.¹⁴³

For the location of the *habitat* polygons of EU protected habitats affected by the *Habitats Study Area* see the maps in Annex 6, and for detailed information on the expected effects of the Proposed Action on individual protected habitat areas see Chapter 7.6.1 of the EIA Report. For information on the protected habitats of EU importance identified during the site surveys, see Table 6.4.4 and for information on areas likely to be affected by the proposed action, see Chapter 7.6.1.

Table 6.4.4. EU protected habitats recorded in the study area

Habitat code, name	Accessibility in the area	Comments on the potential impacts of the Proposed Action (more detail in Chapter 7.6),
3150 Eutrophic lakes with submerged aquatic vegetation and wet vegetation	Gauja rivers, Kokši lakes	The proposed action will not affect the habitat, the opinion does not go into further detail
3260 River courses and natural	Gauja, some watercourses under	Habitat will not be affected by the recommended locations of Alternatives A

¹⁴³ Latvian Environmental Protection Fund funded project No 1-08/29/2023.

<i>Habitat code, name</i>	<i>Accessibility in the area</i>	<i>Comments on the potential impacts of the Proposed Action (more detail in Chapter 7.6),</i>
river channels	existing roads	and B
6120* Sand grassland	Near the "Ielīcu" home	The proposed action will not affect the habitat, the opinion does not go into further detail
6210 Dry grassland on calcareous soils	Near "Ielīcu" and "Kokšu" houses	The proposed action will not affect the habitat, the opinion does not go into further detail
6270* Species-rich pastures and grazed meadows	South-east of Pukši swamp on the roadside, other locations outside the potential impact area	The proposed activity could affect a grass landfill site on the roadside near Pukši Bog
6510 Temperate wet grassland	"Oliņi"	Habitat will not be affected by the recommended locations of Alternatives A and B
7110* Active raised bogs	Small polygons around the VV86 site	No effects on habitat expected as it is >150 m from new development and at a low elevation relative to the development, not assessed in detail in the opinion
7120 Degraded raised bogs where natural regeneration is possible or ongoing	Near Ķauķīšu road and east of VV86	No impact on habitat expected as it is >180 m from new construction, not assessed in detail in the opinion
7140 Transitional marshes and sloughs	In the northern part of the study area, in the forest massif, also in the Pukši swamp, near the road C_VV77	Potential impacts assessed for the construction of C_VV77
7160 Mineral-rich springs and spring marshes	By the Oliņi road	The proposed action will not affect the habitat, the opinion does not go into further detail
9010* Old-growth or natural boreal forests	Frequent throughout the forest, including in the vicinity of planned infrastructure. Most common are variants 1 (typical) and 3 (on dehumidified soils).	Potential fragmentation effects as well as destruction of habitat areas
9020* Large mixed broadleaved forests	At the bridge over the Gauja	The proposed action will not affect the habitat, the opinion does not go into further detail
9050 Deciduous spruce forests	In some places in the area	Potential impacts from the construction of the cable route
9080* Coniferous forests	In some parts of the site, mainly on the western edge of the potential WPP park	Possible effects of dehumidification
9160 Oak forests (oak, lime and	In some places along the	The proposed action will not affect the

Habitat code, name	Accessibility in the area	Comments on the potential impacts of the Proposed Action (more detail in Chapter 7.6),
hornbeam)	Gauja	habitat, the opinion does not go into further detail
91D0* Swamp forests	Quite common throughout the study area, all habitat variants occur	Potential impacts from cable route construction and dehumidification
91E0* Alluvial forests (alluvial riparian and floodplain forests)	In some places in the study area, mostly Option 3 (susin)	Potential impacts from the construction of the cable route
91T0 Lichen-rich pine forests	Common throughout the area where dune landforms are found. Both Option 1 and Option 2 (clearings and coppice)	Potential impacts from construction of WPP sites, roads and cable routes

As the study area is located in a large, long-term forest massif, historically in a sparsely populated area, the forest habitats are often of good and excellent quality, with species typical of natural forest habitats, including species protected in Latvia. The quality of the dry pine forests in the study area is enhanced by the rare and protected species associated with these specific growing conditions, as well as by the mossy topography of the inland dune massif. Habitats associated with wet growing conditions in the study area are often affected by deforestation, but there are also areas of good and excellent quality swamp forest habitats, particularly in the northern part of the forest massif.

The most significant threats to forest habitats of EU importance in the region and Latvia as a whole are the potential destruction of forest stands through clearing or deforestation for the construction of infrastructure such as forest roads or drainage systems.

Indirect negative impacts on habitat quality and the provision of full ecological functions may result from fragmentation of habitat areas, both through clearing and infrastructure construction, and from drainage caused by the construction of road-related ditches and the construction and reconstruction of drainage systems.

These threats are significantly lower for habitat areas that are also habitats for SPA species. This is due to the restriction in Article 12 of *the Species and Habitats Protection Law*, which prohibits the destruction of habitats of specially protected species of plants, fungi and lichens, but often also habitats of protected species that do not have micro-reserve status are felled.

The survey recorded both vascular plant species, fungi, lichens, mosses and invertebrate species associated with the protected habitat types within the experts' competence as characteristic species or indicator species of natural forest habitats and specialist species. The site also supports specially protected species of vascular plants, mosses and lichens.

Specially protected species of vascular plants, mosses and lichens found in the area (SPA I, II - according to the number of the Annex to the Cabinet Regulations), and species for which a microreserve (MIK) is to be established, are noted in 6.4.5. Table 6.5.6, grouped alphabetically

by Latin name¹⁴⁴, provides information on their status as forest habitat indicator species (DMB IS) and specialist species (DMB SS), for species listed in the Latvian Red Data Book¹⁴⁵ the SG category is indicated, species of Annex II to the Habitats Directive (BD II) are noted. The locations and areas of the species occurrences are shown on the maps (Annex 1 to the species and habitats expert opinion, attached as Annex 6 to the EIA). The map and the table show the species localities only in the study area. The spatial dataset of rare and specially protected species found during the surveys has been submitted to the Nature Conservation Agency.

The identified specially protected species (vascular plants, as well as mosses, lichens, fungi, invertebrates associated with the assessed biotopes), the localities of which fall within the potential area of influence of the Proposed Action (see Chapter 7.5 and the Species and Habitats Expert Opinion 1. A more detailed description has been prepared (Species and Habitats Expert Opinion, attached as Annex 6 to the EIA) in order to characterise their ecological requirements and, consequently, to assess the potential impacts of the proposed activity.

Table 6.4.5. Protected and rare species found in the study area

Species group	Latin name	Species group, conservation category, IUCN assessment	No on the map	Number of registered deposits in the study area
Moss	<i>Anastrophyllum hellerianum</i> (<i>Crossocalyx hellerianus</i>)	IAS I, MIK, DMB SS, LC	3	72
Lichens	<i>Arthonia leucopellea</i>	IAS I, DMB IS, NT	4	4
Lichens	<i>Arthonia spadicea</i>	IAS I, DMB IS, LC	5	7
Lichens	<i>Arthonia vinosa</i>	IAS I, DMB IS, NT	6	7
Moss	<i>Buxbaumia viridis</i>	IAS I, MIK, BD II, SG I, DMB SS, VU	8	5
Lichens	<i>Cladonia parasitica</i>	IAS I, MIK, DMB SS, NT	11	12
Vascular plants	<i>Dactylorhiza baltica</i>	IAS I, SG IV, LC	14	39
Vascular plants	<i>Dactylorhiza fuchsii</i>	IAS I, SG IV, LC	15	2
Vascular plants	<i>Dianthus arenarius</i>	SHORT I, VU	19	26
Vascular plants	<i>Diphasiastrum complanatum</i>	IAS I, MIK, SG IV, VU	20	3
Mushrooms	<i>Fomitopsis rosea</i>	IAS I, MIK, DMB SS, VU	24	15
Moss	<i>Geocalyx graveolens</i>	IAS I, MIK, SG IV, DMB SS, LC	26	2
Vascular plants	<i>Gypsophila fastigiata</i>	IAS I, MIK, SG III, VU	29	13
Vascular plants	<i>Huperzia selago</i>	IAS II, SG IV, LC	31	3
Moss	<i>Jungermannia leiantha</i> (<i>Liochlaena lanceolata</i>)	I, NT	32	2
Lichens	<i>Lobaria pulmonaria</i>	IAS I, SG II, DMB SS, NT	37	2
Vascular plants	<i>Lycopodium annotinum</i>	IAS II, SG IV, LC	39	114
Vascular plants	<i>Lycopodium clavatum</i>	IAS II, SG IV, LC	40	36
Moss	<i>Odontoschisma denudatum</i>	IAS I, DMB IS, LC	42	15
Vascular plants	<i>Onobrychis arenaria</i>	IAS I, MIK, SG II, EN	44	2
Mushrooms	<i>Phellinus ferrugineofuscus</i> (<i>Phellinidium ferrugineofuscum</i>)	IAS I, DMB SS, NT	48	4

¹⁴⁴ Species names are used primarily according to the lists in the legislation; where the scientific name of a species has been changed, it is given in brackets.

¹⁴⁵ Red Data book. The LSG uses the following categories of endangered species: I - endangered species; II - declining species; III - rare species; IV - little-known species (LSG contains scientific information on the occurrence of species, does not define protection at the level of legislation)

Species group	Latin name	Species group, conservation category, IUCN assessment	No on the map	Number of registered deposits in the study area
Mushrooms	<i>Phellinus nigrolimitatus</i> (<i>Phellopilus</i>)	IAS I, DMB SS, VU	49	1
Vascular plants	<i>Platanthera bifolia</i>	IAS I, SG IV, LC	51	6
Vascular plants	<i>Platanthera chlorantha</i>	IAS I, SG IV, NT	52	1
Vascular plants	<i>Poa remota</i>	IAS I, MIK, SG III, VU	53	1
Vascular plants	<i>Pulsatilla patens</i>	IAS I, MIK, BD II, SG IV, VU	56	10
Vascular plants	<i>Pulsatilla pratensis</i>	IAS I, SG IV, LC	57	30
Mushrooms	<i>Sarcosoma globosum</i>	SHORT I, VU	58	1
Moss	<i>Schistostega pennata</i>	IAS I, SG III, NT	59	6
Vascular plants	<i>Silene chlorantha</i>	IAS I, SG III, EN	60	8

For the identified specially protected species (vascular plants as well as mosses, lichens, fungi associated with the assessed habitats), whose localities fall within the potential area of influence of the Proposed Action and on which impacts could actually occur, a more detailed description has been prepared in order to characterise their ecological requirements and, accordingly, to assess the potential impacts of the Proposed Action. A detailed description of the ecological requirements of specially protected species can be found in the report "Report of certified experts in the field of species and habitat protection on the impact of the planned activity - construction of the wind park "Valmiera-Valka" in the Plani parish of the Valmiera municipality and the Vijciems and Valka parishes of the Valka municipality on protected habitats of flowing and stagnant freshwater, marsh, forest and heath, vascular plant and moss species" attached as Annex 6 to the EIA Report.

6.4.3. Bird species in the area

The workflow and methodology of the bird surveys are described in detail in the expert opinion on bird species attached to the EIA report, see Annex 6.

The following bird species and species groups have been assessed as part of the EIA:

- Sea eagle
- Golden Eagle
- Lesser Spotted Eagle
- Mednis
- Black Stork
- Hen hawk
- Osprey
- Apodziņš
- Suspended apogee
- Upis
- Whiteback
- Mezirbe
- Grouse
- Migratory bird species

The study of the area of the proposed activity is based on the observations of the bird expert involved in the EIA report and other observers for the period from 1 January 2022; the ornithofauna study area covers an area of 26 565 ha. A total of 5982 observations (excluding

observations recorded in the hunting monitoring programme of JSC "Latvijas Valsts meži") were collected and analysed by a bird expert and other observers in a 3 km area around the turbines under assessment. 154 bird species have been recorded at least once since 1 January 2022 in the 3 km zone around the assessed WPP turbines and, by comparison, 107 species (including crossbills and geese not identified to species) have been recorded at least once since 1 January 2020 in the 500 m zone around the assessed WPP turbines. The ornithofauna of the area was characterised using the expert's, Nature Conservation Agency's, JSC "Latvijas Valsts meži", portal www.dabasdati.lv, DDPS "Ozols" and unpublished data of colleagues. Detailed information on the surveys carried out in the territory of the planned WPP park and the list of bird species recorded is summarised in Annex 6.

All species listed in Annex 1 of Directive 2009/147/EEC of the European Parliament and of the Council on the conservation of wild birds have been assessed by a certified bird expert during the preparation of the opinion. Other bird species have also been recorded during the site survey and during the preparation of the opinion.

Field work has been carried out in 2022, 2023 and 2024 in the study area of the Proposed Action to assess the impact of the Proposed Action on nesting and passage ornithofauna. During the 2022 and 2023 breeding seasons, as a result of the intensified study of the area, the bird expert involved in the EIA report proposed the creation of 7 microreserves for specially protected bird species (some of which have already been created).

The site investigation has been carried out using the "Methodology for Wind Farm Investigation and Expert Opinion"¹⁴⁶.

Despite the fact that from the anthropogenic point of view in the Latvian context the area of the Proposed Action is assessed as highly sparsely populated, the anthropogenic pressure is assessed as quite significant. The A3 and P24 motorways and the railway line form a constant noise background that can be heard almost throughout the area. The relatively easy accessibility of the site encourages recreational pressure on the site in the form of mushroom and berry picking. However, off-road vehicle use in forests outside carriageways, often even on tracks, is seen as a particularly negative anthropogenic impact on the study area from the point of view of impacts on birds. Trackways of two-wheel vehicles can be found in much of the study area, and in places there are also tracks of quadricycles. It is difficult to assess the intensity of this disturbance, but given that the most extensive network of tracks is found in the dry, scrubby pine forest types, where it is objectively easier to drive, while the scrubby forest types have a particularly far noise distribution, this type of disturbance should be assessed as Critically Negative. In the critically sensitive early breeding season, even a single off-roader on the tracks can have irreversible consequences for the breeding success of bird species particularly sensitive to disturbance nesting in the vicinity of the track.

The bird species and groups of bird species on which the impact of the Proposed Action has been assessed are those bird species included in the list of Annex I to the Cabinet of Ministers' Regulation No 396 of 14 November 2000 "Regulations on the List of Specially Protected Species and Species of Special Concern of Restricted Use", species included in the list of Annex I to the Cabinet of Ministers' Regulation No 396 of 14 November 2000 "Regulations on the List of Specially Protected Species and Species of Special Concern of Restricted Use", 2012. Species listed in Annex I or II of Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds. Information on the protected bird species found in the area and the bird species assessed in the context of the EIA report is provided in Table 6.4.6, while

¹⁴⁶ Ūlands, D., Millers, K. 2022. *Methodology for the Wind Farm Study and the Expert Report*.

the impact assessment and recommended mitigation recommendations are provided in Chapters 7.6.2 and 7.6.3.

In February and March 2024, additional searches for the bustard were carried out in the planned area of the Valmiera-Valka Wind Park, as according to a local resident, in November 2023, while hunting in the hunting tower in the evening, the bustard *Bubo bubo* was apparently spotted on a hunting thermal camera. The expert opinion on this additional survey is attached in the expert opinion, see Annex 6.

The bird was searched both in its historically known breeding area and in the vicinity of the potential sighting site, as well as in the nearest relatively suitable area according to habitat suitability calculations. No signs of the presence of the moth were found at any of the sites visited.

Table 6.4.6. Bird species with conservation features found in the 3 km zone around the assessed WPP, and an estimate of their number or distribution

No.	Species in Latvian	Species in Latin	Estimate of abundance or distribution in a 3 km zone around the WPP assessed
1	apodziņš	<i>Glaucidium passerinum</i>	At least 15% of 500x500 m squares nest
2	Great Egret	<i>Ardea alba</i>	Non-flying, low-volume transit flights
3	White Stork	<i>Ciconia ciconia</i>	Non-flying, low-volume transit flights
4	whiteback	<i>Dendrocopos leucotos</i>	The species does not breed in priority protected areas, 1 breeding pair confirmed
5	Bighorn	<i>Aegolius funereus</i>	The species does not breed in priority protected areas, breeding in the area has not been confirmed
6	brown wagtail	<i>Lanius collurio</i>	Not rated*
7	Yellow Plover	<i>Pluvialis apricaria</i>	Not rated
8	Crane	<i>Grus grus</i>	Breeding - not assessed, migratory - small, unspecified number of migratory birds foraging in the New Forest
9	gaigala	<i>Bucephala clangula</i>	Not rated
10	cut	<i>Crex crex</i>	Not rated
11	Sea eagle	<i>Haliaeetus albicilla</i>	Occasional, but not breeding, wandering individuals, concentration area identified at the D boundary of the site
12	cormorant	<i>Phalacrocorax carbo</i>	Non-flying, low-volume transit flights
13	The Wedge	<i>Pernis apivorus</i>	at least 1 breeding pair
14	golden eagle	<i>Aquila chrysaetos</i>	Limited access information
15	kuitala	<i>Numenius arquata</i>	Some pairs nest in Pukši marsh
16	welcome to	<i>Perdix perdix</i>	Possible nesting of a few pairs in the agricultural land to the S of Valka
17	rural drizzle	<i>Circus cyaneus</i>	Some pairs may nest in open landscapes on the periphery of the planned wind farm

No.	Species in Latvian	Species in Latin	Estimate of abundance or distribution in a 3 km zone around the WPP assessed
18	Country Falcon	<i>Falco tinnunculus</i>	Possible breeding of one pair in the agricultural land to the S of Valka
19	the big chakste	<i>Lanius excubitor</i>	Not rated
20	the great auk	<i>Mergus merganser</i>	Not rated
21	the great rebellion	<i>Botaurus stellaris</i>	Uncertain number of nesting pairs in Seda swamp
22	the great gull	<i>Larus ridibundus</i>	Non-flying, low-volume transit flights
23	Lesser Spotted Eagle	<i>Clanga pomarina</i>	1 successful nest in agricultural land to the S of Valka
24	Little Flycatcher	<i>Ficedula parva</i>	Not rated
25	tree	<i>Tetrao urogallus</i>	8 confirmed and 3 probable breeding, up to 30 breeding roosters in total
26	black woodpecker	<i>Dryocopus martius</i>	Not rated
27	black kite	<i>Milvus migrans</i>	Non-flying, low-volume transit flights
28	Black Stork	<i>Ciconia nigra</i>	2-3 pairs in the vicinity of the planned wind farm
29	Wood Pigeon	<i>Columba oenas</i>	Not rated
30	logging	<i>Bonasa bonasia</i>	At least 20% of 500x500 m squares nest
31	the cane	<i>Circus aeruginosus</i>	Some pairs may nest in open landscapes on the periphery of the planned wind farm
32	ormanitis	<i>Porzana porzana</i>	Not rated
33	Greater Scaup	<i>Cygnus olor</i>	Non-flying, low-volume transit flights
34	Grey Woodpecker	<i>Picus canus</i>	Not rated
35	Meadow Tern	<i>Tringa totanus</i>	One to a few pairs nest in Pukši marsh
36	bean	<i>Upupa epops</i>	Not rated
37	barn owl	<i>Asio flammeus</i>	Casual observation in Pukšu swamp
38	Marsh Tern	<i>Tringa glareola</i>	An unspecified number of pairs breed in Seda and Pukšu swamps
39	grouse	<i>Lyrurus tetrix</i>	Main nest in Pukši swamp and 6-7 satellite nests. Total number of roosters not assessed
40	Seivi warbler	<i>Locustella luscinioides</i>	Not rated
41	Sila Chirulis	<i>Lullula arborea</i>	Not rated
42	Somzilitē	<i>Remiz pendulinus</i>	Not rated
43	steppe chips	<i>Anthus campestris</i>	Not rated
44	Striped Warbler	<i>Sylvia nisoria</i>	Not rated
45	tītiņš	<i>Jynx torquilla</i>	Not rated
46	three-toed	<i>Picoides tridactylus</i>	Breeds in at least 0.4% of 500x500 m squares,

No.	Species in Latvian	Species in Latin	Estimate of abundance or distribution in a 3 km zone around the WPP assessed
	woodpecker		micro-reserve established outside priority protected areas
47	river tern	<i>Sterna hirundo</i>	Non-flying, possible low transit flights
48	The Barn Owl	<i>Strix uralensis</i>	At least 34% of 500x500 m squares nest
49	party	<i>Caprimulgus europaeus</i>	Found in virtually the entire area of the planned wind farm, but numbers and distribution have not been assessed
50	Middle Spotted Woodpecker	<i>Leiopicus medius</i>	Found in the vicinity of the old rivers of the Gauja and in settlements on the periphery of the planned wind park
51	hen hawk	<i>Accipiter gentilis</i>	3 known nests
52	Northern swan	<i>Cygnus cygnus</i>	Breeds in unspecified numbers in Seda, and possibly in Puksi swamp
53	Osprey	<i>Pandion haliaetus</i>	3 known nests
54	fish propeller	<i>Alcedo atthis</i>	Not rated
55	goose	<i>Anser sp.</i>	Low flyway with up to 2000 flying individuals between Seda swamp and Jaunklidza fields

*Specially Protected Bird Species (SPA) found in the study area that are not considered to be particularly endangered in the literature and in the current practice in Latvia have not been assessed in the context of the proposed activity in the framework of the preparation of the EIA report. These include Specially Protected Passerines, Wood Pigeon, Evening Grosbeak, etc. The presence of these species is not considered to be a sufficient reason to change the configuration of the wind farm or to recommend additional operational restrictions. The protection of these species is ensured by following the recommendations for the protection of more threatened species.

6.4.4. Bat species in the area

Bat species in the study area were surveyed following the EUROBATS guidelines "On compliance with bat conservation requirements in wind farm projects"¹⁴⁷ and the Latvian adapted "Guidelines for assessing the impact of wind power plants on bats"¹⁴⁸. Bat species were surveyed using the following approach:

- Seven times a season, with three (May, June, July) or six (August, September) nights counted each month.
- The timing of the surveys was chosen according to the bats' biological cycle (breeding, migration/mating).
- Bat activity was recorded at 12 fixed observation stations D1-D12 and three routes (M1-M3) (Figure 6.4.2).
- The monitoring stations and routes were selected to survey bat activity in habitats similar to those in which the WPP is planned to be located.
- All ultrasonic detectors at the stations were placed in open woodland (mainly clearings).

¹⁴⁷ <https://tethys.pnnl.gov/sites/default/files/publications/EUROBATS-2015.pdf>

¹⁴⁸ https://lvafa.vraa.gov.lv/faili/materiali/petijumi/2020/171/Vadlinijas_VES_siksparni_fin.pdf

A total of 1710 bat sound files were recorded at 12 monitoring stations in the planned area of the WPP Park over 84 detector nights (21 monitoring nights, with four fixed detectors per night), with 1978 bat passes recorded (Table 6.4.7). Route records - seven 90-minute records on each of the three routes - recorded 505 bat overflights per season (Table 6.4.7).

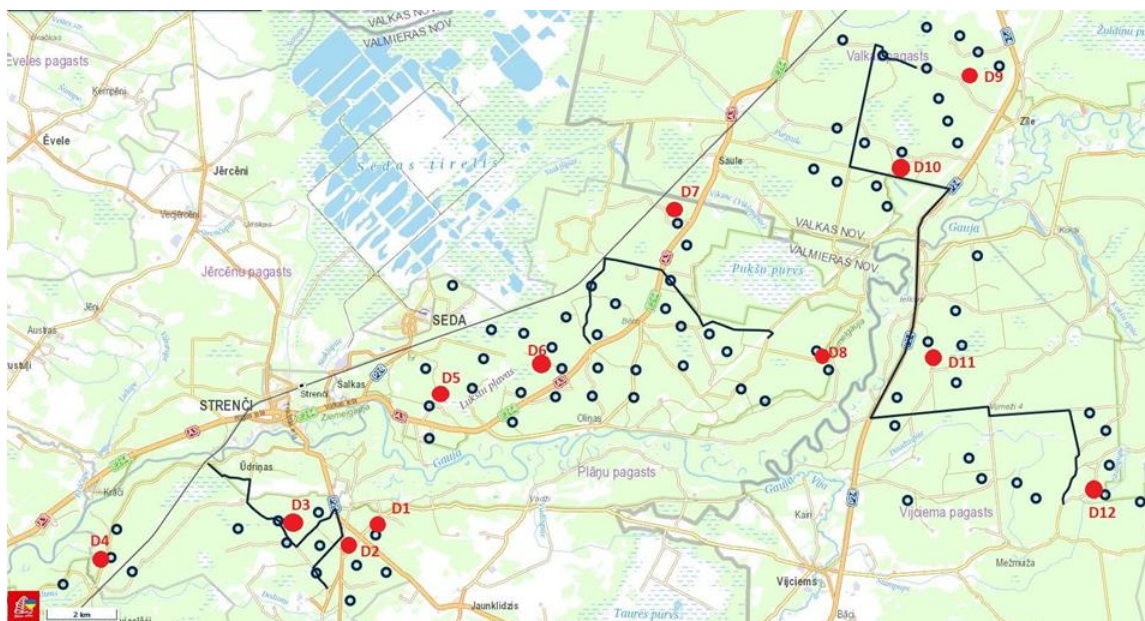


Figure 6.4.3. Locations of stationary bat observation stations D1-D12 (red dots) and diagrams of survey routes (black lines) in the planned area of the Valmiera-Valka wind park. The black circles indicate the planned WPP locations. Maps from "Baltic maps" website¹⁴⁹.

Table 6.4.7. Bat species or species groups detected by D-500x automatic detectors at 12 observation stations in the planned area of the Valmiera-Valka WPP in May-September 2022, their affiliation to the migratory or hibernating bat group and the number of recorded overflights

Bat species in Latvian	Bat species in Latin	Migratory or wintering species	Number of overflights
Northern bat	<i>Eptesicus nilssonii</i>	Wintery	1847
Rusty Evening Bat	<i>Nyctalus noctula</i>	Migratory	32
Two-coloured bat	<i>Vespertilio murinus</i>	Wintering/migratory	9
Nobody	<i>Nyctalus/Vespertilio/Eptesicus ģinšu grupa</i>	Migratory or semi-migratory	4
Natuz bat	<i>Pipistrellus nathusii</i>	Migratory	48
Pygmy Bat	<i>Pipistrellus pygmaeus</i>	Migratory	1
Genus Noctuidae	<i>Myotis spp.</i>	All species wintering	34
Bat of undetermined species	Chiroptera		3
Total			1978

¹⁴⁹ https://balticmaps.eu/lv/c_56.951558-24.113432-11/bl_cl/q

Table 6.4.8. Bat species or species groups detected, their migratory or hibernating status and the number of recorded overflights in the planned area of the Valmiera-Valka WPP in May-September 2022 at 27 points along three routes during 10-minute sessions with the D-500x automatic detector

Bat species in Latvian	Bat species in Latin	Migratory or wintering species	Number of overflights
Northern bat	<i>Eptesicus nilssonii</i>	Wintery	491
Rusty Evening Bat	<i>Nyctalus noctula</i>	Migratory	3
Natuz bat	<i>Pipistrellus nathusii</i>	Migratory	6
Genus Noctuidae	<i>Myotis</i> spp.	All species wintering	5
Total			505

The most frequently encountered roost species in the area of the proposed activity, the Natuz bat and the northern bat, are the species at highest risk from wind farms. According to EUROBATS statistics on bat fatalities at wind farms in Europe in 2003-2014, the Natuz bat ranked third, while the northern bat is the most frequent victim of wind turbines in Scandinavian countries. In Latvia, the Natuz's bat is the first and the northern bat the second most important among the recorded victims of wind farms¹⁵⁰. Noctule bats are generally not considered a high risk species, as they usually fly and hunt close to landscape structures and are rarely seen at higher altitudes, but the pond noctule bat is a species that is more likely to fly higher and in more open areas than other noctule bat species found in Latvia.

The average bat activity at all stations combined in the planned wind park area is **2.96 flights per hour**. The results can be compared with other bat species surveys carried out in 14 other potential WPP using identical methodology. The overall bat activity detected in this study is relatively high (above the 3rd quartile threshold (Table 6.4.9.)). This is due to the fact that forests are suitable habitats for bats, and the surveys carried out so far have mostly taken place in landscapes less suitable for bats, where forests covered only part of the area. The close proximity of several important feeding sites should also be taken into account in this area.

Table 6.4.9. Total bat activity thresholds in three activity classes - low, medium or high (based on 14 different sites in Latvia)

Activity class	Kvartile	Average number of flights per hour
Zema	below 1st quartile	≤1,29
Medium	2nd-3rd quartile	>1,29 – 2,35
Growing	above 3rd quartile	>2,35

At least five reliably identified bat species have been recorded in the area of the proposed activity: the northern bat *Eptesicus nilssonii*, the rusty long-eared bat *Nyctalus noctula*, the bicoloured bat *Vespertilio murinus*, the Nathus bat *Pipistrellus nathusii* and the pygmy bat *Pipistrellus pygmaeus*, as well as at least one species of the noctule *Myotis* genus. The northern bat, the Natuz bat, the rusty bat, the double-coloured bat and the pygmy bat are species at high risk of mortality in the context of wind farms.

¹⁵⁰ <https://tethys.pnnl.gov/sites/default/files/publications/EUROBATS-2015.pdf>

6.4.5. Invertebrate species in the area

Assessment of the presence of protected invertebrate species in July 2024 at potential WPP and substation construction sites - in case of construction of alternatives A or B, implemented in accordance with the letter of the Nature Conservation Agency to Latvijas vēja parki Ltd (23.05.2024. No 1.6.1/3200/2024-N) (Annex 2), which states, inter alia, that "... not only species scores should be indicated, but also the forest stands should be assessed as suitable habitats for different invertebrate species and the potential loss of habitat for each of the SPA invertebrate species should be indicated and how this will affect the conservation status assessments for these species at a national scale".

For the assessment of the presence of invertebrate species in June/July 2024 at the potential construction sites of the WPP and substations - in the case of construction of alternatives A or B, an "Opinion of certified experts in the field of species and habitat conservation on insects in the planned WPP park Valmiera-Valka" has been prepared, which is attached as Annex 6.

The area of the proposed activity has been intensively managed for a long time, the habitats suitable for SPA invertebrate species in the case of the construction of alternatives A or B, in the area of the planned WPP and the new roads to be constructed, have been assessed only according to their suitability for SPA invertebrate species, see Table 6.4.10 and Figure 6.4.3.

Table 6.4.10. Description of the WPP, species found, habitat suitability and notes on factors affecting the species.

WPP	WPP construction ¹⁵¹	Biotopes	Suitable habitats, habitats	Species found	Notes
VV1		Pine coppice in semi-mature stand	Not suitable	None found	
VV3	Not recommended	Young and middle-aged spruce-birch stands	Not suitable	None found	Shading by birch
VV7		In various pine plantations, ecological trees	Semi-suitable	Old runs of the Great Spotted Beetle	Shading
VV9		Pine coppice, middle-aged pine stand	Not suitable	None found	Shading with birch and spruce
VV16		Pine coppice, ecological trees, pine plantations	Semi-suitable	Old runs of the great crested newt, yellow stump fly	Dead wood is scarce
VV19	Not recommended	Pine coppice, ecological trees, pine stand	Semi-suitable	Humped stump fly	Traces of burns, burns cleared, pine trees planted. There are no pines suitable for the striped hooded pine. Pine grove shaded by spruce
VV20		Pine coppice,	Suitable for	Great Spotted	

¹⁵¹ Additional information on the conclusions of the EIA is attached - significant environmental effects have been identified and construction of the WPP is not recommended

WPP	WPP construction ¹⁵¹	Biotopes	Suitable habitats, habitats	Species found	Notes
		ecological trees, includes pine coppice		Beetle	
VV21		Pine coppice, pine forest	Not suitable	None found	No ecological trees
VV22		Pine stands with spruce, part coppice	Semi-suitable	Old runs of the Great Spotted Beetle	
VV23	Not recommended	Pine coppice, ecological trees, part pine coppice	Suitable for	Old runs of the great crested newt, yellow stump fly	Shading and small shrubs have a negative impact on species
VV24		Pine coppice, ecological trees, pine forest, spruce trees	Not suitable	None found	Shading has a negative impact
VV26		Pine and spruce coppice, ecological trees, middle-aged pine stand	Not suitable	None found	
VV27	Not recommended	Pine and birch coppice. Ecological trees	Semi-suitable	Old runs of the Great Spotted Beetle	Shading has a negative impact
VV28		Birch coppice, ecological trees, pine coppice with spruce	Not suitable	None found	Shading has a negative impact
VV30		Pine coppice, ecological trees	Not suitable	None found	
VV31		Pine coppice, ecological trees, pine stand	Suitable for	Great crested newt and imago, humpbacked newt	Abundant populations of both species. The population has existed for a long time, at different ages. Main habitat is fallen ecological trees
VV32		Pine coppice, ecological trees - trunks, pine coppice around the turning area	Semi-suitable	Old runs of the Great Spotted Beetle	
VV33		Young stands, ecological tree groups, small part of pine plantations	Not suitable	None found	No large dimension dead wood
VV34	Not recommended	Young pine forest, small part under pine	Suitable for	Great stink bug, yellow stink bug, yellow stump fly	Abundant populations of both species
VV35	Not recommended	Pine coppice, some pine coppice,	Not suitable	None found	Pine forest shaded, no

WPP	WPP construction ¹⁵¹	Biotores	Suitable habitats, habitats	Species found	Notes
		ecological trees			fallen trees in young stand
VV36		Pine stands of different ages, ecological trees, pine plantations	Semi-suitable	Old runs of the Great Spotted Beetle	Pine stand potentially suitable for Schneider's Mistletoe
VV37		Pine stands of different ages	Not suitable	None found	
VV38		Young stands of different ages, ecological trees, pine plantations	Semi-suitable	Old runs of the Great Spotted Beetle	Shading is caused by ferns and other plants. Pine stand potentially suitable for Schneider's Mistletoe
VV42		Young stands of different ages	Not suitable	None found	
VV43	Not recommended	Pine plantations, ecological trees and stems, pine groves	Semi-suitable	Old runs of the Great Spotted Beetle	Pine stand potentially suitable for Schneider's Mistletoe
VV44	Not recommended	New pine plantations	Not suitable	None found	
VV45	Not recommended	Pine plantations, ecological tree groups, pine stands	Suitable for	Great Spotted Beetle	Little dead wood
VV46		Pine stands of different ages	Suitable for	Great crested new and old hatchlings, humpback stump fly	
VV47		Pine stands of different ages	Not suitable	None found	Shaded, with fir tree
VV48	Not recommended	Pine coppice, ecological trees, pine stand	Semi-suitable	Old runs of the Great Spotted Beetle	Shady pine forest
VV49		Pine stands with birch and spruce	Not suitable	None found	Shading
VV50		Various pine stands, much of it recently felled, spruce mixed in	Not suitable	None found	Shading
VV51		Pine coppice, ecological trees, pine stand	Not suitable	None found	Little dead wood
VV64		Pine coppice, ecological trees, pine stand	Not suitable	None found	Shading
VV65		Pine stands with	Not suitable	None found	Shading

WPP	WPP construction ¹⁵¹	Biotores	Suitable habitats, habitats	Species found	Notes
		birch and spruce			
VV68		Pine plantations, ecological trees	Not suitable	None found	Shading
VV70		Pine plantations, ecological trees	Semi-suitable	Yellow stump fly, old runs of the great crested newt	Partial shading
VV81		Young pine stand, ecological trees, old pine stand felled	Not suitable	None found	Shading has a negative impact
VV82		Two-aged pine coppice, ecological trees and trunks	Suitable for	Great crested new and old flushes, yellow stump fly	
VV84		In pine stands of different ages	Not suitable	Myotis found in adjacent stands	Pine stand potentially suitable for Schneider's Mistletoe
VV85		Pine coppice and young stand, ecological trees	Semi-suitable	Old runs of the Great Spotted Beetle	Shading has a negative impact
VV86		Pine plantation, fragment of a stand	Semi-suitable	None found	Very little dead wood in pine stands
VV88		Pine coppice, ecological trees and trunks, spruce forest	Suitable for	New passages of the Great Spotted Beetle	Young growth relatively shaded
VV89	Not recommended	Pine plantation, ecological trees, pine coppice	Not suitable	None found	Little dead wood
VV91		Pine stands of different ages, ecological trees, felled pine stands	Suitable for	Great crested newt and imago, humpbacked newt	
VV92	Not recommended	Pine stands, with spruce	Not suitable	None found	Little dead wood
VV92	Not recommended	Various pine stands, spruce mixed in	Not suitable	None found	
VV93	Not recommended	Pine coppice, ecological tree groups, pine plantations	Suitable for	Great crested newt and imago, humpback and yellow stump flies	

Adult imagoes and fresh hatchlings of the Great Crested Beetle were found in 12 plots, old hatchlings in 18 plots, 30 plots in total (see Table 6.4.10). This indicates that the species has a stable population in the study area. In the farm forests, there is a mosaic of forest patches - both mature stands and young stands of different ages. The main factor positively affecting the population is dead ecological trees. Suitable habitat for the species is young pine stands up to 10-

15 years of age, when the pine crowns close. Conditions favourable for the population were found at VV31 and VV34 (WPP construction is not recommended), and in large numbers at VV46, VV91 and VV93. From the point of view of the conservation of the species, no loss of natural habitats has been observed in Latvia. In Latvia, the Great Spotted Beetle is found in about 150 localities¹⁵², which are more densely distributed in pine forests, including Valmiera-Valka (about 20 localities and 30 new localities). The establishment of the WPP Park will have no impact on the population at national level.

For several WPP (VV7, VV11¹⁵³, VV81, VV92) the designed access roads are located in young stands with ecological trees suitable for saproxylic species.

Humped stump was found in six of the surveyed planned WPP maintenance sites and yellow stump in seven. Humped Stitchwort is common throughout Latvia.

Many of the planned locations for the WPP maintenance sites are in stands of medium-aged and old pine trees. The probability of finding Schneider's mycelium has been assessed in several of them. If the pine is inhabited by the aspen fungus *Aurobasidion sp.* and is reliably detected, these sites are marked as potentially suitable for the fungus (VV36, VV38, VV43¹⁵⁴, VV84). The fungus is necessary for the development of the beetle larva. There are some pines that would be suitable, but they have already been stripped of their bark and are no longer suitable for the species. The Mismolus is also found in managed pine forests¹⁵⁵.

Potential substation sites were also surveyed and Table 6.4.10 and Figure 6.4.3 summarise the data on the occurrence of SPA species at the substation sites.

Table 6.4.11. Data on specially protected species found at substation sites

Substation location option	Biotores	Suitable habitats	Species found	Notes
ST1	Cable line location: small coppice, ecological trees, young pine stand	Semi-suitable	Old runs of the Great Spotted Beetle	Little dead wood
ST1	Location of the transformer: mainly in a clearing, ecological trees, overgrown with birch, small fragment in a pine grove	Suitable for	Great Spotted Beetles new and old	Could be a rich beetle population
ST1	BESS location: partly in clearings, ecological trees, partly in young and mature pine stands	Semi-suitable	Old runs of the Great Spotted Beetle	
ST2	Cable line location: mainly pine plantations, small fragment of clearing, ecological trees	Semi-suitable	Old runs of the Great Spotted Beetle	Little dead wood, stands relatively shaded with spruce. Traces of an ancient burn
ST2	Location of the	Not suitable	None found	

¹⁵² <https://dabasdati.lv/lv>

¹⁵³ WPP construction not recommended

¹⁵⁴ WPP construction not recommended

¹⁵⁵ <https://dabasdati.lv/lv>

Substation location option	Biotores	Suitable habitats	Species found	Notes
	transformer: mostly middle-aged pine stands, spruce mixed in, small fragment of young forest			
ST2	Location of BESS: medium old pine stands, clearing fragment, ecological trees	Not suitable	None found	Little dead wood
ST3	Cable line location: old pine stand, spruce admixture, part stand part stand on dry hill, ecological trees	Semi-suitable	Old runs of the Great Spotted Beetle	Shading with birch, spruce and broadleaf plants
ST3	Transformer location: medium-aged pine stands with spruce and birch	Not suitable	None found	
ST3	Location of BESS: mainly recent clearing, trunks, part of pine forest	Not suitable	None found	A clearing overgrown with leafy plants
ST4	Cable line location: shaded middle-aged pine stand, shaded young forest, small recent clearing	Semi-suitable	Great Spotted Beetles of different ages	Only on a single fall. Overall shading
ST4	Transformer location: young and middle-aged pine stands	Not suitable	None found	Shaded, no large dimension of the falls
ST4	BESS location: part middle-aged pine stand, part young stand, ecological trees	Semi-suitable	Old runs of the Great Spotted Beetle	Few high-dimensional falls

The purpose of the proposed action in the study area is to assess the suitability of the habitats for SPA invertebrate species. As the area is dominated by intensively managed pine forests, the suitability of the forests for saproxylic species was assessed. The main criteria are the stand's edge, trees directly exposed to the sun, dry trees, stems and fallen trees. Shaded forest is unsuitable for saproxylic species.

The main negative factor identified is shading. If a pine stand contains spruce or birch, it is *a priori* unsuitable for protected species. Pine stands with ecological tree litter or pine stumps are favourable for the species for about 10-15 years. The pine crowns then close and shade out the dead wood. The same negative effect on saproxylics is caused by overgrowth of the young stand with herbaceous plants and small shrubs, especially in stands with wetter soil conditions.

Minor traces of forest burns were observed at one WPP and one AST site (VV19, ST2). Schneider's Mistletoe and Striped Hooded Fritillary were found in a burn at substation ST2 in

2018. The burnt trees were felled and the site destroyed. Although six years after the species was found, they no longer inhabit the trees.

At a landscape scale, intensive silviculture contributes significantly to the maintenance of populations of saproxylic species (especially the great crested beetle and the hump-backed stump fly). If there is a clearing, a young stand and fallen ecological trees in the same place, habitat is provided for these and for common saproxylic species. The key is to have the right microclimatic conditions - dead wood that has been exposed to the sun. These favourable sites change during logging. It should be noted that saproxylic species have good dispersal abilities.

Potential records include the large beech beetle *Ergates faber* and the pine beetle *Prionus coriaceus* (both not recorded in the Northern Vidzeme area), the conifer beetle *Tragosoma depsarium* (recorded in the Northern Vidzeme area but not in the area of the proposed activity). None of these species has been recorded either as beetle-specific wood-boring or as adults. The species is found mainly in protected areas and requires biologically old pine forests. The pine resin beetle *Nothorhina muricata* can also potentially be detected by its specific stem lesions, although the species is mainly distributed in maritime forests.

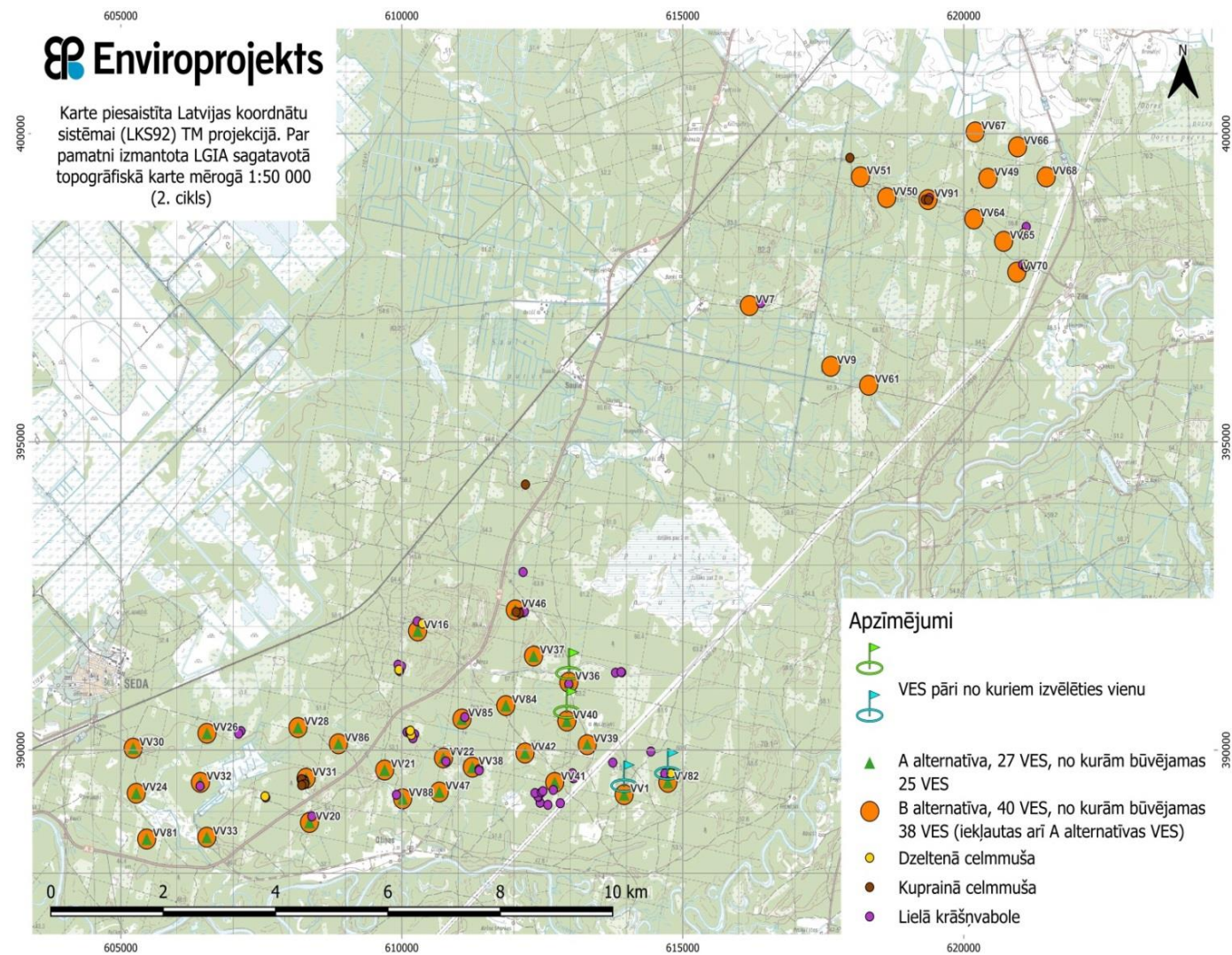


Figure 6.4.4. Invertebrate species in the surveyed area of the proposed activity.

6.4.6. Mammals

Within the framework of the EIA, an expert on the species group "mammals" (LVMI "Silava" lead researcher J. Ozoliņš, NCA certificate No 160) prepared an opinion on the assessment of the impact of the WPP on terrestrial non-flying mammals (the opinion is attached as Annex 6). Both the Limbaži and Valmiera-Valka WPPs were assessed as part of the opinion.

The information provided in the opinion is based on data obtained within the framework of the monitoring of the status and damage caused to large wild mammal populations (ungulates, carnivores), which the Latvian State Forest Research Institute (LVRI) "Silava" has been carrying out for some species for 20 years, visiting the area in different seasons and meteorological conditions. The study area and its surroundings have been visited and the occurrence of mammals has been recorded on numerous occasions in the framework of several projects, as listed in the expert's report (report attached as Annex 6).

With regard to the Valmiera-Valka WPP, it is concluded that the land transport arteries - the Valmiera-Valka railway and the A3 motorway, which do not have and are not planned to have animal crossing points, as well as the dune-like elevations in the area, which face NE-SW (see Figures 4.3 and 4.4), may direct animal movements in this direction, similar to the transport infrastructure mentioned above.

Almost all species of terrestrial non-flying mammals found in Latvia occur in the area, with the exception of the marmots, whose distribution is restricted to some known localities outside the study areas. An overview of the species, together with their relative importance scores, is given in Table 6.4.11. Observations in the vicinity of the two WPP parks studied show that up to 10% of the Latvian brown bear population has visited the areas of the WPP Limbaži and WPP Valmiera-Valka so far¹⁵⁶.

Brown bears are also a species for which little or no scientific research in Europe has examined the impact of wind farms. Their dispersal in Latvia has been N-S, and currently the highest population densities and most successful breeding occur in northern Vidzeme. The proportion of the population of other mammals, both protected and commercially exploited, in the area where the wind farms are planned shall not exceed 1% of the total population and range of Latvia.

Extensive literature studies on the impacts of wind farms on terrestrial wild mammal and domestic animal species have been carried out in Sweden¹⁵⁷. The source also provides basic requirements for monitoring impacts and evaluating the results. It is believed that results should not be extrapolated from one area to another. The construction and maintenance of additional access roads for wind turbines may cause additional disturbance to large mammals if these access roads are used for increased traffic and forest visits. The existence of roads as such does not threaten large mammals. For more specific information on canids and carnivores, see¹⁵⁸. Correspondingly, the impact of wind turbines has been linked to the interest in killed birds in the vicinity of the installations as food or avoidance of background noise that interferes with hearing

¹⁵⁶ <https://www.silava.lv/images/Petijumi/2023-Lacu-monitorings/2023-Lacu-monitorings-Parskats.pdf>

¹⁵⁷ Helldin J.O., et.al. 2012. The impacts of wind power on terrestrial mammals. A synthesis - SWEDISH ENVIRONMENTAL PROTECTION AGENCY REPORT 6510, 52 pp.

¹⁵⁸ Scholl E.M. & Nopp-Mayr U. 2021. Impact of wind power plants on mammalian and avian wildlife species in shrub- and woodlands. - Biological Conservation 256

predators approaching¹⁵⁹. Separate studies have been devoted to the impact of wind farms on wolves^{160,161}. These studies identify impacts and propose ways to refine and mitigate them. Wolf breeding middens and meeting places in and around wind farms are expected to change.

A frequency comparison between the sounds produced by a wind turbine and those perceived by wild mammals and humans shows that animals perceive turbine noise in a similar way to humans¹⁶². There is no evidence of adverse effects of electromagnetic fields on the body. Studies in Poland do not confirm the effects of wind turbine operation (sound, vibration, lighting changes) on small rodents and insectivores¹⁶³. Some studies have also produced contradictory results. The density and activity of roe deer and hare tracks is reduced in the vicinity of wind turbines, and there is less fox activity¹⁶⁴. Field voles living near wind turbines have markedly higher levels of the stress hormone corticosterone, but this was not observed in the field mouse. The question of what exactly causes the increase in corticosterone levels and whether it also occurs in animal species living in other countries has not been answered¹⁶⁵. Wind turbines cause increased stress levels in badgers, as evidenced by blood cortisol levels several times higher in badgers living near wind farms. Chronic stress can cause many health and psychological problems¹⁶⁶. In Scandinavia, there is a negative correlation between the construction of wind farms and the number of moose hunted. The construction of wind farms and the creation of additional gravel roads should also be taken into account as negative factors¹⁶⁷.

In essence, the impact of wind turbines on mammal behaviour will depend on the interaction of two processes: reactions to a new object in the environment and habituation to that object.

There are no micro-reserves in the WPP Park to protect mammals or their habitats.

¹⁵⁹ Tolvanen A., et.al. 2023. How far are birds, bats, and terrestrial mammals displaced from onshore wind power development? - A systematic review. *Biological Conservation*, 288, 110382.

¹⁶⁰ Ferrão da Costa, G., et.al. 2018. The Indirect Impacts of Wind Farms on Terrestrial Mammals: Insights from the Disturbance and Exclusion Effects on Wolves (*Canis lupus*). In: Mascarenhas, M., Marques, A., Ramalho, R., Santos, D., Bernardino, J., Fonseca, C. (eds) *Biodiversity and Wind Farms in Portugal*. Springer, Cham.

¹⁶¹ Miltz C., et.al. 2024. Will future wind power development in Scandinavia have an impact on wolves? - *WILDLIFE BIOLOGY*

¹⁶² Helldin J.O., et.al. 2012. The impacts of wind power on terrestrial mammals. A synthesis - SWEDISH ENVIRONMENTAL PROTECTION AGENCY REPORT 6510, 52 pp.

¹⁶³ Łopucki R. & Mróz I. 2016. An assessment of non-volant terrestrial vertebrates response to wind farms-a study of small mammals. - *Environ Monit Assess* 188: 122

¹⁶⁴ Łopucki, R., Klich, D. & Gielarek, S. 2017. Do terrestrial animals avoid areas close to turbines in functioning wind farms in agricultural landscapes? - *Environ Monit Assess* 189: 343

¹⁶⁵ Łopucki R., et.al. 2018. Living in habitats affected by wind turbines may result in an increase in corticosterone levels in ground dwelling animals - *Ecological Indicators*, Volume 84, pp. 165-171

¹⁶⁶ Agnew R.C.N., Smith V.J., Fowkes R.C. 2016. WIND TURBINES CAUSE CHRONIC STRESS IN BADGERS (*MELES MELES*) IN GREAT BRITAIN. *J Wildl Dis*, 52 (3), pp. 459–467

¹⁶⁷ Berg E. 2024. Wind of change. Wind power establishments correlate with changes in moose harvests in central Sweden and Norway. Master thesis at Uppsala University

Table 6.4.11. Mammal species and species groups in the study area

Species	% of LV population*	Species value: points 0-4				Status in Latvia and the EU (Annex to the Species and Habitats Directive)
		economic**	ecological ***	recreational and aesthetic ****	Scientific *****	
Small mammals (insectivores, rodents, carnivores)	<1	0	3	1	3	To be saved
Forest sista <i>Sicista betulina</i>	<1	0	1	1	3	Special Protection Area (BD V)
Beaver <i>Castor fiber</i>	<1	3	4	3	4	Game, specially protected, restricted, (BD V)
Squirrel <i>Sciurus vulgaris</i>	<1	0	3	4	3	To be saved
White Hare <i>Lepus timidus</i>	<1	1	3	3	3	Game, specially protected, restricted, (BD V)
Grey hare <i>Lepus europaeus</i>	<1	1	3	3	2	Prey
Brown bear <i>Ursus arctos</i>	1-10	0	3	3	4	Special Protection Area (BD II,IV)
Grey wolf <i>Canis lupus</i>	<1	2	4	3	4	Game, specially protected, restricted, (BD V)
Fox <i>Vulpes vulpes</i>	<1	1	3	3	2	Hunt
Raccoon dog <i>Nyctereutes procyonoides</i>	<1	1	2	1	2	Prey
Lūsis Lynx <i>lynx</i>	<1	0	4	4	4	Special Protection Area (BD IV)
Ūdrs <i>Lutra lutra</i>	<1	0	4	4	4	Special Protection Area (BD II,IV)
American mink <i>Neovison vison</i>	<1	1	2	1	2	Prey, to be restricted as an invasive species
Badger <i>Meles meles</i>	<1	1	3	3	2	Prey
Forest marten <i>Martes martes</i>	<1	1	2	2	2	Game, specially protected, restricted use, (BD V)
Rock marten <i>Martes foina</i>	<1	1	2	2	2	Hunt
Ferret <i>Mustela putorius</i>	<1	1	2	2	3	Game, specially protected, restricted use, (BD V)
Elk <i>Alces alces</i>	<1	4	3	4	4	Prey
Red deer <i>Cervus elaphus</i>	<1	4	3	4	3	Prey

Species	% of LV population*	Species value: points 0-4				Status in Latvia and the EU (Annex to the Species and Habitats Directive)
		economic**	ecological ***	recreational and aesthetic ****	Scientific *****	
<i>Roe deer</i> <i>Capreolus capreolus</i>	<1	4	3	4	3	Hunt
<i>Wild boar</i> <i>Sus scrofa</i>	<1	3	3	2	4	Prey, to be restricted due to ASF

*the proportion is based on the approximate proportion of the area covered by wind farms (WPP "Limbaži" and WPP "Valmiera-Valka") (i.e. 136 km²) in relation to the area occupied by the species in the whole country;

**based on importance for the game farm;

***based on impacts on other species, habitats, ability to affect forestry, agriculture, fish farming;

****based on the possibility of being observed during visits to forests related to tourism or other non-management activities;

*****based on research, monitoring or education-related demonstration

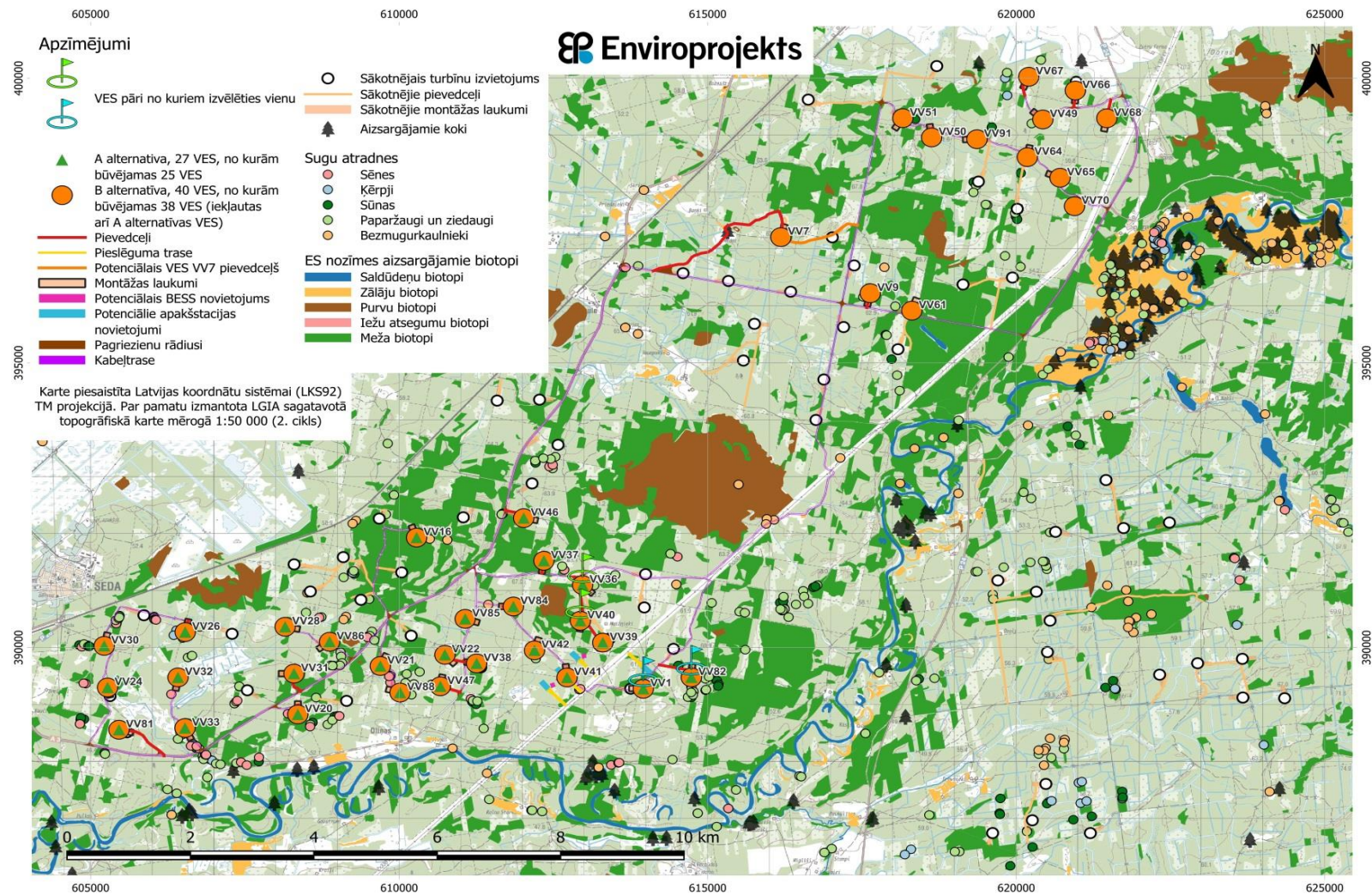


Figure 6.4.5. Natural values in and around the WPP Valmiera-Valka

6.5. Scenic and cultural heritage significance

6.5.1. Landscape characteristics

According to the landscape division, the territory of the WPP Park falls within Gaujaszeme (Figure 6.5.1).

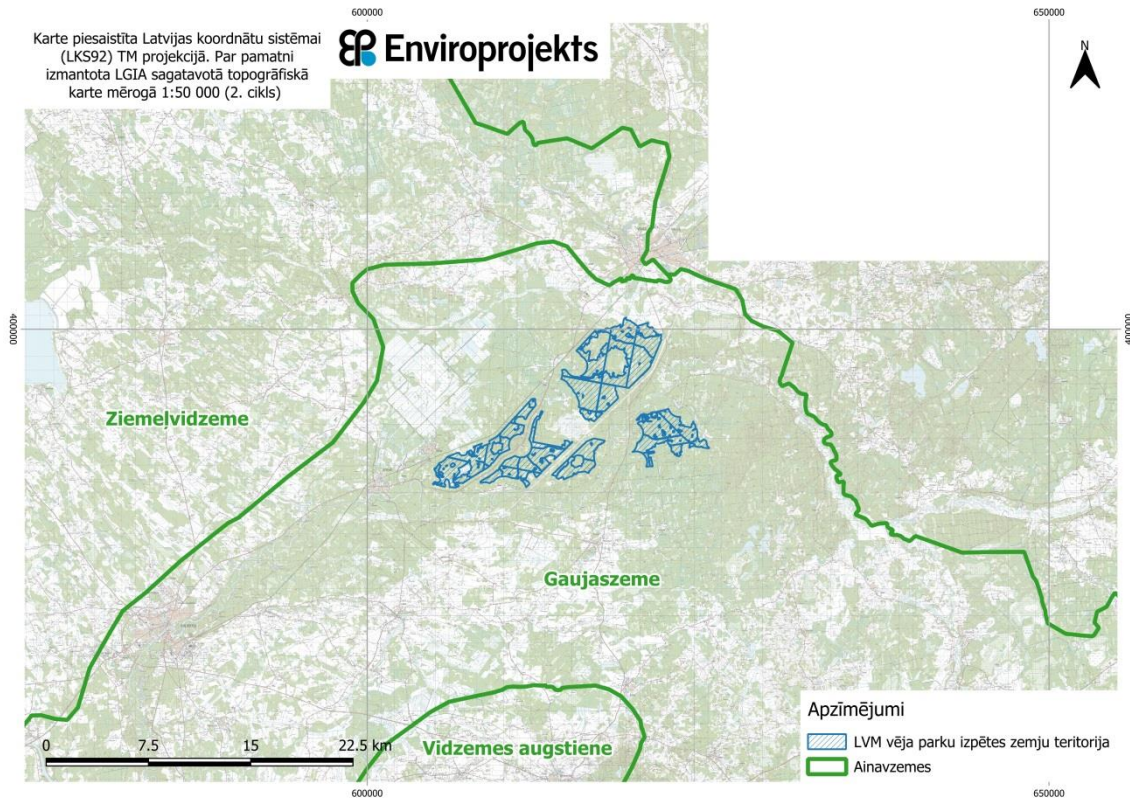


Figure 6.5.1. Location of the proposed activity site according to the landscape¹⁶⁸

Physiogeographically, the territory of the WPP Park is part of the Sedas Plain of the North Central Lowlands, while the south-western part of the study area is located in the Trikata Upland of the North Central Lowlands, the northern part - in the Ergeme Hills of the Sakala Upland, the north-eastern part - in the Karula Upland of Estonia, and a small part of the eastern part - in the Aumeistari Upland of the North Central Lowlands.

The study area is crossed by several national, regional and local roads. The national road A3 separates the western part of the planned WPP site from the rest of the site, the regional road P24 separates the eastern part of the site, and the rest of the proposed development area is located between the A3 and P24 roads. The operational area is also bordered by the V261 and V260 roads, but the operational area itself has an extensive road network built by JSC Latvijas Valsts Meži, which means that the existing road network is very dense and fewer new roads will need to be built for the construction of the WPP, see Figure 6.5.2. The study area also includes the P23, P25, V240 and V237 motorways, as well as several municipal roads.

¹⁶⁸ <https://experience.arcgis.com/experience/32051c63871a47f1a6446a04f8ade1c2/page/Ainavas-kart%C4%93s/>

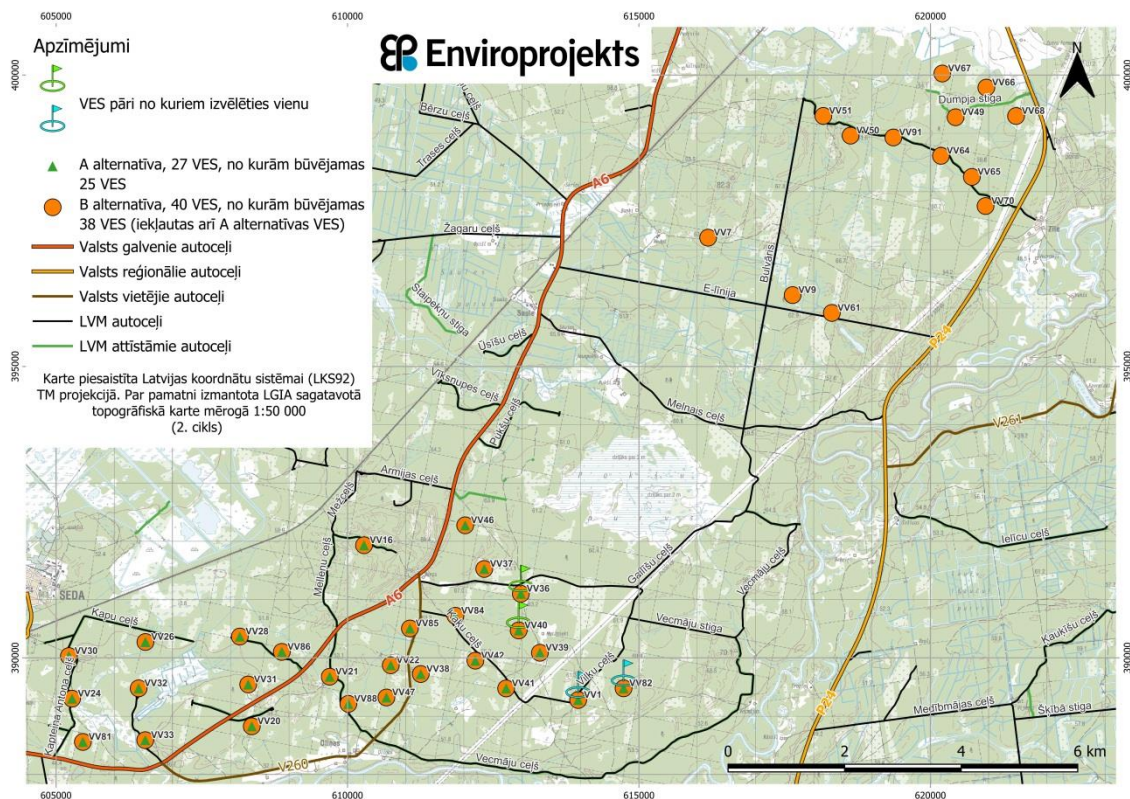


Figure 6.5.2. National, regional, local and LVM roads in the vicinity of the proposed area of operation

The visibility of WPP is affected by distance, colour, weather conditions (overcast or sunny), the angle at which the sun's rays fall on them and the angle from which they are viewed. On clearer days, the sky will be more visible because of the colour contrast, but on cloudy days, the WPP will blend into the sky and be less visible, thus having less of an impact on the surrounding landscape. To reduce their visual impact on the surrounding area, it is preferable to choose light colours for the rotors and earth tones (green) for the supports, thus blending them into their surroundings and further reducing their volumetric impact on the landscape.

Landscapes change objectively as a result of the interaction between man and nature, and the appearance of new elements in the landscape is the result of modern human activity and the exploitation of natural opportunities. WPP are not a new element in the Latvian landscape, they are gradually becoming familiar and recognisable, especially in Kurzeme. The WPPs assessed in this EIA are larger than the ones that have so far been installed in Latvia. The perception of landscape is subjective, so there is no reason to argue that WPP will reduce the overall value of the landscape: they will also exploit the potential of the landscape, creating a new dominant feature and place marker in the existing landscape. The inhabitants of the surrounding farmsteads and villages will experience a significant change in the landscape, as their everyday landscape will acquire new landscape elements that are unprecedented in this particular location, although already familiar elsewhere. Every new element in the landscape may seem out of place at first, but as time passes and the landscape changes, it takes on a life of its own and becomes an element of the local landscape, characterising the view and making the place recognisable.

The planned WPPs will be visible from various locations in the surrounding area, regardless of the chosen alternative, and will attract people's attention, as WPPs of this size are a relatively new element in the Latvian landscape.

The landscape that will be affected is important for the local population, whose opinions, arguments and preferences can influence the development of the site, but as technology develops, environmental policies change and overall priorities for electricity generation change, the construction of a WPP is both welcome and necessary to increase the use of wind energy in Latvia. As identified in the Strategic Environmental Assessment Environmental Report of the Latvian National Energy and Climate Plan 2021-2030, 2024 update (September 2024 version):

"The perception of a landscape is subjective: there are no objective criteria for whether a WPP as a landscape element has a positive or negative impact. However, as evidenced by decades of practice in the world, where WPPs are already a common element of the landscape, and by recent practice in Latvia, where very few WPPs still exist in nature, but there have been quite a few public consultations on the possible installation of WPPs, public attitudes towards the impact of WPPs on the landscape range from strongly negative to neutral, while positive attitudes (a desire to see WPPs as an enriching element in the landscape) are considered virtually unheard of. Overall, the public's subjective perception of the landscape impacts of the WPPs is negative.

In the developed countries of the world, where WPPs have been a common feature of the landscape for decades, society has accepted them both as an element of the industrial landscape and as a compromise element of the natural and resort landscape, which is inevitable due to both the far-reaching landscape impact of WPPs and the presence of wind more suitable for energy production on elevated terrain (which extends the landscape impact of WPPs) and in open areas, especially along the coast (a widely used environment for recreation).

The Latvian public is also expected to accept this subjective inconvenience as a trade-off for the sake of necessary energy sustainability, but for the time being, the planned rapid development of wind energy in Latvia can be assessed as having a negative impact on the landscape, and this impact can reasonably be assessed as significant. For these significant adverse impacts to be acceptable, the WPP parks should be built in locations where they do not significantly affect the SSSI with the landscape as the profiling protected asset, each project should be subject to an EIA and the project should only be implemented if no significant adverse impacts are identified."

The wind turbines are an example of modern architecture, differing from many other elements in the landscape in shape and scale of height. Given their size and rotor movements, they can become visually dominant elements in the landscape. It is important to recognise that the use of wind energy will expand and have an increasing impact on the landscape, but it is vital to be aware that these changes must be deliberate, taking into account the unique landscape, its values and its importance. Some landscapes may be particularly sensitive to wind energy, while wind turbines can add new values to other landscapes. The design and siting of features of this scale requires great care and respect for the site and its value, both in the creation of large parks and in the siting of individual turbines.

WPP are controversial elements of the visual landscape, which have different impacts on the visual values of the landscape at different angles and distances. Landscapes are very important in people's daily lives, forming the identity of places, so it is important to pay attention to how they change and what they mean. Public involvement in the creation of such sites and in landscape change is essential, as new uses and new landscape elements are often difficult to get into people's consciousness.

Within the framework of the European Landscape Convention (ELC), a landscape is an area as perceived by people and as a result of natural and/or human activity and interaction. So too, the "new landscapes" in which wind farms appear are part of the landscape for which

"landscape management", "landscape protection" are essential and whose creation cannot take place without "landscape planning" - forward-looking actions to improve, restore or create new landscapes.

On-site surveys of the study area and its surroundings have been carried out of the most significant landscape features (within a 10 km radius around the outer WPPs) whose viewsheds may be affected. 10 km assessment area is defined in accordance with *the Guidelines for the Preliminary Environmental Impact Assessment of the Construction of Wind Power Plants*¹⁶⁹ from the outermost tower of the wind farm (such a boundary of the wind farm is defined by the Cabinet of Ministers Regulation No 240 "General Regulations on Planning, Use and Construction of the Territory", paragraph 163.5). As the WPPs are planned in a forested area and at the same time the sites to be assessed do not allow the construction of wind turbines in their immediate vicinity, the surroundings outside the potential WPP area have been assessed.

Although wind turbines will be visible at distances of more than 20 km in clear weather conditions,¹⁷⁰ their impact on the landscape at such distances has not been assessed, as the surface area of the viewshed covered by them would be proportionally small. However, it is taken into account that in this case - the wind farm - the wind turbines will have a cumulative impact.

Landscape assessment follows the guidelines for local landscape planning approved by the MoEPRD.¹⁷¹

Most of the WPP study area is considered to be part of the Latvian forest landscape included in the Latvian landscape canon. According to the Landscape Canon, "forests are Latvia's most important natural treasure. Not only do they have great economic value, but forests also provide habitat for many [...] species and an important social function, providing recreational and leisure opportunities for people." Forests are defined as one of the main contributors to the Latvian landscape. In the context of the WPP study area, it is the forest massifs that "form the characteristic forest landscape of Latvia", but the description of the canonical landscape does not forget that the landscape has been and continues to be shaped by anthropogenic processes, in this case the construction of the wind farm.

In his description of the canonical forest landscape, O. Nikodemus implicitly identifies the Strenči forest massif as a reference area for one of the most highly valued types of boreal coniferous forest - white silts (inland dunes covered with white lichens).¹⁷²

The plan is to locate the turbines primarily in clearings and copses, which is the right thing to do from a landscape point of view. Non-associated deforestation in the area of the proposed activity or in the area immediately adjacent to it should be proportionally reduced, thereby compensating for the reduction in forests.

According to the EAC, landscape planning is the consistent, forward-looking action to improve, restore or create new landscapes.

Landscape planning at national level

In Latvia, the landscape is defined by national planning documents: Latvia's National Development Plan 2021-2027 (NDP2027) and Latvia's Sustainable Development Strategy 2030

¹⁶⁹ <https://www.vvd.gov.lv/lv/media/9969/download?attachment>

¹⁷⁰ <https://www.vvd.gov.lv/lv/media/9969/download?attachment>

¹⁷¹ https://www.varam.gov.lv/sites/varam/files/content/files/vadlinijas_viet_limenim_2019.pdf

¹⁷² <https://kulturaskanons.lv/archive/latvijas-mezu-ainava/>

"Latvia2030" (hereinafter - Latvia2030). In 2024, the Landscape Policy Implementation Plan 2024-2027 (LIPP) was adopted with the aim to create conditions for the development of diverse, accessible landscapes that improve the quality of life of people throughout Latvia by ensuring good environmental status, including biodiversity, preserving and developing the common cultural and natural heritage, promoting economic activity, as well as strengthening the sense of place, patriotism and place identity of people.

The following is also mentioned in the APIP: *in line with the objectives of the European Green Deal and Latvia's energy independence, landscape assessments at regional and local scales should take into account that energy independence and security are as important and should be taken into account as tourism and environmental protection. The Latvian cultural canon on seascapes also stresses that "climate change is predicted to lead to sea level rise and increased storms, which could potentially have a major impact on coastal landscapes. The development of wind farms, both offshore and onshore, as part of climate policy will also change the seascape. But this is the nature of this dynamic landscape, at once strong and fragile, which will always be and remain the interplay of sea and land."*

The Latvian Landscape Atlas associated with the AAP identifies proposals for areas of national scenic value. They do not include the proposed activities and the study area. The nearest such area is the Gauja Valley, which is just over 10 kilometres from the nearest assessed location of the WPP turbine, and therefore can be considered to be unaffected or a minor background feature.

According to Latvia2030, the largest part of the area of the proposed activity and the study area is defined as one of the spaces of national interest: the space of concentration of nature, landscape and cultural heritage areas (see Figure 6.5.3).

The Latvian National Development Plan 2021-2027 (NDP2027) sets out the following directions for the development prospects of these territories until 2027:

- support for measures to preserve biodiversity and the unique natural and cultural landscapes typical of Latvia, and to create a multifunctional and productive rural area, while providing reasonable compensation mechanisms for restrictions on economic activity;
- studying, defining and planning landscapes, cleaning up and regenerating degraded landscapes. Establishing conditions of use for areas of nature, culture and recreation of public importance, ensuring their public accessibility and providing for the protection of areas of scenic importance;
- Public involvement and education on the management and conservation of protected natural areas and cultural landscapes in cooperation with landowners (embedding the principle of "natural and cultural heritage as an asset for the territorial community");
- sustainable and sustainable use of natural and cultural resources for economic development and business-friendly environment

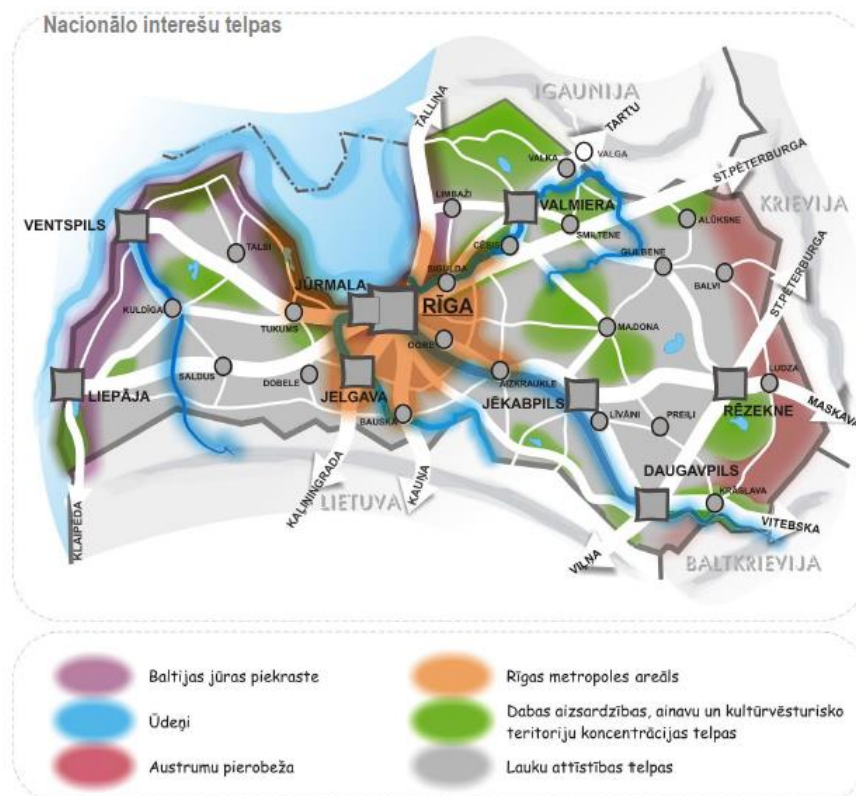


Figure 6.5.3. Latvian national interest areas.

Landscape planning at regional level

According to the Vidzeme Planning Region (VPR) Sustainable Development Strategy, the *attractiveness of places* is mentioned among the most important directions for action. It is pointed out that Vidzeme's identity is closely linked to the region's cultural and natural heritage, including its intangible cultural heritage, a creative environment that nurtures cultural diversity while preserving cultural heritage, directly and indirectly supports the creation of new products, and creates a fertile ground for the development of territories. An important aspect is the exploitation of the region's landscape potential through improved spatial identification and development planning, and the preservation and use of the region's cultural and natural capital.

The study area falls within the *Vidzeme Special Border Area*, defined as an area of natural, cultural, historical and scenic value (see Figure 6.5.4). It is a concentration of natural and cultural heritage sites of international, national and regional importance, characterised by high scenic quality and biodiversity. The Strategy sets out the directions in which such areas should be developed (only those relevant to the site and the planned activity are mentioned):

1. identification, conservation, wise management and use of natural, landscape and cultural heritage sites
2. Developing ecological networks, maintaining green corridors for species migration;
3. Establishing conditions of use for areas of nature, culture and recreation of public importance, ensuring public access to waterfronts, natural and cultural monuments and providing for the protection of places of scenic importance;
4. Protecting, maintaining and developing landscape areas, which are essential for recreational uses associated with the landscape, so as to create the conditions for leisure opportunities in nature and the landscape, while also meeting the requirements for the protection of species and habitats;

5. Supporting environmentally friendly economic activity;
6. development of eco-tourism sites and tourism infrastructure
7. Development of business and tourism services infrastructure in the context of enhancing the quality of the cultural landscape;
8. Maintaining and nurturing the cultural landscape by preserving the topography and developing its individual elements.

It is also noted that the diversity and aesthetic quality of the landscape in areas of scenic value must not be compromised, with no loss of panoramic views or obscuring of sites of cultural and historical importance.

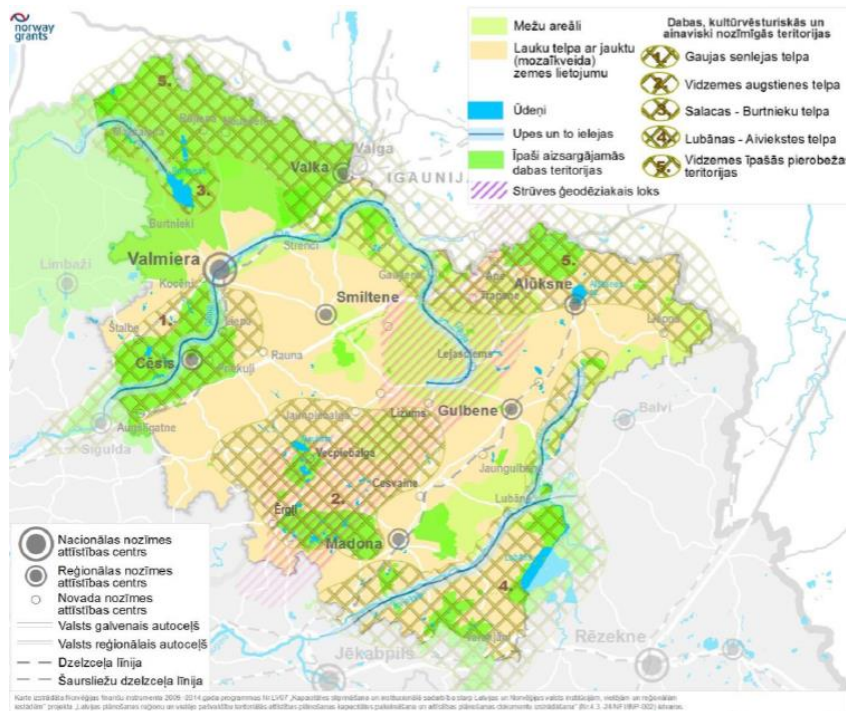


Figure 6.5.4. Natural, cultural, historical and scenic valuable territories of Vidzeme planning region.

The site also falls within *a forested area*. The following guidelines are related to sustainable landscape protection:

- the possibility of forestry activities in ecologically and scenically valuable areas, in accordance with environmental and nature protection requirements;
- wood processing and manufacturing facilities should be located without detracting from the value of the surrounding landscape and close to existing regional infrastructure;
- when planning new industrial sites, the primary use should be for areas where no change of use from forest land to built-up area is required.

NPSs are seen as new industrial space and are also comparable to the impact of the construction of manufacturing plants.

Due to the Gauja valley, which effectively divides the study area into two parts, the territory also falls within *the area of river valleys* defined as important for tourism and recreation development.

Landscape planning at local level

Landscape planning is regulated by the current planning documents of Valmiera (including Brenguļi, Ēvele, Jērceni, Plani, Trikata parishes, Seda and Strenči towns) and Valka (Ergeme, Valka, Vijciems, Zvārtava parishes, Valka town) municipalities, as well as the historical Strenči

and Beverīna municipalities. As the former Beverīna municipality is far away from the area of operation and Smiltene municipality includes only a small part of Bilska municipality, the planning documents of these municipalities have not been analysed.

The Valmiera District Sustainable Development Strategy mentions that attractive and green living, natural values and the landscapes of the Northern Vidzeme region are among the district's roles at national level. At the county level, the areas of landscape value and cultural and historic interest are identified, based on the SSSI framework, in this case: The landscape protection areas of the NVBR and the Northern Gauja AAP.

The Strenči Municipality Spatial Plan (hereafter - SNTP) was developed in 2011 (although originally intended for 2023, it is valid until the adoption of the new Valmiera Municipality Spatial Plan), before the development of national level documents and guidelines regulating landscape planning. The landscape section of this planning document is not very detailed and structured. However, one of its objectives is to preserve natural and cultural heritage, landscape and biodiversity. The plan does not define any specific high-quality viewpoints; the oak alleys in Jērceni parish and the birch alleys in Plani parish are indicated as scenic road sections. Important landscapes, including landscapes of conservation concern, are identified (see next subsection).

The tasks of the *Valka Municipality Spatial Plan* (hereinafter – VMSP) include: to ensure the quality of the environment and opportunities for rational use of the territory; to preserve natural and cultural heritage, landscape and biodiversity, as well as to improve the quality of the cultural landscape and settlements. The plan's environmental report states that "before changing land use, the environmental and landscape impacts of such activities in the immediate and more distant vicinity should be carefully assessed". This is being done as part of the EIA process.

It is important that the VMSP defines one of the four priority development directions of Valka County as "*valued natural capital and preserved cultural and historical heritage*".

6.5.2. Characteristics of cultural heritage

According to the cartographic information of the information system "Heritage"¹⁷³, there are 19 monuments of cultural heritage in the study area. 13 of them are archaeological monuments, three architectural monuments, one industrial monument, one artistic monument and one historical monument, the art monument "Altar" is located indoors, in the Vijciems Church. In terms of status, 6 monuments are of national importance, 9 monuments are of regional importance and 4 monuments are of local importance, see Table 6.5.2 and Figure 6.5.5.

Table 6.5.1. State-protected cultural monuments in the WPP study area

No. ¹⁷⁴	Name	Meaning of	Typology	Distance to the nearest WPP, km	Name of the WPP	WPP construction ¹⁷⁵
6884	"Ielīcas" (Farmstead)	of national importance	architecture	1,23	VV59	Not recommended

¹⁷³ <https://karte.mantojums.lv/>

¹⁷⁴ State protection number of the cultural monument.

¹⁷⁵ Additional information on the conclusions of the EIA is attached - significant environmental effects have been identified and construction of the WPP is not recommended

No. ¹⁷⁴	Name	Meaning of	Typology	Distance to the nearest WPP, km	Name of the WPP	WPP construction ¹⁷⁵
2400	Pauklis medieval cemetery	of regional importance	archaeology	3,29	VV82	
9198	Strenči Psychoneurological Hospital (Director's House)	of regional importance	architecture	3,85	VV24	
2401	Silbitari Antiquities	of national importance	archaeology	4,17	VV82	
2395	Lugazi Medieval Castle	of regional importance	archaeology	4,38	VV2	Not recommended
97	Vidzeme teachers' seminar	of regional importance	place/history of a historic event	4,52	VV92	
2394	Planči hillfort	of local interest	archaeology	4,55	VV66	
9280	Vijciema cone	of national importance	Industrial	4,96	VV53	Not recommended
2398	Vijciems Mound	of national importance	archaeology	4,96	VV82	
6883	Lugazi Lutheran Church	of national importance	architecture	5,56	VV67	
4483	Altar (in Vijciems Lutheran Church)	of national importance	Art	5,73	VV82	
2396	Lejasmuižnieki Ancient Monuments	of regional importance	archaeology	7,04	VV2	Not recommended
2388	Victims' Oak of Atpili	of regional importance	archaeology	7,7	VV81	
2384	Elvanci Antiquities	of regional importance	archaeology	8,06	VV1	

No. ¹⁷⁴	Name	Meaning of	Typology	Distance to the nearest WPP, km	Name of the WPP	WPP construction ¹⁷⁵
2391	Medieval cemetery of Lus	of local interest	archaeology	8,64	VV81	
2390	Libirtu Senkapi	of local interest	archaeology	8,84	VV81	
2372	Cannabis Holy Sol	of regional importance	archaeology	9,11	VV30	
2385	Mascatu Antiquities	of regional importance	archaeology	9,17	VV1	
2397	Mādzinas bog stone	of local interest	archaeology	9,55	VV82	

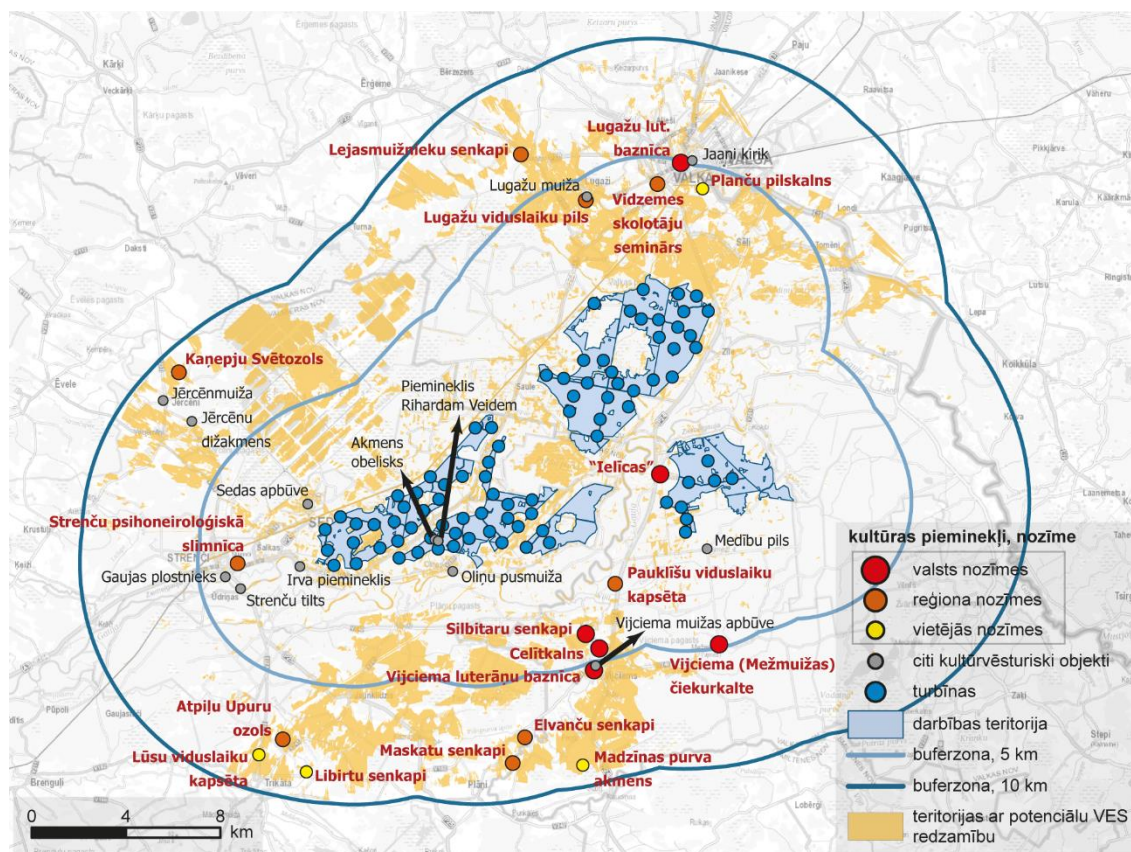


Figure 6.5.5. Cultural heritage and potential WPP visibility zones in the study area

26 other sites or objects of cultural or historical importance have also been identified within the study area (see Table 6.5.3). They include six monuments, nine architectural objects, six industrial heritage sites, two military heritage sites, an urban heritage site and a park. 16 of these sites have been recognised as cultural and historical sites of local cultural significance in Strenči Municipality (now part of Valmiera Municipality). These sites are covered by Section 9.2 of the SNTP Land Use and Development Regulations "Requirements for heritage sites of regional importance". It states that "Cultural and historical sites of regional importance are

determined by the Strenči Municipality Council and their destruction is prohibited. The condition and preservation of heritage sites is the responsibility of the owner. Demolition of cultural heritage sites and historic buildings is only permitted if it is technically impossible to preserve them. Closer sites, the existence of which has led to recommendations or which would be directly or indirectly affected by the proposed action, have been assessed in depth.

Table 6.5.2. *Other significant cultural and historical sites in the study area. Ranked by distance to the nearest WPP turbine*

Name	Typology	Cultural heritage site of municipal importance ¹⁷⁶	Distance to the nearest WPP, km	Name of the WPP
Stone obelisk	Monument	Yes	0,19	VV21
Monument to the Crown Prince of Prussia	Monument		0,23	VV38
Monument to Rihards Veide	Monument		0,34	VV21
Oliņi half-manor	architecture		1,06	VV47
Hunting Castle	architecture		1,16	VV53 (not recommended)
Seda buildings	urban planning	Yes	1,31	VV30
Irva monument	Monument		1,35	VV24
Tar and turpentine factory	Industrial	Yes	0,98	VV88
Freedom fighting trenches	Military	Yes	2,26	VV24
Charcoal burning site	archaeology	Yes	2,32	VV82
Graves of Holocaust victims	Monument		2,64	VV24
Sand dam	Industrial	Yes	3,8	VV24
Enclosures and fortifications. In the vortex of love	Military	Yes	3,97	VV81
Strenči Bridge	Industrial	Yes	4,03	VV24
Strenči Lutheran	architecture	Yes	4,43	VV24

¹⁷⁶ Strenči Municipality 2011. *Strenči Municipality Spatial Plan 2012-2023*. Part 1. Paskaidrojuma raksts. <https://geolatvija.lv/geo/tapis#>

Name	Typology	Cultural heritage site of municipal importance ¹⁷⁶	Distance to the nearest WPP, km	Name of the WPP
Church				
Reinforcement of the right bank of the Gauja	Industrial	Yes	4,48	VV24
"Rafter of the Gauja"	Monument		4,48	VV24
Lugazi Manor	architecture		4,53	VV2 (not recommended)
Strenči fire station	Architecture/industrial	Yes	4,63	VV24
Verstu stabs	Industrial	Yes	4,83	VV30
Horse Post Office building	architecture	Yes	5,03	VV24
Vijciems manor buildings	architecture		5,57	VV82
Jaani kirik (St John's Church in Valga)	architecture		5,68	VV67
Jārcēnmuiža	architecture	Yes	8,79	VV30
New Jārcenai Park	park	Yes	8,83	VV30
General Karl Goppers Memorial Room in his birthplace	place of a historical event	Yes	8,84	VV1

6.5.3. Tourism and recreation opportunities in the area

The area of the proposed action and the landscape study area has a fairly wide and varied offer of educational (non-commercial) and nature tourism. There are many point tourist attractions, but at the same time an unusually large number of tourist routes of different significance. (see Figure 6.5.6).

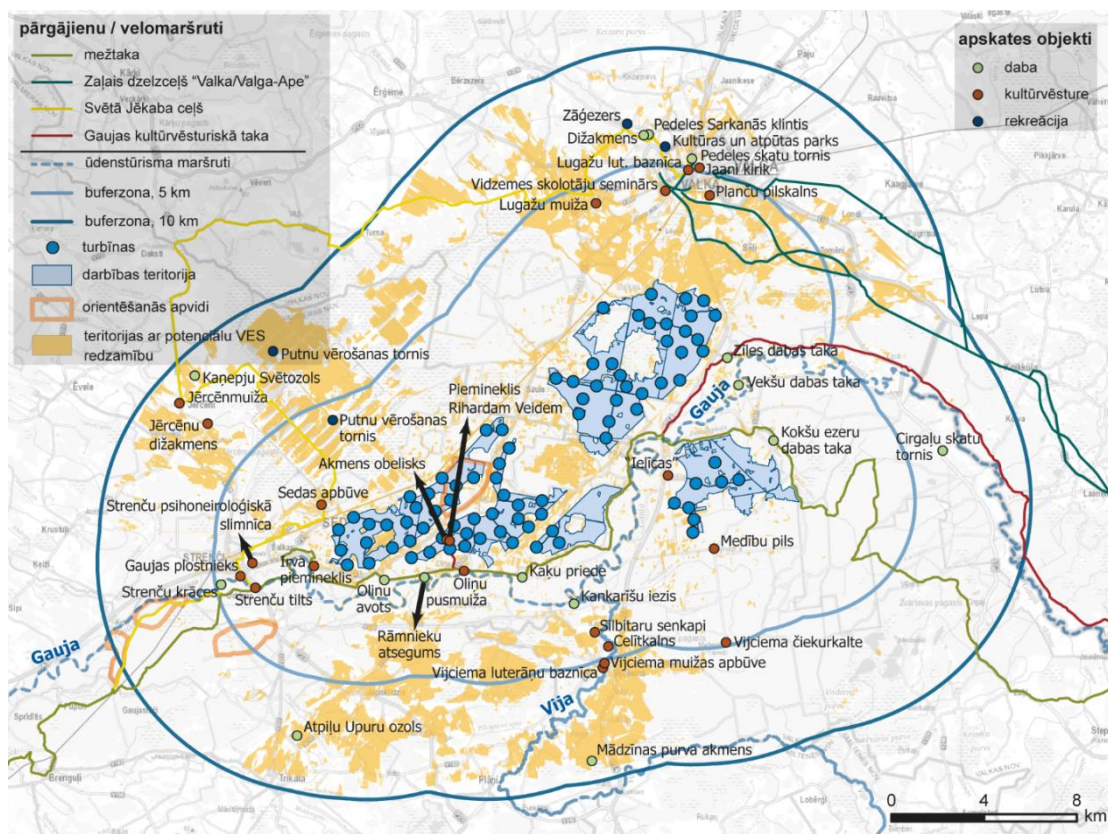


Figure 6.5.6. Tourist attractions, cycle routes, hiking and water routes and orienteering areas in the study area

Number of tourists

There is no specific data on the number of tourists in the landscape study area. The CSO tourism data on accommodation¹⁷⁷ in Valka county can be used (it would be difficult to correctly apply the Valmiera county data to the territory of the former Strenči county), although it should be assumed that they are not complete, if only because not all tourism operators register all their guests. In 2022 and 2023, Valka District accommodation will cater for 1598 and 1890 guests respectively. So the number has increased significantly. However, the reliability is undermined by the statistics that only 29 and 2 foreign guests were served respectively.

For most of the attractions in the study area, there is no specific data on the number of tourists. It is known that **the Cigali lookout tower is visited by around 3000 people a year**.¹⁷⁸ The owner of Ielīcu tells us that the ethnographic farm is visited by a few thousand people.

Attractions

The nearest areas where tourist attractions are concentrated in groups are the surroundings of Strenči - Seda (buildings of both towns, Strenči environmental objects and the nature territory of Milestības veri; Seda swamp), around Vijciems (church, buildings, Kankarišu rock, Celītkalns, Bitarinkalns) and Olini Lielais Ies (Olini spring, Olini half-manor, Cat pine, Stone obelisks, etc.), the more distant areas are around Lugazi and Valka, and around Jērceni. The

¹⁷⁷ https://data.stat.gov.lv/pxweb/lv/OSP_PUB/START_NOZ_TU_TUV/TUV050m/table/tableViewLayout1/

¹⁷⁸ <https://www.daba.gov.lv/lv/jaunums/drosibas-apsverumu-del-slegts-cigalu-skatu-tornis>

ethnographic farm "Ielicas" and the Vijciems Hunting Lodge, where there is also an active tourism business (the guest house "Bergervilla"), are important sites of their own. For impacts on these sites, see Chapter 7.7.2 "Impacts on cultural heritage".

Recreational opportunities in the area of operation

The territory of the proposed activity falls entirely within state forest land managed by JSC Latvia's State Forests (LST). In its medium-term strategy 2022-2027¹⁷⁹, the company states that one of its objectives is to "provide natural diversity, recreational opportunities and other ecosystem services essential to society from forests and related ecosystems."

Recreational opportunities include mushroom picking and other natural resource gathering, fishing, physical activity (jogging, Nordic walking, cycling, etc.), walking, sunbathing, relaxing by the water, etc.¹⁸⁰

LST commissioned the Latvian State Forest Research Institute "Silava" to carry out a study on recreation in forests in Latvia (to be published in 2021). The results show that, depending on the season, 35-53% of respondents visit the forest for recreation on weekdays. Most people go to the forest in summer: 69% of respondents have been to the forest at least once on weekends, while the average Latvian visits the forest 7 times a season. It also asked how far respondents travel and how they get to the forest. On weekdays, people go to the forest up to 9 km away from their place of residence on average, and around 50% of holidaymakers go within 2 km. On weekends, it is further - 15 km away from the place of permanent residence, while 50% go no further than 5 km. On weekends and during holidays, people most often go to the forest by car (40-50%), while on weekdays they walk (37-67%) and drive (26-43%).¹⁸¹

Equally important is the type of forest that holidaymakers prefer. "The most suitable place for recreation for the Latvian population is a forest, which has been slightly landscaped, preserving its relative naturalness. The second most suitable alternative is a forest that has been improved and turned into a park, and the third most suitable forest landscape for recreation is a forest that has not been affected by economic activity. Forests with active forestry are last in terms of suitability."¹⁸²

As the area of the proposed activity is adjacent to several SSSIs, it would be important to understand how visitors to these SSSIs might view the proposal. In 2022, the results of the monitoring of visitors to Specially Protected Nature Areas (carried out by Vidzeme University of Applied Sciences in cooperation with NCA) were published.¹⁸³ The study uses both visitor counter data and a survey of 11 visitors (both locals and travellers) to the SSSIs (not located in the study area). Factors that determine attraction to a place are important: 'attractive landscapes' (79.5%) and 'unspoilt wilderness' (59.3%) are the most frequently mentioned as very important. The most common descriptors used by residents to describe the benefits of

¹⁷⁹ https://www.lvm.lv/images/lvm/demo/lvm_videja_termina_darbibas_strategijas_kopsavilkums.pdf

¹⁸⁰ Institute for Social, Economic and Humanitarian Studies (VIA HESPI) 2022. *Monitoring of visitors to specially protected areas. Report on the survey results.*

¹⁸¹ <https://www.lvm.lv/jaunumi/5517-petijums-latvijas-iedzivotaju-paradumi-atputai-meza>

¹⁸² <https://www.lvm.lv/jaunumi/5517-petijums-latvijas-iedzivotaju-paradumi-atputai-meza>

¹⁸³ Institute for Social, Economic and Humanitarian Studies (VIA HESPI) 2022. *Monitoring of visitors to specially protected areas. Report on the survey results.*

living in a SSSI are "nature", "quiet", "close" and "beautiful". The most common reason for visiting a SAC is to "enjoy nature". The proposed activity would result in a reduction in attractive landscapes and intact wildlife (for the activity to take place outside the SPA, but still be perceived as being within it).

According to the LVM Forest Management Plan (FMP), LVM identifies individually planned areas (IPAs), i.e. forest areas that "require individual planning for the provision of forest values (ecosystem services - mainly regulating, supporting and cultural activities) of importance to the local community within the framework of the goals and objectives set by the LVM Strategy and Tactical Plan". The MDP states that such areas should be created in places of concentration of natural and/or recreational assets.¹⁸⁴ Other LVM materials, such as the LVMGEO spatial data browser, indicate that these areas should also be designated for the conservation and enhancement of landscape values. According to these data, there are 79 different sizes of ISPs in the country.¹⁸⁵

Although the area of the Proposed Action has been identified as an area of significant scenic value, nature and cultural heritage at the national and Vidzeme planning region level¹⁸⁶, no IBAs have been established here. There are also no separate recreational forests (there are only two in the whole East Vidzeme region, near Smiltene and the High Mountains (near Vēlna, Gulbene municipality)). The closest IPT is "Strenči" near Strenči (in Mīlestības vēri, near the Strenči Bridge, between the core of Strenči and Šalki, up to Kauči), covering an area of almost 258 ha. A large part of it is located in the Northern Gauja AAP. This is the only IPT in the entire study area. Moreover, not all of the area is practical for recreation due to natural conditions (old rivers, alluvial forests). Thus, of the LVM forest land of various statuses in the landscape study area (47 029 ha in total, including SSSIs), only 0.55% is defined as IPT. Thus, the IPT "Strenči" is the only LVM-provided outdoor recreation area accessible to the 9113 inhabitants of the study area, not to mention visitors to the area, for example, from Valmiera. Based on the LVM study on forest recreation, it can be calculated that about 4000 of these people would use the forest for recreation on weekdays, and about 6290 people would go to the forest at least once a year.

LVM also provides relatively point-based recreational facilities. The MAP states that "recreational opportunities have been identified and evaluated, and more than 300 tourist sites have been developed¹⁸⁷: rest areas, nature trails, sightseeing attractions, including 10 lookout towers". LVM points out that forests are diverse, so "recreational opportunities are also diverse - berry picking, mushroom picking, walks, especially near towns, active recreation". Hunting has been identified as another important form of recreation.¹⁸⁸

There are no recreation sites managed by LVM in the area of the proposed activity, such sites are located in the territory of the Northern Gauja AAC near the Gauja River. According to

¹⁸⁴ JSC "Latvia's State Forests" 2023. Forest Management Plan of JSC "Latvia's State Forests" for 2022-2026. Public part.

¹⁸⁵ <https://www.lvmgeo.lv/dati>

¹⁸⁶ Vidzeme Planning Region 2015.

¹⁸⁷ According to LVMGEO, there are 346 LVM fully or partially maintained recreation sites in the country

¹⁸⁸ JSC "Latvia's State Forests" 2023. Forest Management Plan of JSC "Latvia's State Forests" for 2022-2026. Public part.

LVMGEO data and the map of LVM tourism portal "mammadaba"¹⁸⁹(March 2024), there are 8 LVM-maintained recreation sites in the stretch from Aņņu Bridge to Ūdriņi¹⁹⁰, one of which is closed:

- Resting place by the Gauja "Bekas",
- Resting place by the Gauja River "Raft Walling Place",
- Resting place at the Gauja Spit Bridge,
- Resting place by the Gauja "Low Island",
- Resting place by the Gauja "Iežuleja",
- Resting place by the Gauja "Aiz Oliņām",
- Resting place by the Gauja "Kauči" (closed),
- Resting place by the Gauja "Ūdriņas".

As the location and the existence and condition of the access roads show, they are mainly intended for water tourists. 3 rest areas are easily accessible for motorists (at the Gauja Spicu Bridge, at the Gauja "behind Oliņi", "Kauči" (now closed).

Another 3 LVM-managed sites are located further away: at Vijciems Čiekurkalte, at Lake Cepurīte and at Lake Valdis.

Geographically analysing the territory, it can be considered that recreation is least "supported" in the Strenči massif (from Strenči to Valka), where a large area outside the Special Protection Area does not have conditions more suitable for tourism and recreation. In general, LVM has not attempted to develop favourable recreational infrastructure and conditions outside the Special Protection Areas (SPAs) or in areas of economic forests in the study area.

Although there are no specific studies on recreation and tourism in the area of the proposed activity, it should be assumed that the area, especially closer to the settlements and farmsteads, is used for recreation and not only for orienteering (described below).

More detailed information on tourism and recreation opportunities and the impacts of the proposed action on them is provided in Chapter 7.8 "Impacts on tourism and recreation".

6.6. Residential houses and residential areas

The planned WPP area is divided into several separate parcels separated by roads and marshland, all parcels planned for WPP development are located in forest areas. The WPP site is surrounded by large areas of woodland and marshland, which has also influenced the intensity of settlement. Farmsteads in the immediate area around the WPP are sparse and rare, with no farmsteads within 800 m of potential WPP sites, however the study area includes a number of densely populated settlements (Table 6.6.1). The densest population density is found in the direction to the R from the potential WPP area, in Seda (1197 inhabitants) and Strenče (1042 inhabitants) (Figure 3.2). The largest settlement in the study area is Valka (4,935 inhabitants), which is located ~5.1 km from the nearest proposed WPP turbine. In the direction to the S the most densely populated places are Vijciems (277 inhabitants) and Jaunklidzis (80 inhabitants). The areas to the NW and E of the planned WPP areas are less populated,

¹⁸⁹ <https://www.mammadaba.lv/karte>

¹⁹⁰ There is also one recreation site maintained by the Valmiera Municipality near Strenči.

occupied by the Seda Moor and large woodlands respectively, and are therefore uninhabited or sparsely populated. A population density map in the vicinity of the WPP site can be found in Figure 6.6.1.

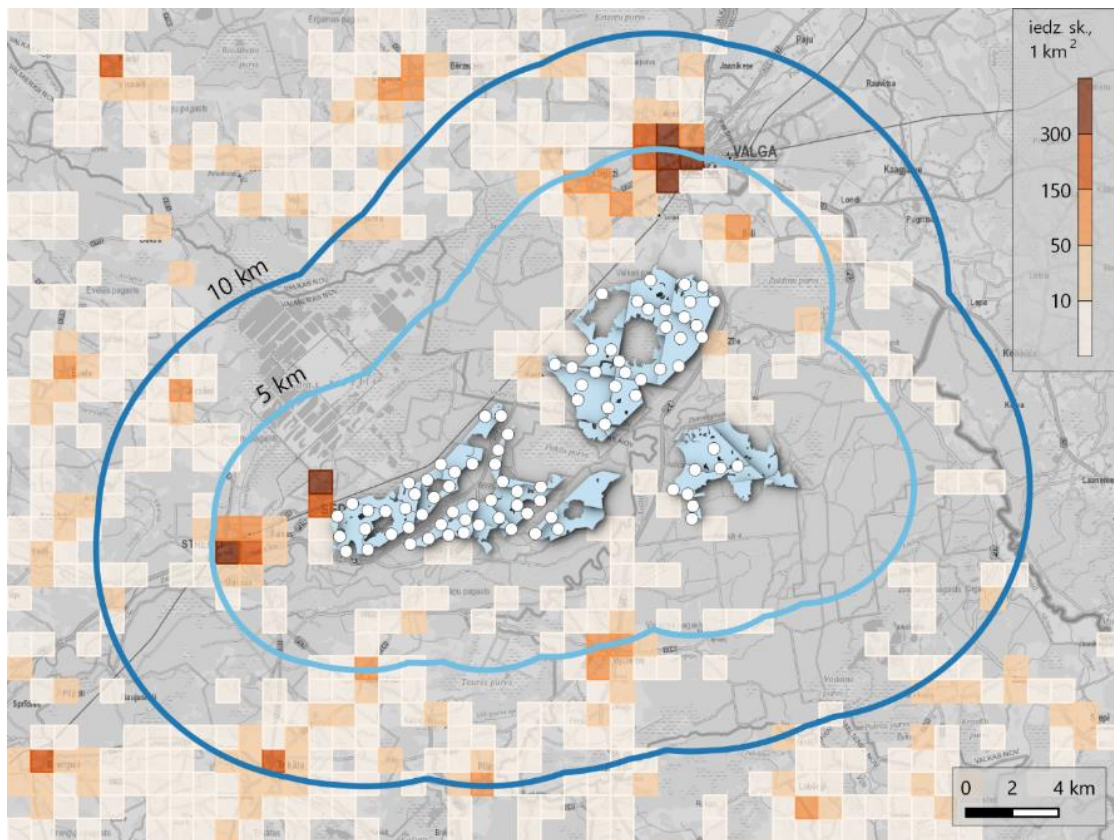


Figure 6.6.1. Population density in the area around the WPP study area

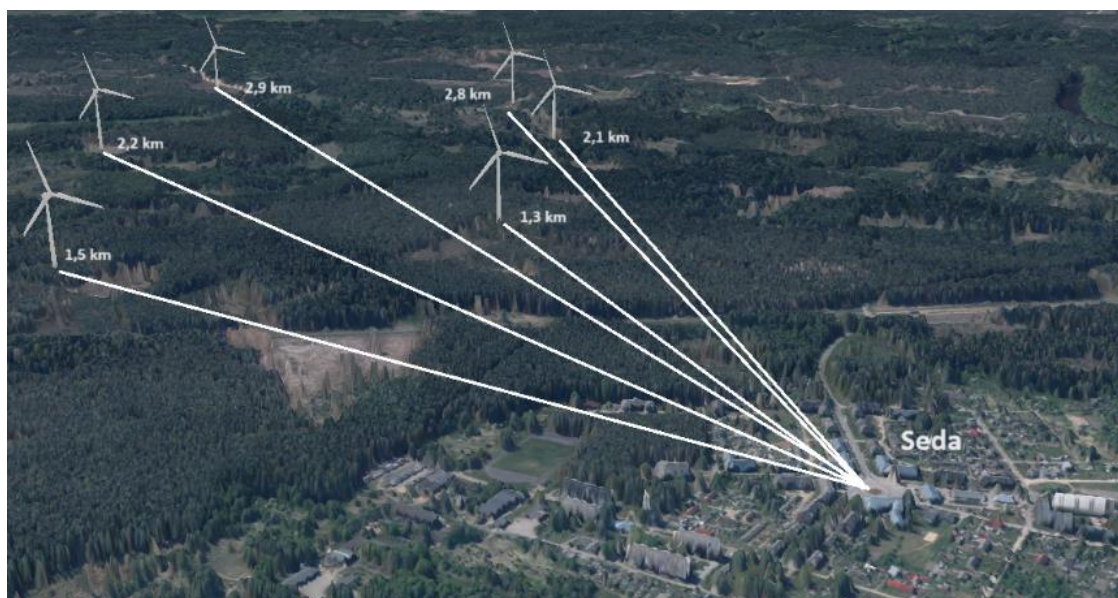


Figure 6.6.2. Location of planned WPP turbines closest to the centre of Seda

Table 6.6.1. Major settlements within 10 km around the potential WPP site

Settlement	See. Population (2022, PMLP)	Distance from roundabout from the centre of the site to the nearest potential WPP, km
Zile	32 ^{*191}	0,9
Seda	1197	1,2
Saule	32*	1,6
Seli	245	2,4
Schalk	50*	2,5
Strenči	1042	4,3
Luggage	230	4,6
Valka	4935	5,1
New	80	5,4
Vijciems	277	5,5
Tomatoes	33*	5,7
Jērceni	140	8,7
Trikata	313	9,8

Approximately 1 596 residences have been registered in the 3 km area around the WPP site, and 9 113 residences have been registered in the 10 km area around the Latvian territory.

It should be stressed that these figures are approximate, as information on the true population at specific addresses is not publicly available. It should also be mentioned that according to sub-paragraph 163.5 of Cabinet Regulation No 240 of 30 April 2013 "General Regulations on Spatial Planning, Use and Construction", the boundary of the wind park is defined from the outermost tower of the wind farm, therefore the decision not to install individual generators may affect the potential buffer zone, resulting in a significant change in the potential total population in each area.

6.7. Noise assessment

The planned location of the WPP Park is based on marshlands: the Laiviņi marsh in the north, the Pukši marsh in the middle and the Gauja marsh in the south. The WPP Park is located in an area bounded to the west-east by the national main road A3 and the regional road P24, and by rivers: the Gauja to the south and the Seda to the north (and also the P24). There are no settlements in the WPP area, only a few isolated farmsteads (see Appendix 2 for permitted development in the area). There are a few small settlements around the perimeter of the WPP park: on the south side - Oliņas, on the east side - Zile, on the west side - Saule. The nearest farmsteads (see Figure 6.7.1). are located approximately 800 m from the WPP. All noise-regulated areas are single detached dwellings surrounded by woodland. Virtually all individual WPPs are located in forest areas. The situation is louder near the A3 and P24, where traffic volumes are significantly higher than on the V260. However, as in the countryside, most of the farmsteads in the WPP Park are close to roads, the traffic noise from which already creates a noise nuisance for these houses. There are no noise-generating activities in the planned area

¹⁹¹ *(in this table) 2007 data from local parish councils. More recent data are not available.

of the WPP. Other industrial sites can be found in the larger settlements in the area, such as Seda. However, these settlements are all located outside the proposed NPPF and do not affect the noise levels of the NPPF at the nearest residential areas affected. The A3, P24 and V260 roads in the vicinity are mostly further away from the proposed WPP sites, however in some locations, as already mentioned, residential farmsteads are located close to these roads and road traffic noise has an impact on the noise levels of the farmsteads. The overall noise in the area is mainly natural, such as the rustling of tree leaves and grasses, birdsong; the A3 and P24 are the loudest of the surrounding roads.

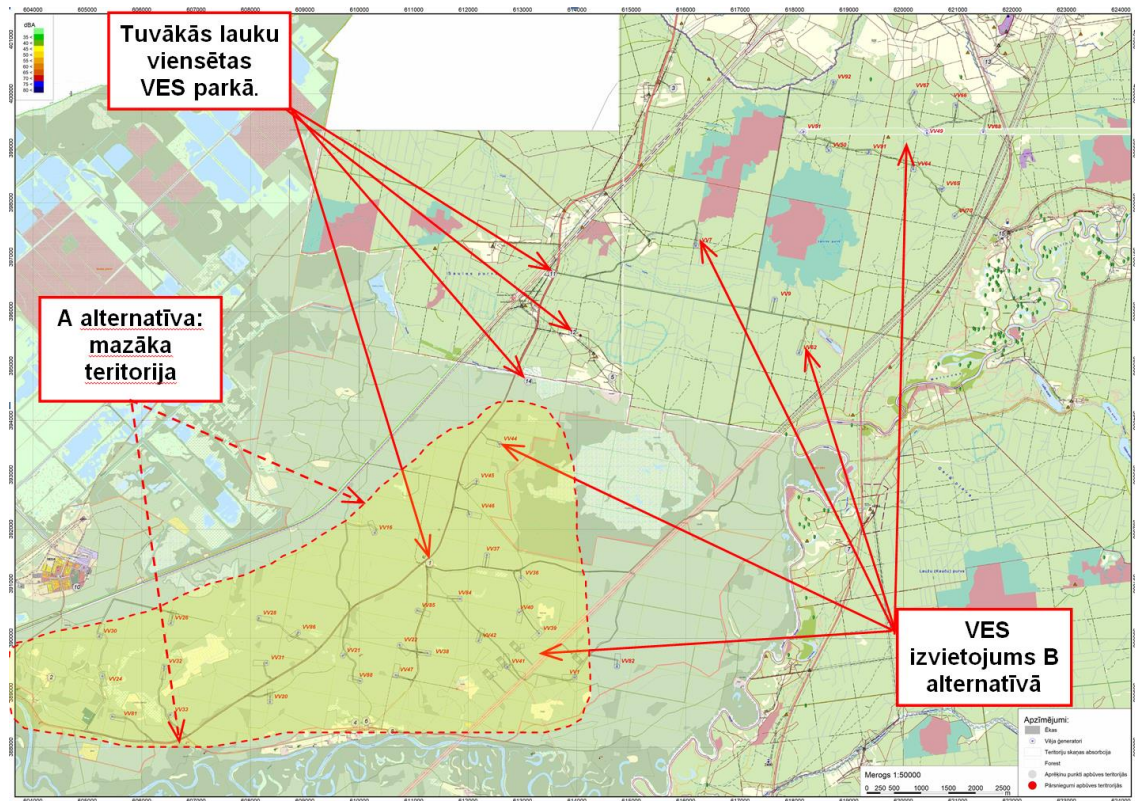


Figure 6.7.1. Overall location of the WPPs for Alternatives A and B.

To assess the existing noise situation in the vicinity of the WPP, road traffic noise has been modelled as a single source (noise propagation map in Annex 7) and compared with the traffic noise limit values set out in Cabinet Regulation No 16 of 7 January 2014 "Procedures for Noise Assessment and Management": the results are summarised in Table 6.7.1.

Table 6.7.1. Traffic noise levels in farmsteads

Designation of calculation points on the map	Designations of calculation points characterising built-up areas	Height of the calculation point above the site, m (according to Building Regulation 016, Annex 1, paragraph 1.4.2)	Long-term ambient noise indicator level, L_{day} dBA	Long-term ambient noise indicator level, L_{vakar} dBA	Long-term ambient noise indicator level, L_{night} dBA	Limit value for the long-term environmental noise indicator of the Building Regulation 016, L_{day}	Difference of the level of the environmental noise indicator L_{day} compared to the limit values of the LR MC noise standard, dB - below the limit value + above the limit value	Long-term environmental noise limit value of the noise limit value of the building regulation 016 of the Cabinet of Ministers of the Republic of Latvia, L_{vakars}	Difference in the evening level of the environmental noise indicator L compared to the noise limit values of the Building Regulation of the Council of Ministers, dB - below the limit value + above the limit value	Limit value of the long-term environmental noise indicator of the Building Regulation 016, L_{night}	Difference of the ambient noise indicator L_{night} level with respect to the noise limit values of the Building Regulation of the Council of Ministers, dB - below the limit value + above the limit value
1	Bērzi, Plani par.	1,5	46,2	43,6	38,9	65	-19	60	-16	55	-16
2	Dreimani, Plani par.	1,5	23,8	31,2	16,5	65	-41	60	-39	55	-39
3	Kalngulbj, Valkas pag.	1,5	23,3	25,7	21,0	65	-37	60	-34	55	-34
4	Kūminas, Plani par.	1,5	28,6	26,0	21,1	65	-36	60	-34	55	-34
5	Madaras 1, Valkas pag.	1,5	19,4	16,8	12,1	65	-46	60	-43	55	-43
6	Melderi, Plani par.	1,5	28,3	25,6	20,7	65	-37	60	-34	55	-34

Designation of calculation points on the map	Designations of calculation points characterising built-up areas	Height of the calculation point above the site, m (according to Building Regulation 016, Annex 1, paragraph 1.4.2)	Long-term ambient noise indicator level, L_{day} dBA	Long-term ambient noise indicator level, L_{vakar} dBA	Long-term ambient noise indicator level, L_{night} dBA	Limit value for the long-term environmental noise indicator of the Building Regulation 016, L_{day}	Difference of the level of the environmental noise indicator L_{day} compared to the limit values of the LR MC noise standard, dB - below the limit value + above the limit value	Long-term environmental noise limit value of the noise limit value of the building regulation 016 of the Cabinet of Ministers of the Republic of Latvia, L_{vakars}	Difference in the evening level of the environmental noise indicator L compared to the noise limit values of the Building Regulation of the Council of Ministers, dB - below the limit value + above the limit value	Limit value of the long-term environmental noise indicator of the Building Regulation 016, L_{night}	Difference of the ambient noise indicator L_{night} level with respect to the noise limit values of the Building Regulation of the Council of Ministers, dB - below the limit value + above the limit value
7	Mieriņi, Vilciema pag.	1,5	42,2	39,6	34,7	65	-23	60	-20	55	-20
8	Oliņas, Plani par.	1,5	17,9	15,3	10,5	65	-47	60	-45	55	-45
9	Ozoli, Vijciema pag.	1,5	21,7	19,1	14,2	65	-43	60	-41	55	-41
10	Parka street 23, Seda	1,5	18,8	16,2	11,5	65	-46	60	-44	55	-43
11	Saule 4, Valkas pag.	1,5	53,9	51,3	46,6	65	-11	60	-9	55	-8
12	Skujas, Valkas pag.	1,5	20,3	17,7	13,0	65	-45	60	-42	55	-42
13	Veverzemnieki	1,5	47,5	44,9	40,0	65	-18	60	-15	55	-15

Designation of calculation points on the map	Designations of calculation points characterising built-up areas	Height of the calculation point above the site, m (according to Building Regulation 016, Annex 1, paragraph 1.4.2)	Long-term ambient noise indicator level, L_{day} dBA	Long-term ambient noise indicator level, L_{vakar} dBA	Long-term ambient noise indicator level, L_{night} dBA	Limit value for the long-term environmental noise indicator of the Building Regulation 016, L_{day}	Difference of the level of the environmental noise indicator L_{day} compared to the limit values of the LR MC noise standard, dB - below the limit value + above the limit value	Long-term environmental noise limit value of the noise limit value of the building regulation 016 of the Cabinet of Ministers of the Republic of Latvia, L_{vakars}	Difference in the evening level of the environmental noise indicator L compared to the noise limit values of the Building Regulation of the Council of Ministers, dB - below the limit value + above the limit value	Limit value of the long-term environmental noise indicator of the Building Regulation 016, L_{night}	Difference of the ambient noise indicator L_{night} level with respect to the noise limit values of the Building Regulation of the Council of Ministers, dB - below the limit value + above the limit value
14	Vīksnupes, Plani municipality	1,5	34,4	31,9	27,1	65	-31	60	-28	55	-28
15	Zīle 4, Valkas pag.	1,5	23,8	21,2	16,3	65	-41	60	-39	55	-39

As can be seen, the noise levels are very low, being relatively highest at night in the Saule 4 home: 8 dB(A) below the night-time noise limit. The site is very quiet as it stands, with no existing noise sources which could significantly limit the creation of new noise sources.

6.8. Air quality assessment in the WPP area

Wind is a clean, renewable natural resource. The operation of WPPs does not result in emissions of pollutants into the air, which is one of the main arguments for the development of WPPs in Latvia as a "green" energy solution.

Construction equipment and transport for the construction of the WPP will cause insignificant, local, temporary and episodic air pollution, which will be localised in the construction zone, which is not located in the immediate vicinity of a residential area. During construction work, such as the use of machinery and access roads, including gravel roads, there is a risk of air pollution from dust particles PM₁₀ and PM_{2.5}, as well as nitrogen dioxide, and the concentration limit values for these substances are set by Cabinet Regulation No 1290 of 3 November 2009 "Regulations on Air Quality".

Table 6.8.1. Air quality standards

Pollutant	Determination period	Threshold
Carbon monoxide	8 hours	10 mg/m ³
Nitrogen dioxide	1 hour (19th highest value)	200 µg/m ³
	Calendar year	40 µg/m ³
PM ₁₀	24 hours (36th highest value)	50 µg/m ³
	Calendar year	40 µg/m ³
PM _{2.5}	Calendar year	20 µg/m ³

Cabinet of Ministers Regulation No 1082 of 30.11.2010 "Procedure for applying for and issuing permits for polluting activities of categories A, B and C" does not provide for a permit for wind power plants to carry out polluting activities. Annex 2 to the Cabinet of Ministers Regulation No 1082 of 30.11.2010 lists "wind power plants or power plant parks with a total capacity greater than 125 kilowatts" as category C polluting activities (equipment) that require registration, but the types of pollution they may cause (e.g. spills of lubricants during maintenance) do not include air pollution and do not require the preparation of emission limit projects in accordance with Cabinet of Ministers Regulation No 182 of 02.04.2013 "On Preparing Emission Limit Projects for Stationary Sources of Pollution".

The latest five-year *Air Quality Assessment in Latvia 2014-2018* report prepared by the LEGMC¹⁹² concludes that air quality problems in relation to human health are mainly concentrated in large cities, regardless of their location:

- In the observation period from 2014 to 2018, exceedances of the hourly lower pollution assessment threshold of 100 µg/m³ **for nitrogen dioxide** have only

¹⁹² https://videscentrs.lv/gmc.lv/files/Gaiss/Gaissa_kvalitate/Gaissa_kvalitates_novertejums_2014_2018.pdf

occurred in a few years. The most frequent cases were recorded at the observation station "Liepāja".

- The annual mean lower pollution assessment threshold value for **PM₁₀** for the protection of human health was exceeded at the **Liepāja** and **Rezekne** monitoring stations (impact stations for road traffic sources) from 2014 to 2018, as was the **World Health Organisation'**s recommended level (20 $\mu\text{g}/\text{m}^3$).
- At the **Liepāja** and **Rezekne** monitoring stations, exceedances of the daily **PM₁₀** upper (35 $\mu\text{g}/\text{m}^3$) pollution assessment threshold for human health protection were also recorded.
- Exceedances of the lower daily **PM₁₀** (25 $\mu\text{g}/\text{m}^3$) assessment threshold for human health protection were also recorded **at all** monitoring stations .
- The annual mean upper (17 $\mu\text{g}/\text{m}^3$) and lower (12 $\mu\text{g}/\text{m}^3$) pollution assessment thresholds for **PM_{2.5}** for the protection of human health were exceeded at the observation station **Rezekne** . The **World Health Organisation'**s recommended level of 10 $\mu\text{g}/\text{m}^3$ was also exceeded at all monitoring stations "**Liepāja**", "**Rezekne**" and "**Ventspils**" .

The latest LEGMC report on air quality in 2023¹⁹³ concludes similarly:

- In 2023, the daily average upper pollution assessment threshold value for **PM₁₀** (35 $\mu\text{g}/\text{m}^3$) for the protection of human health was exceeded at the monitoring station Rezekne - Atbrīvošanas 115A.
- The annual limit value for **PM₁₀** recommended by the World Health Organisation (15 $\mu\text{g}/\text{m}^3$) was exceeded at all stations except the field background monitoring station "Rucava".
- In 2023, the limit value for **PM_{2.5}** recommended by the World Health Organisation guidelines of 5 $\mu\text{g}/\text{m}^3$ was exceeded at all monitoring stations.

The air quality in the study area of the WPP Park has been assessed taking into account the requirements of Para 40 of the Cabinet of Ministers Regulation No 182 of 2 April 2013 "Regulations on the development of emission limit projects for stationary sources of pollution", which requires an official certificate from the LEGMC on the existing pollution level (background concentrations of air pollutants) for the potential impact area of the polluting activity, for which air quality standards are in force.

The existing pollution levels are described in the letter No 4-6/1385 of the LEGMC of 20 September 2024 (Annex 2) on the concentrations of air pollutants in the potential area of influence of the activity, excluding the contribution of the polluting activity. The area of potential effect for the determination of background concentrations is the area around the location of the polluting activity at a distance equivalent to the 20 highest emission source heights, but not less than 2000 m.

According to the information provided by the LEGMC, the annual average concentrations in the non-operator impact area (background concentrations) were modelled in EnviMan (perpetual licence No 0479-7349-8007, version 3.0) using a Gaussian mathematical model. The

¹⁹³ https://videscentrs.lv/mc.lv/files/Gaiss/Gaisa_kvalitate/Gaisa_kvalitates_novertejums_2014_2018.pdf

software is developed by OPSIS AB (Sweden). The calculations take into account the local topography and built-up area characteristics. For the meteorological characterisation, long-term observation data from the Rūjiena observation station for the period 2019-2023 were used.

Table 6.8.2. Annual mean background concentrations ($\mu\text{g}/\text{m}^3$) in the study area of the proposed activity

Viela	Annual mean concentration ($\mu\text{g}/\text{m}^3$)
PM ₁₀	13,55
PM _{2.5}	7,00
Carbon monoxide (CO)	305,53
Nitrogen dioxide (NO ₂)	4,33

As can be seen in the figures below (Figures 6.8.1 to 6.8.3), the concentrations of pollutants in the vicinity of the proposed activity are low and do not even approach the limit values for pollutants specified in the Cabinet of Ministers' Regulations. The annual mean concentrations for nitrogen dioxide, PM₁₀ and PM_{2.5} are below even the lower pollution assessment thresholds (65% of the limit value for nitrogen oxides or $26 \mu\text{g}/\text{m}^3$, 50% of the annual limit value for PM₁₀ and PM_{2.5} or $20 \mu\text{g}/\text{m}^3$ and $10 \mu\text{g}/\text{m}^3$, respectively). In conclusion, the existing air quality in the area of the proposed operation is good and no measures are required to improve air quality. As the pollutant plots show, the highest concentrations of air pollutants are in the vicinity of the largest settlements (Strenči, Valka) and roads.

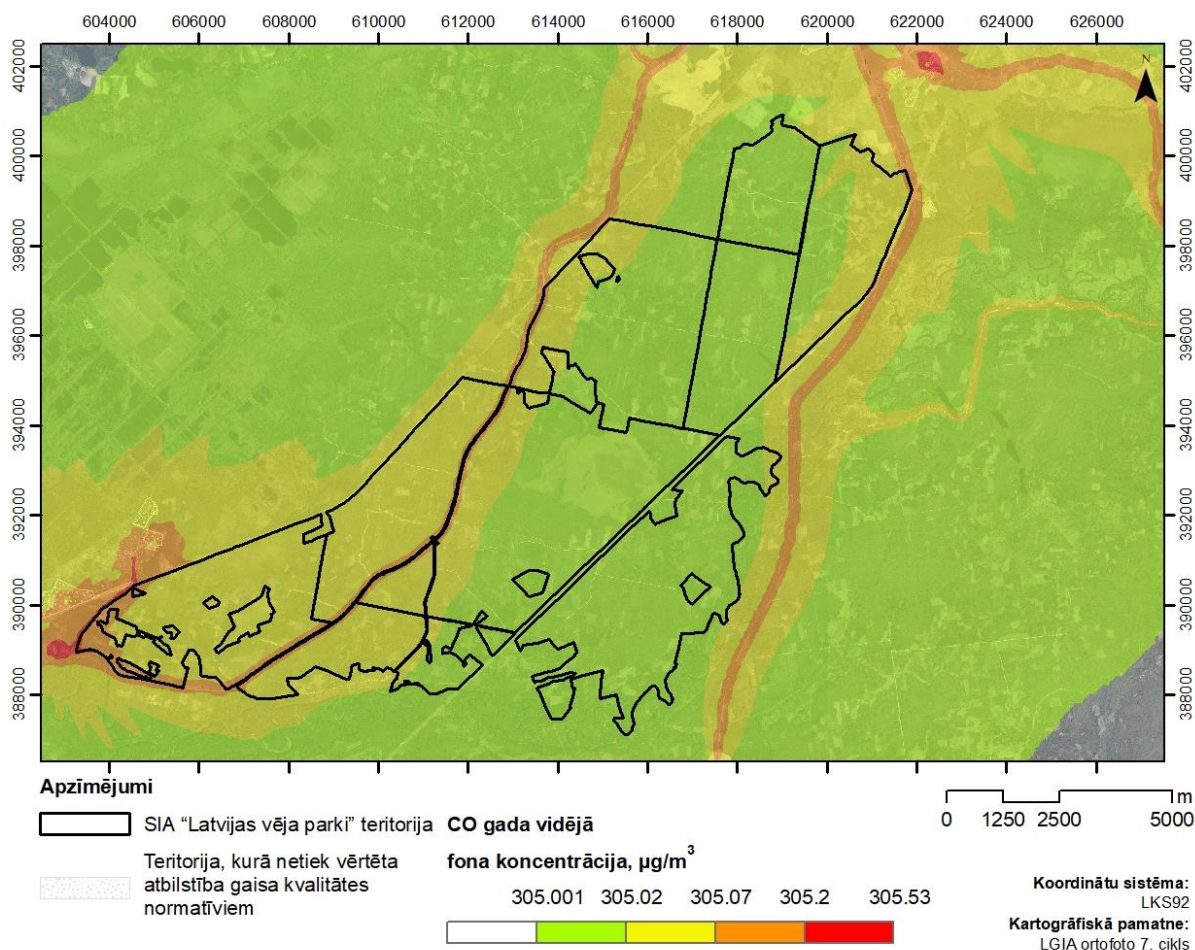


Figure 6.8.1. CO (carbon monoxide) background concentrations in the WPP Park study area

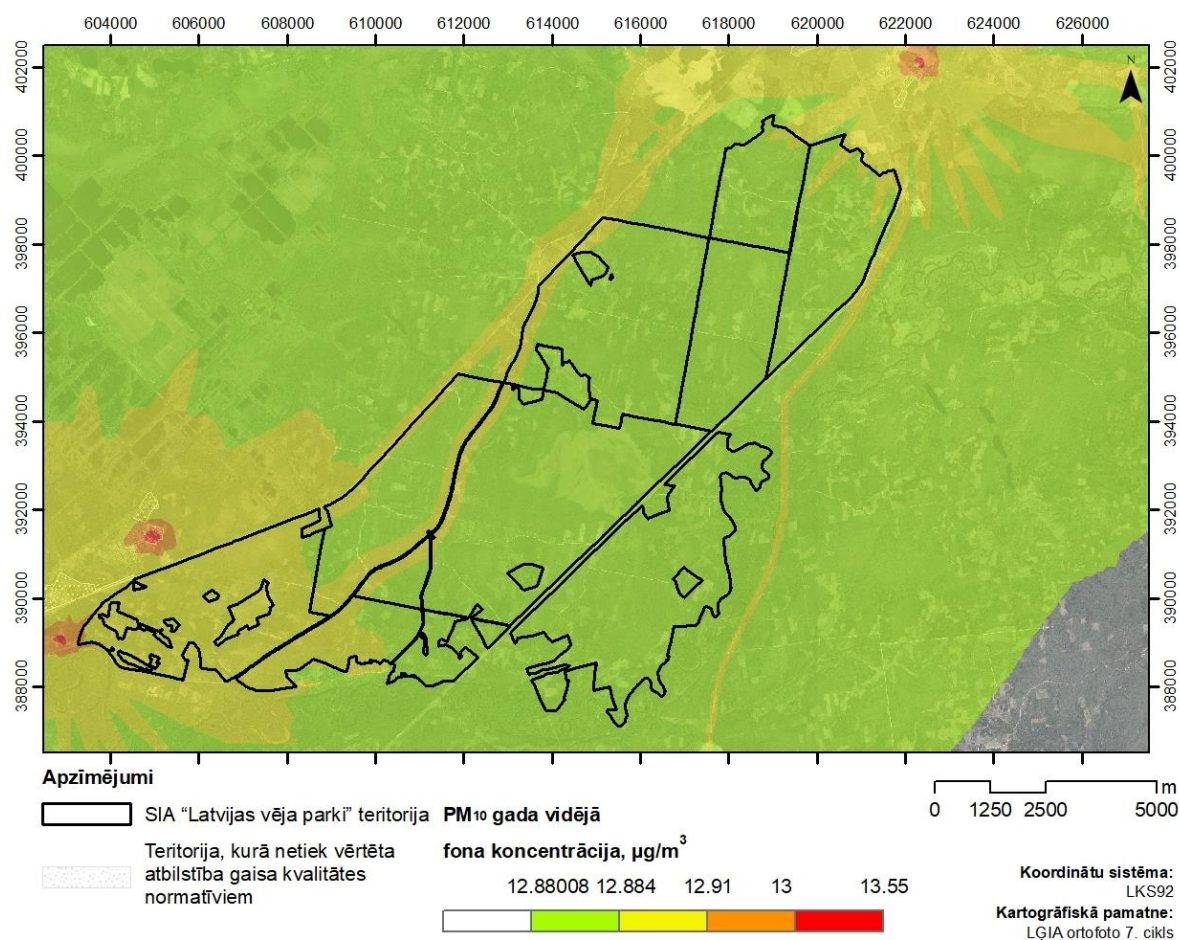


Figure 6.8.2. PM₁₀ background concentrations in the WPP Park study area

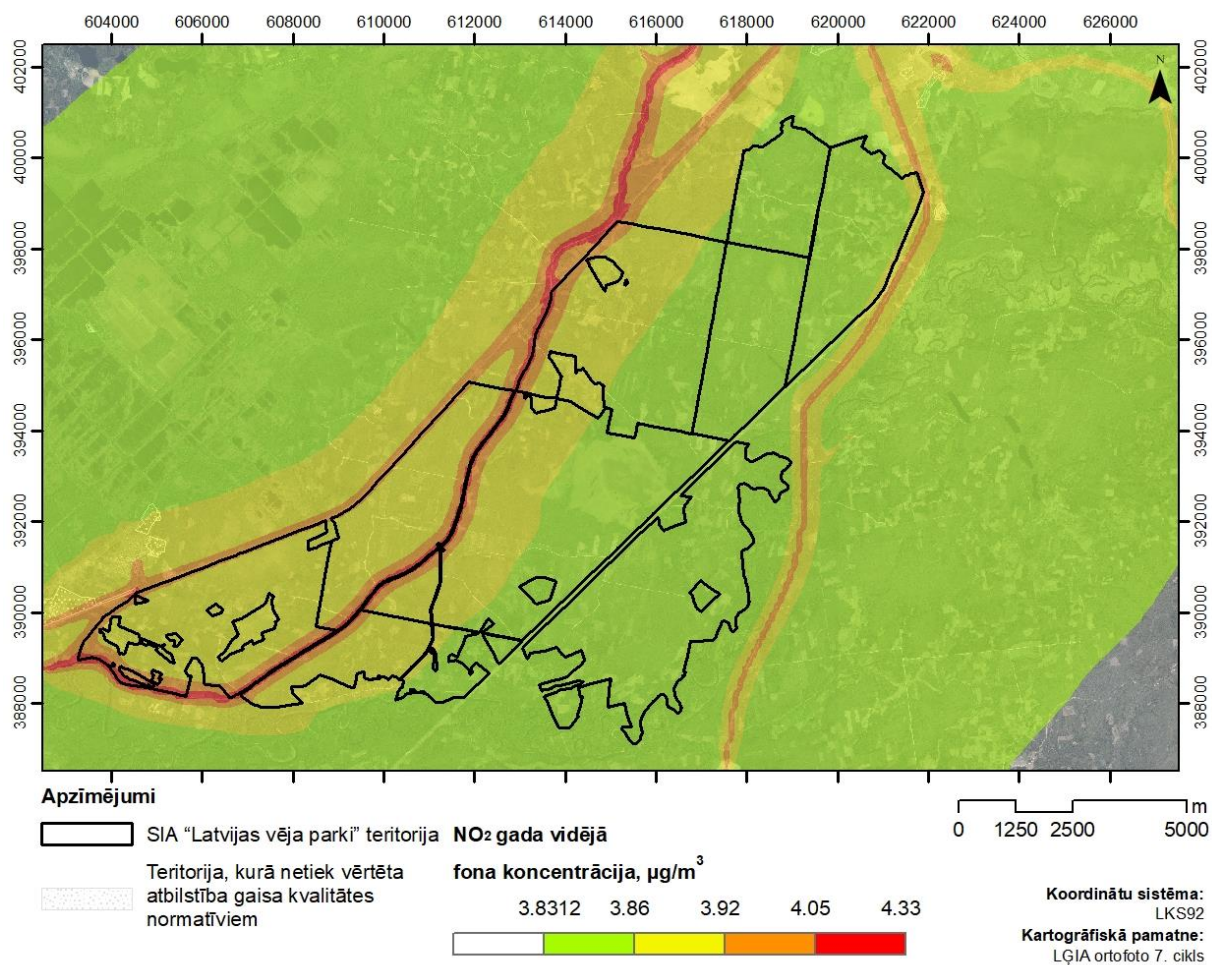


Figure 6.8.3. NO₂ (nitrogen dioxide) background concentrations in the WPP Park study area

6.9. Information on nearby industrial activities

In order to ensure sufficient infrastructure for the energy independence of the Baltic States from the combined power system of Russia and for the successful synchronisation of the Baltic States' power systems with the continental European grids by 2025, the project "Reconstruction of 330 kV power transmission lines Valmiera-Tartu and Valmiera-Tsiregulina in the territory of Latvia", which has been assigned the status of an object of national interest by the Cabinet of Ministers, is being implemented in the area of the proposed operation.

The electricity generated by the Valmiera-Valka WPP will be fed into the transmission grid by connecting to the reconstructed 330 kV transmission line.

In order to take care of the cranes, fish eagles and kittiwakes nesting in the Pukši marsh, AST has installed bird diversion signs on the rebuilt 330 kV power line from Valmiera to Tsiregulina (Estonia). According to the results of the ornithologists' research, the special signs have been installed along a 5.1-kilometre stretch of the marsh in Valmiera County.¹⁹⁴

There are 2 sand, sand-gravel deposits within 1 km of the proposed activity area: JSC "Latvia's State Forests" sand, sand-ranch deposit "Seda II "527. kvartals"" and deposit "Ziles (Dores)", these quarries are used for economic activity - extraction of natural resources.

The peat deposits "Sedas (Tirela) bog", approximately 4 km from the area of the proposed activity, and "Taures bog" (approximately 3 km away) are used for economic activities - extraction of natural resources.

For further information on mineral sites in the vicinity of the proposed activity, see Chapter 6.12.2.

There are no contaminated or potentially contaminated sites in the area of the proposed activity. For further information on contaminated or potentially contaminated sites in the vicinity of the proposed activity, see Chapter 3.2.

The air quality assessment and the impact of the proposed operation on air quality are described and assessed in Chapter 7.4 of the EIA Report.

6.10. Consistency with Valmiera and Valka District planning documents

The implementation of the proposed action is planned in the Plani municipality of Valmiera county and the Vijciems and Valka municipalities of Valka county.

Valmiera Municipality has developed the Valmiera Municipality Sustainable Energy and Climate Action Plan 2030¹⁹⁵, which foresees achieving climate neutrality by 2050. The plan states that the terms of reference for the development of the spatial plan of Valmiera Municipality, approved by the decision of the municipal council No 713 of 24.11.2022 (Minutes No 22, item 25) "On initiating the development of the spatial plan of Valmiera Municipality", include the task 2.8.14 - to develop and prepare at least the following thematic study/thematic plan for the spatial plan: spatial development of wind and solar power plants (hereinafter - SES) parks. The spatial plan also has the following tasks: 2.36 "to define the areas where the construction of wind power plants is prohibited" and 2.37 "to develop conditions for the siting

¹⁹⁴ <https://www.ast.lv/lv/events/jaunaja-330-kv-elektroparvades-linija-valmiera-tsiregulina-uzstadi-putnu-novirzitati-puksu>

¹⁹⁵ https://www.valmierasnovads.lv/content/uploads/2023/03/81_lem_pielikums.pdf

of solar power parks (establishing the distances to residential buildings), as well as to define the requirements for the siting of solar power plants."

However, in order to ensure the protection of the landscape of the municipality, the development of solar and wind farms is not allowed in the landscape protection zones of the Valmiera Municipality Special Landscape Protection Area, as well as in the territories designated as cultural landscape zones, including the territories of national importance for landscape value. In other locations, the sensitivity of the landscape should be respected in order to minimise conflict situations that degrade the quality of the landscape in close proximity to settlements.

Objective of the Action Plan document: 2. Include the whole territory of Valmiera municipality in the energy management system of the IEKRP and the municipality to achieve climate neutrality of the municipality by 2050; included in Task 2.8: *Promote the generation and use of energy from renewable sources in the public services sector, including transport, and foster an enabling environment for the production and use of RES by businesses and citizens that is harmoniously integrated with the other SDGs*. It includes 2 actions: 2.8.1. "Promoting RES production in the private sector, including households" and 2.8.2. "Exploring the potential of wind energy production sites, identifying suitable areas". Expected results *The TIAN of Valmiera Municipality sets requirements for the installation of solar and wind facilities, respectively, respecting the landscape sensitivity and in relation to the Cabinet of Ministers Regulation No 303 of 19 April 2011 "Individual Rules for the Protection and Use of the North Vidzeme Biosphere Reserve" and other normative acts, the locations where it is allowed to place WPP are assessed, the requirements for the development of new wind farms are incorporated into the spatial plan, respecting landscapes of national importance, landscape sensitivity*.

The objective: 4. Reducing energy poverty by strengthening energy independence - Target 4.1: Support for the creation of renewable energy communities is foreseen in Action 4.1.1: Promotion of RES production in Valmiera Municipality with expected results *Concept for RES use in Valmiera Municipality developed; RES included in construction projects of municipal public facilities (solar cells, wind generators, heat pumps, etc.); municipal participation in RES production in cooperation with the private sector, promoting the formation of energy communities*.

The Environmental Report of the Valmiera District Sustainable Development Strategy 2022-2038 and the Development Programme 2022-2028 states that the availability of energy resources is an important precondition for the development of the territory. Given its geographical location, the main renewable energy sources in Valmiera are solar, wind, geothermal, fuel wood, biomass and water. When planning the siting of WPPs in the NWBR, it should be taken into account that for high altitude WPPs it has designated special areas where the siting of WPPs is allowed without a height limit¹⁹⁶.

The development of WPPs in the municipality is also possible outside the territory of the NVBR, except in the protected landscape area "Ziemeļgauja", where the installation of WPPs with a diameter of the impeller greater than five metres or a highest point exceeding 30 metres is "prohibited throughout"¹⁹⁷, and in the Gauja National Park, where it is prohibited: "9.8. to install wind power plants whose highest point exceeds 30 metres, except for wind power

¹⁹⁶ Cabinet of Ministers Regulation No 303 of 19 April 2011 "Individual Rules for the Protection and Use of the North Vidzeme Biosphere Reserve"

¹⁹⁷ Cabinet of Ministers Regulation No 957 of 20 November 2008 "Protected Landscape Area "Individual Rules for the Protection and Use of the "Ziemeļgauja"

plants in the neutral zone, where the permissible height of wind power plants shall be determined by the municipality's spatial plan.¹⁹⁸

For target U2-2 *Promote the production and use of renewable energy in the public services sector, including transport, and create an enabling environment for the production and use of RES by businesses and citizens*: P1 Promotion of RES production in municipally managed real estate; P2 Promotion of RES production in the private sector, including households up to 11 kW; P3 Investigation of the potential of wind energy production sites, identification of suitable sites.

In order to minimise potential negative impacts, the selection of sites for wind farms should take into account the wind energy resources and nature conservation requirements of the county's IADT.

The planning documents include development directions in relation to the hierarchically higher long-term development planning documents, i.e. the "Latvian Sustainable Development Strategy 2030", the National Development Plan 2021-2027 and the Vidzeme Planning Region Sustainable Development Strategy 2014-2030, as well as European-level planning documents, such as the European Union's "Green Deal", which is defined as the new European Union growth strategy. According to the requirements of the Cabinet of Ministers Regulation No 240 of 30 April 2013 "General Regulations on Spatial Planning, Use and Construction", WPP with a capacity greater than 20 kW are allowed to be located in the industrial construction area (R), technical construction area (TA), agricultural area (L) and forest area (M) in accordance with the conditions of the spatial plan.

The Valka Regional Sustainable Development Strategy 2013-2037 mentions the use of renewable energy as a long-term priority.

Valka Municipality Development Programme 2022-2028¹⁹⁹ has been prepared taking into account: Latvia's Sustainable Development Strategy 2030 and the UN Sustainable Development Goals; priorities set out in the Latvian National Development Plan 2021-2027 and the strategic objectives of the European Green Deal; regional planning documents - Vidzeme Planning Region's Sustainable Development Strategy 2030, Vidzeme Planning Region's Development Programme 2021.-2027; Valka Municipality Sustainable Development Strategy 2013-2037, analysis of the current situation in the municipality, statistical information, opinions of municipality specialists, opinions expressed by citizens; planning documents of neighbouring municipalities and common interests; legislation.

Medium-term priority (MTP) 1 Human resources development Action 12: Energy infrastructure, Action 12: The energy infrastructure target is U3: Increase the share of renewable energy sources, while MTP 3: Entrepreneurship development in the municipality Action 15: The development of manufacturing and services is Objective U8: Exploring and promoting potential sites for solar and wind power generation.

The document mentions that one of the priority areas for smart specialisation in the Vidzeme region is the production of renewable energy resources, supplying the region and exporting where possible.

The compatibility of the proposed action with the spatial plans is presented in Chapter 3.1.

¹⁹⁸ Cabinet of Ministers Regulation No 317 of 2 May 2012 "Individual Rules for the Protection and Use of the Gauja National Park"

¹⁹⁹ <https://www.valka.lv/lv/media/2907/download?attachment>

According to the existing spatial plans of Valmiera and Valka municipalities²⁰⁰, the construction area of the WPP park includes land units or parts thereof, the planned (permitted) use of which is basically defined as a forest area. Relatively small areas of the WPP construction zone are covered by water.

The conditions of the spatial plans impose a number of preconditions, but the proposed activity does not conflict with them. According to the currently valid conditions in Valka Municipality, the planned area of the wind park will have to be subject to local planning, while in order to implement the planned activity in Valmiera Municipality, it is necessary to carry out local planning for the land units where it is planned to install wind power plants or to submit an application with a request to provide for the construction of the WPP park "Valmiera-Valka" when developing the new Valmiera Municipality spatial plan.

6.11. Information on nearby airports and aerodromes and the impact on communication systems

The closest airport to the NPPF is the private general aviation certified Cēsis Aerodrome (EVCA) 43 km away, and the closest international commercial airport is Riga International Airport (EVRA) in Marupe Municipality 130 km away (see Figure 6.11.1): Valmiera-Valka WPP Park is located 70 km from the nearest airspace of Riga Airport.

²⁰⁰ <https://geolatvija.lv/geo/tapis#>



Figure 6.11.1. Location of the planned Latvian Wind Parks "Limbaži" and "Valmiera-Valka" in relation to the airfields and airspace of Riga Airport (source: LGS).

The EU has an EMC Directive, the requirements of which were implemented in Latvia by Cabinet Regulation No 483 of 20 June 2006 "Regulations on Electromagnetic Compatibility of Equipment" and continue to be maintained by Cabinet Regulation No 208 of 12 April 2016 "Regulations on Electromagnetic Compatibility of Equipment", which is currently in force. These documents require that electrical and electronic equipment must, on the one hand, not cause electromagnetic interference to other equipment and, on the other hand, be capable of operating to the required quality for its intended purpose, even in normal environments where electric and magnetic fields are likely to be present. Therefore, modern communication equipment manufactured in compliance with EU and Latvian requirements should not be subject to interference from WPPs, even in close proximity.

The second factor that determines the ability of modern communication systems to operate normally, without interference, in the vicinity of a WPP is that modern public communication systems use digital technology, while digital signals cannot be destroyed by electromagnetic fields (only interrupted at high field strengths). In addition, it should be recalled that the electromagnetic fields generated by WPPs are still many times smaller than the magnetic fields of the high-voltage transmission lines to which these conclusions apply. It follows that WPPs will not affect communication systems in their immediate vicinity as such, but there are no communication systems in their immediate vicinity either (except, for example, mobile phones of maintenance staff during working hours directly in front of WPPs).

Studies on the impact of WPP show that WPP can still affect the quality of TV broadcasting and mobile communications²⁰¹: although the digital signal cannot be destroyed, it can block (obscure), fragment and reflect the signals transmitted by these communications equipment by simply interrupting the transmission temporarily. Studies by the International Telecommunication Union (ITU) on the impact of WPPs on the quality of TV broadcasting, including digital terrestrial television, have found that interference may occur in the vicinity of WPPs, but that it is negligible: it may only occur in areas with low broadcast signal quality (very weak signals).

²⁰¹ <https://www.vpvb.gov.lv/lv/jaunums/pazinojums-par-sia-pienava-wind-un-sia-dobele-wind-ietekmes-uz-vidi-novertejuma-zinojuma-iesniegsanu-vides-parraudzibas-valsts-biroja-atzinuma-sanemsanai>

Also, the quality of mobile communications, including mobile internet traffic, is likely to be affected by NECs only in areas with very poor communications quality. Looking at the information provided by the largest Latvian mobile operators - LMT, Tele2 and Bite - on the quality of communications in the vicinity of the Proposed Development, it can be seen that both 3G and 4G mobile internet are provided in high quality, with a sufficiently dense network of base stations across a wide area of the Proposed Development. The height of transmitters and receivers is an important aspect to be taken into account when assessing the potential impact of the proposed activity on the quality of mobile *orradiolink* communications. The towers on which mobile transmission equipment is located in the vicinity of the proposed activity are much lower than the WPP: up to 50 m. The lowest downward position of the WPP wing tip will be 100 m or 50 m higher than the mobile transmission towers constructed in the vicinity of the proposed activity. The moving parts of the WPP, which can fragment the communication signal, will therefore be higher than the line connecting the communication tower to the service receiver.

Studies around the world have shown that WPP can affect the performance of telecommunications transmitters and receivers, causing signal interference in air traffic control radars, weather radars, maritime navigation radars, aeronautical systems such as very high frequency circular radars (VOR) and instrument landing systems (ILS), fixed radio networks and analogue TV broadcasting²⁰².

Aviation security, meteorological and maritime navigation radars are electromagnetic systems used to identify specific objects by transmitting an electromagnetic signal and receiving a reflected signal from the target object. The received signal is used to characterise the size and position of the object. Radar equipment that also uses the Doppler effect to observe an object identifies not only the size and position of the object, but also its speed of movement. WPP in the vicinity of radar systems function both as blocking devices and as large reflective objects whose strong reflected signals can be misinterpreted and mask weaker reflected signals. The same effect can be produced by any other high-rise structure located within radar "line of sight". The radar systems currently in widespread use are not able to recognise the signals reflected by WPP.

Land-based WPP are not considered a potential threat to the operation of maritime navigation systems, but their impact on aviation safety and meteorological radars has been demonstrated. For example, the Spanish National Meteorological Agency (*Agencia Estatal de Meteorología*) has recorded reflections of the weather radar signal from WPP parks, which are identified as precipitation zones on a day when no precipitation is observed in the radar area. Although the potential impacts of WPPs have been identified, there is currently no common methodology for assessing these impacts, which is hampered by the variety of radar systems used and the fact that the method of assessment may depend on the nature of the area where the WPP park is to be built.

The World Meteorological Organisation (WMO) and the European Meteorological Services Network (EUMETNET) recommend certain distances from the weather radar where it is preferable not to build NPS (up to 5 km for C-band and 10 km for S-band radars), or where the NPS construction should be agreed with the weather radar owner (up to 20 km for C-band and 30 km for S-band radars)²⁰³. More recent studies suggest that the upper limit for C-band radars

²⁰² I. Anguloa et al., Impact analysis of wind farms on telecommunication services, Renewable and Sustainable Energy Reviews, Volume 32, April 2014

²⁰³ Finnish Meteorological Institute, EUMETNET OPERA PROGRAMME (2004-2006) - Operational programme for the exchange of weather radar information, Final report, 2007

- 20 km - should be increased, as impacts can be observed at greater distances²⁰⁴. An important factor that can affect the performance of a radar is the position of the WPP within the radar's field of view.

The European Organisation for the Safety of Air Navigation (*EUROCONTROL*), taking into account the International Civil Aviation Organisation (*ICAO*) guidance on the regulation of construction in restricted areas around air navigation facilities²⁰⁵, has developed guidance for air navigation service providers on the need and procedures for assessing the impact of WPP on navigation facilities²⁰⁶. The guidelines define 4 zones in the vicinity of a primary surveillance radar (*PSR*) and a secondary surveillance radar (*SSR*) where the impact of a WPP should be assessed: as shown in Table 6.11.1, also for air traffic surveillance radars, the location of the WPP within the radar's line of sight is an important aspect.

Table 6.11.1. Assessment areas for WPP impacts on primary and secondary surveillance radars

Zone	Description	Impact assessment conditions
Zone 1	0-500 m from radar	Safety zone for PSR and SSR installations, where construction of WPPs would not be allowed
Zone 2	500 m - 15 km radar visibility	Detailed assessment area for PSR and SSR radars in which air navigation service providers should object to the construction of WPPs unless a detailed impact assessment is carried out, the results of which are acceptable to the air navigation service provider
Zone 3	Beyond 15 km but within the radar's maximum range and radar visibility	Indicative assessment area for PSR radars
Zone 4	In the radar's maximum range outside its visibility zone or outside the radar's maximum range	Acceptance zone for PSR and SSR radars where no assessment is required

The closest meteorological radar to the territory of the proposed activity is the radar installed at the territory of Riga Airport and operated by the LEGMC. The distance from the radar to the nearest WPP in the area of the proposed operation is 130 km. According to the information published by the LEGMC, the radar installed is a C-band device with a range of up to 250 km and a lowest scan angle of 0.3°.

The nearest PSR and SSR radars to the area of the proposed activity are installed at Riga Airport: STAR 2000 PSR radar with a maximum range of 80 NM (148 km), RSM970S SSR radar with a maximum range of 240 NM (445 km). Both have a lowest sounding angle of 0.25°. The distance from the radar to the nearest WPP in the proposed wind farm is 130 km.

Simple trigonometric calculations are sufficient to ensure that WPPs up to 300 m high will not be in the line of sight of meteorological and air traffic surveillance radars. At a distance of 130 km, at the lowest scan angle of 0.25°, the beam height on a flat Earth would not fall below 570 m, almost twice the maximum height of the wingtip of the nearest WPP. With this margin, there would be no need to further refine the calculation with more details: the height of the

²⁰⁴ VINDRAD. Project report v1.0, A tool for calculation of interference from wind power stations to weather radars, 2011

²⁰⁵ European guidance material on managing building restricted areas: 3rd edition, International civil aviation organisation, 2015

²⁰⁶ EUROCONTROL Guidelines for Assessing the Potential Impact of Wind Turbines on Surveillance Sensors, EUROCONTROL, 2014

radar's emitting point above the ground (only increasing the beam height by a few metres) and the difference in absolute height between the terrain of the wind farm and Riga Airport (the WPP site is a maximum of 60 metres higher). But the curvature of the Earth's surface makes all these calculations unnecessary: At a distance of 130 km, the point at sea level is 2.65 km below the horizon. Consequently, there is no likelihood of negative impacts of the planned WPPs on the operation of the radar installations.

According to ICAO guidelines, the impact of WPP planned to be constructed closer than 15 km to radio navigation and landing aids such as VOR, Instrument Landing Systems (ILS) on these air navigation systems shall be assessed by identifying the significance of the impact and the interference to the system. Distant WPP S should not have an impact on radio navigation and landing aids. Radio navigation and landing facilities are located at Riga Airport and possibly (now or in the future) at Cēsis Aerodrome, but both are much more than 15 km away.

To avoid any potential negative impacts, all electrical equipment in the WPP will be certified and CE-marked, guaranteeing that the WPP itself cannot cause any adverse effects over such a long distance. The project has received approval from the Ministry of Defence and other authorities.

6.12. Nearest water abstraction and mineral extraction sites

6.12.1. Characteristics and use of nearby water abstraction points and groundwater deposits

Based on the data from the LEGMC Unified Environmental Information System²⁰⁷, where information on water supply boreholes is maintained and updated, no water supply boreholes are registered in the planned WPP area, but within a 1 km radius around the study area there are 12 boreholes that are or have been used for water supply (Figure 6.12.1 and Table 6.12.1).

Table 6.12.1. Known water supply boreholes in the vicinity of the proposed activity

Borehole No.	Address	Year of drilling	Borehole depth	Water aquifer	Urbum status
18824	Zile Forestry	1975	90	D ₂ br	unknown
18934	Railway station "Saule"	1978	56	D ₂ br	unknown
6342	Seda, Parka iela 19 (land plot with cadastral designation 9413 001 0302). Centralised Seda underground water deposits (UWD)	1972	125	D ₂ ar	Operational
12645	Seda, Parka iela 19 (land plot with cadastral designation 9413 001 0302). Centralised Seda UWD	2014	125	D ₂ ar	Operational
17276	Land alone. "Peat pressing shop" cad. No 9433 001 0012 JSC "Seda", peat farm)	1959	121	D ₂ ar	unknown
6285	Land alone. "Peat pressing shop" cad. No 9433 001 0012 (A/S "Seda", peat farm)	1974	102	D ₂ ar	unknown
18594	Land alone. "Apses" or that. No 9433 001 0015 (former bitumen base)	1970	100	D ₂ ar	unknown
6740	Land alone. "Šalku boiler house" with cad. No 9476 001 0025 (former road repair point No 2)	1969	90	D ₂ ar	unknown

²⁰⁷ <https://17276www.meteo.lv>

Borehole No.	Address	Year of drilling	Borehole depth	Water aquifer	Urbum status
18867	Recreation base "Vecmājas"	1977	95	D ₂ ar+br	unknown
13689	"Dravnieki", land plot no. Cad. No 9492 002 0039 (ex. VEF recreation base)	1981	100	D ₂ ar	unknown
20541	"Vijmeži 4", land plot no. Cad. No 9492 003 0012 (former recreation base "Hunting Castle")	1989	100	D ₂ ar+br	unknown
24103	The houses "Gaujmaļi" (ex. CRCP No 7)	1982	91	D ₂ ar	unknown

According to the data of the Unified Environmental Information System of the LEGMC, 3 underground water deposits (hereinafter - UWD) have been registered in the vicinity of the envisaged area of operation: one deposit in Seda - UWD "Seda centralized" and two deposits in Valka - UWD "Valka" and "Valkas cogeneration station". Information on the deposits and their location can be found in Figure 6.12.1 and Table 6.12.2 respectively. The planned area of the WPP Park is not located within the protection zones of the WFD.

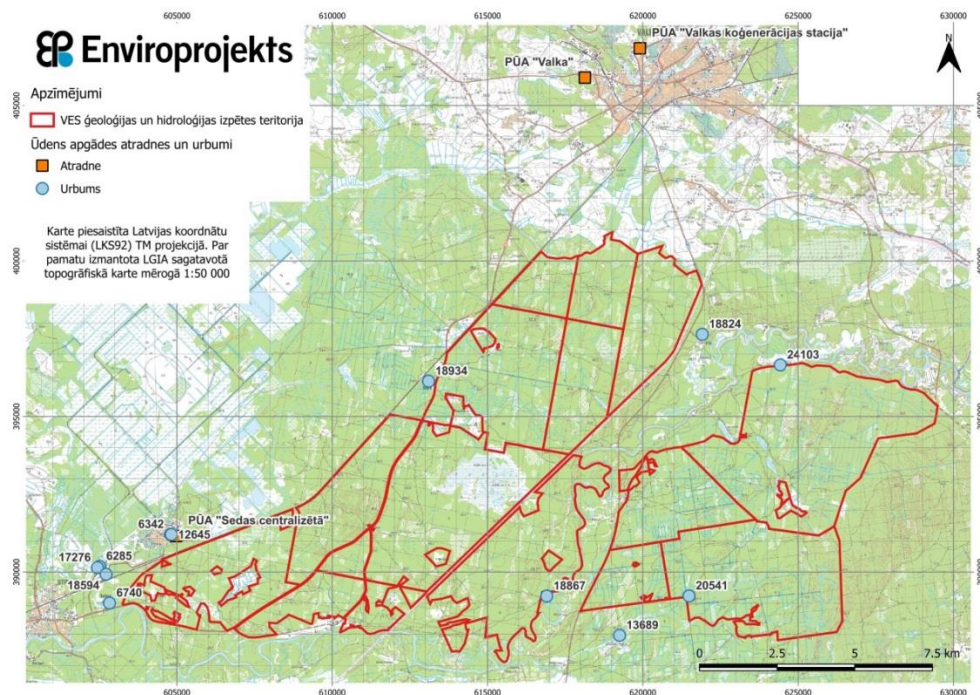


Figure 6.12.1. Location of water supply and groundwater deposits in the area of the proposed activity and its surroundings (based on the LGIA topographic map M:10 000, location of deposits and boreholes²⁰⁸)

²⁰⁸ 10LGMC Deep Earth Information System - <https://videscentrs.lv/gmc.lv/iebuve/zemes-dzilu-informacijas-sistema>

Table 6.12.2. Underground water deposits in the vicinity of the area of the proposed activity

Site and its LEGMC DB number	Location	Type of ground water	Water aquifer	Use of the site	Accepted stocks	Water protection zones	Status
Seda centralised No 610816	Valmiera region, Seda, real estates "Sporta iela 1D" (cadastre No 9413 001 0308) and "Sporta iela 1C" (cadastre No 9413 001 0303).	Freshwater	D ₂ ar	For centralised water supply in Seda	Category A - 500 ^{m³/day}	Strict regime - 10 m, bacteriologic al - not required, chemical (area) - 152 ha	Operational
Valka No 610900	Valka, Valka region	Freshwater	D ₂ ar	Valka centralised water supply	Category A - 1074 ^{m³/day}	Strict - 10 m, bacteriologic al - not required, chemical - 141 ha.	Operational
Valka CHP plant No 610905	Valkas region, Valka, Rūjienas street 5c (land cadastre No 9401 008 0399)	Freshwater	D ₂ ar	Enefit Power & Heat Valka Ltd for water supply	Category A - 600 ^{m³/day}	Strict regime - 10 m around each borehole, bacteriologic al - not required, chemical - 289 ha (301 ha taking into account the interaction of boreholes from the adjacent Salacgrīva field)	Operational

6.12.2. Mining sites

According to publicly available information at²⁰⁹, hard minerals such as sand, sand-gravel and peat are present in the vicinity of the proposed activity. Sand and sand-gravel are extracted for construction, road building, maintenance and repair. Peat is used for export, agriculture and peat substrate production.

There are 7 sand, sand-gravel and 6 sapropel projected resource areas in the territory of the planned WPP park, no deposits with mineral reserves approved by the LEGMC. Information on the predicted resource plots is summarised in Table 6.12.3 and their location is shown in Figure 6.12.2.

²⁰⁹ <https://izraktenis.lv/gmc.lv/atradnes>

Table 6.12.3. Prospective resource areas in the vicinity of the area of operation

Name	Minerals
Kauchi (B2261)	Sand
Rame (B1141)	Sand
Seda (B1160)	Sand-gravel
Olives (B1135)	Sand
Birches (B1708)	Sand
Skewed bar (B1730)	Sand
Kokshi II (B1117)	Sand-gravel
Silezers lake (S6071)	Sapropel
Leiši lake basin (S5981)	Sapropel
Herb Lake (S6098)	Sapropel
Deep Lake (S16980)	Sapropel
Lake Diben (S5946)	Sapropel

There are 2 sand, sand-gravel deposits with reserves and minerals approved by the LEGMC within 1 km from the WPP area: JSC Latvijas valsts meži sand, sand-gravel deposits "Seda II "Block 527"" and deposit "Zīles (Dores)".

There are 2 peat deposits in the vicinity of the planned WPP ("Sedas (Tīreļa) bog" and "Taures bog") and several forecast sand resource areas. The Sedas (Tīreļa) bog peat deposit is located approximately 4 km to the E of the study area and the Taures bog peat deposit is located approximately 3 km to the S of the study area. The nearest predicted sand resource area is Saule (B1132), located approximately 2.7 km to the NW of the study area.

Information on the deposits is summarised in Table 6.12.4, the location of the deposits can be seen in Figure 6.21.

Table 6.12.4. Existing deposits in the vicinity of the area of the proposed activity

Name	In the source part	Minerals	Year of start of development	Category	Remaining stocks on 1 January 2023, thous. tonnes	Extraction volume, thous. tonnes		
						2020	2021	2022
Seda II (B1792)	Precinct I	Sand	-	A	598,7	-	-	-
		Sand-gravel	-	A	146,6	-	-	-
	Block 527	Sand	2011.	A	678,29*	11,65	-	-
		Sand-gravel	2011.	A	130,67*	1,4	-	-
		Sand	2021.	N	626 284	-	21,51	9 206
		Sand-gravel	2021.	N	12 005	-	0,1	0 395
Dores (B1729)	-	Sand	2000.	A	133,14	3,5	0,55	-
		Sand-gravel	2000.	A	106,36	0,72	0,01	-
		Sand	2022.	N	164,58	-	-	3,62
		Sand-gravel	2022.	N	106,36	-	-	4,84

Name	In the source part	Minerals	Year of start of development	Category	Remaining stocks on 1 January 2023, thous. tonnes	Extraction volume, thous. tonnes		
						2020	2021	2022
Seda (Tyrelis) Swamp (K16815)	-	Peat	2005.	A	923 315	7,77	18,05	21 555
Taures swamp (K16816)	-	Peat	2005.	A	1832,469	16,15	17,76	26 381

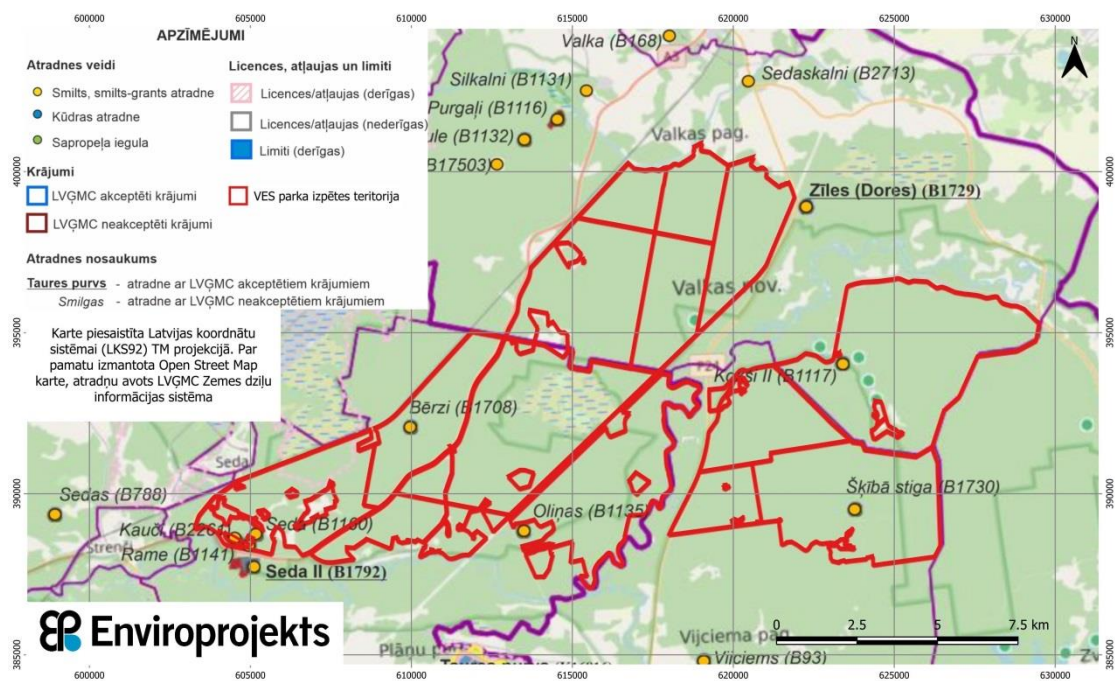


Figure 6.12.2. Sites in the vicinity of the proposed area of operation (based on Open Street Map²¹⁰)

²¹⁰ LEGMC Subsoil Information System - <https://videscentrs.lvgmc.lv/iebuve/zemes-dzilu-informacijas-sistema>

7. Assessment of the significant environmental effects of the proposed action and possible alternatives

DIRECTIVE (EU) 2023/2413 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL sets the EU the target of becoming climate neutral by 2050 at the latest and an interim target of reducing net GHG emissions by at least 55% below 1990 levels by 2030. Achieving climate neutrality requires a transformation of the energy sector, increasing energy efficiency and significantly increasing the share of renewable energy in an integrated energy system.

Renewable energy, including wind energy, has an important role to play in achieving these goals. The transition to a renewable energy economy will contribute to achieving the objectives of Decision (EU) 2022/591 of the European Parliament and of the Council to protect, restore and enhance the environment, inter alia by halting biodiversity loss and achieving biodiversity gain. Renewable energy has a lower risk of price volatility compared to fossil fuels and can be an important tool in the fight against energy poverty. In addition, renewable energy can generate significant socio-economic benefits, contributing to job creation and the development of local industries, while taking into account the growing demand for renewable energy technologies both in Europe and globally. The EU aims to have at least 32% of gross final energy consumption from renewable energy sources by 2030.

The general situation, influenced by the Russian invasion of Ukraine and the effects of the Covid-19 pandemic, has led to an increase in energy prices across the EU. To achieve the long-term goal of an energy system independent from third countries, it is essential to accelerate the green transformation and develop an energy policy that reduces dependence on imported fossil fuels and promotes affordable prices for EU citizens and businesses in all sectors of the economy.

Directive (EU) 2018/2001 of 11 December 2018 on the promotion of the use of energy from renewable sources streamlines requirements to facilitate administrative procedures for renewable energy installations by introducing rules on the organisation and maximum duration of the administrative phase of the authorisation procedure for renewable energy projects, covering all relevant authorisations for the construction, capacity renewal and operation of renewable energy installations and for the connection of such installations to the grid. Some of the most common problems faced by renewable energy project developers are related to complex and lengthy administrative, permitting and grid connection procedures. It is therefore desirable to streamline certain environmental aspects of the authorisation procedure.

Member States should support the accelerated development of renewable energy projects in cooperation with local and regional authorities by identifying and designating land, surface, underground and marine or inland water areas required for the installation of renewable energy plants and related infrastructure to ensure the achievement of the 2030 renewable energy target and support the achievement of the climate neutrality target by 2050 at the latest in accordance with Regulation (EU) 2021/1119.

7.1. Total deforested area

The exact size of the total deforested area will be determined during the construction design phase, and the maximum possible area estimates have been assessed during the EIA.

The calculations in this chapter are for the potential WPPs to be built, corresponding to the Valmiera-Valka park location alternative A with 27 WPPs and location alternative B with 40 WPPs.

The approximate area to be deforested if the recommended alternative A is implemented will be 86 ha. Of these, approximately 58% will be young stands, 18% middle-aged stands and 17.5% mature stands; see calculations in Table 7.1.1. 2.4% of the deforested area is currently clear-cut.

However, if the recommended alternative B is implemented, the deforested area will be 128 ha. Of which approximately 57% are young stands, 18% middle-aged stands and 14% mature stands; see calculations in Table 7.1.2. 3% of deforested land is currently clear-cut.

The exact areas to be deforested will be known after design.

Table 7.1.1. Total deforested area under Alternative A

Alternative A							TOTAL (ha)
	New yield (ha)	Middle- aged stand (ha)	Briestaudze (ha)	Growing stand (ha)	Overgrown stand (ha)	Deforestation (ha)	
Kopā	50,19	15,05	11,12	7,19	0,54	2,04	86,13
%	58,27	17,47	12,91	8,35	0,63	2,37	

Table 7.1.2. Total deforested area under Alternative B

Alternative B							TOTAL (ha)
	New yield (ha)	Middle- aged stand (ha)	Briestaudze (ha)	Growing stand (ha)	Overgrown stand (ha)	Deforestation (ha)	
Kopā	73,17	23,31	18,20	8,89	0,6	3,78	127,95
%	57,19	18,22	14,22	6,95	0,47	2,95	

According to the Central Statistical Office, in 2024 there will be 3 607 thousand ha of forest land in Latvia²¹¹, so the area deforested by Latvijas vēja parki Ltd for the construction of the Valmiera-Valka WPP in Alternative A will be approximately 0.0025%, while in Alternative B it will be approximately 0.004% of the total forest area in Latvia. The impact is assessed as not significant.

More detailed information on the deforestation areas required for the construction of maintenance yards per WPP and for the recommended construction of Alternatives A and B, based on possible calculations that would be required for the construction of the WPP, is summarised in Tables 7.1.3 and 7.1.4.

²¹¹https://data.stat.gov.lv/pxweb/lv/OSP_PUB/START_NOZ_ME_MEP/MEM010/table/tableViewLayout1/

The required deforested areas for the construction of new roads for one WPP and for the recommended alternatives A and B, based on the probabilistic calculations that would be required for the construction of the WPP, are summarised in Tables 7.1.5 and 7.1.6. Tables 7.1.7 and 7.1.8. Comparative information on deforested areas for turning extensions to existing roads.

Table 7.1.3. *Area to be set aside for the construction of WPP maintenance yards under Alternative A*

WPP No.	Forest land use and age groups in the area of the assembly site to be transformed (including access roads, turns in the assembly site), ha (Alternative A)						Area to be deforested, ha
	Excerpt	Age group					
		Young people	Middle-aged stand	Briestaudze	A mature grove	Overgrown stand	
VV1	0	1,41046	1,1908	0	0	0	2,60126
VV16	0	1,9948	0	0,01388	0,59262	0	2,6013
VV20	0	2,2376	0	0,15233	0	0,2114	2,60133
VV21	0	0,93144	0,25287	1,41701	0	0	2,60132
VV22	0	1,80653	0,72035	0,07441	0	0	2,60129
VV24	0	1,12881	0	1,47257	0	0	2,60138
VV26	0	1,85922	0,37525	0,30825	0,05863	0	2,60135
VV28	0	0,85684	1,19726	0,54655	0,00068	0	2,60133
VV30	0	2,60137	0	0	0	0	2,60137
VV31	0,30696	2,22918	0,0652	0	0	0	2,60134
VV32	0	0,74324	0	0	1,85812	0	2,60136
VV33	0	2,30725	0	0,00645	0,28766	0	2,60136
VV36	0	1,90422	0,69367	0,00337	0	0	2,60126
VV37	0	2,56284	0	0	0,03844	0	2,60128
VV38	0	0,35308	0,81189	0,63845	0,72162	0	2,52504
VV39	0	1,69665	0,38252	0,52209	0	0	2,60126
VV40	0	2,57453	0,01391	0	0,01283	0	2,60127
VV41	0,04767	0,53128	2,02102	0,0013	0	0	2,60127
VV42	0	1,99439	0,36225	0	0,24464	0	2,60128
VV46	0	2,30637	0	0,29492	0	0	2,60129
VV47	0	0	2,19893	0,27228	0	0	2,47121
VV81	0	1,69207	0	0	0,90931	0	2,60138
VV82	0	2,56197	0	0,03927	0	0	2,60124
VV84	0	0	2,15979	0,44149	0	0	2,60128
VV85	0	1,24621	1,14442	0,0203	0	0	2,41093

WPP No.	Forest land use and age groups in the area of the assembly site to be transformed (including access roads, turns in the assembly site), ha (Alternative A)						Area to be deforested, ha
	Excerpt	Age group					
		Young people	Middle-aged stand	Briestaudze	A mature grove	Overgrown stand	
VV86	0	0,76925	0,00165	1,83042	0	0	2,60132
VV88	0,284	2,25358	0,00054	0	0,06319	0	2,60131
Kopā	0,63863	42,55318	13,59232	8,05534	4,78774	0,2114	69,83861

Table 7.1.4. Area to be set aside for the construction of WPP maintenance yards under Alternative B

WPP No.	Forest land use and age groups in the area of the assembly site to be transformed (including access roads, turns in the assembly site), ha (Alternative B)						Area to be deforested, ha
	Excerpt	Age group					
		Young people	Middle-aged stand	Briestaudze	A mature grove	Overgrown stand	
VV1	0	1,41046	1,1908	0	0	0	2,60126
VV7	0	2,45882	0	0	0,14239	0	2,60121
VV9	0	2,20775	0,32354	0,06992	0	0	2,60121
VV16	0	1,9948	0	0,01388	0,59262	0	2,6013
VV20	0	2,2376	0	0,15233	0	0,2114	2,60133
VV21	0	0,93144	0,25287	1,41701	0	0	2,60132
VV22	0	1,80653	0,72035	0,07441	0	0	2,60129
VV24	0	1,12881	0	1,47257	0	0	2,60138
VV26	0	1,85922	0,37525	0,30825	0,05863	0	2,60135
VV28	0	0,85684	1,19726	0,54655	0,00068	0	2,60133
VV30	0	2,60137	0	0	0	0	2,60137
VV31	0,30696	2,22918	0,0652	0	0	0	2,60134
VV32	0	0,74324	0	0	1,85812	0	2,60136
VV33	0	2,30725	0	0,00645	0,28766	0	2,60136
VV36	0	1,90422	0,69367	0,00337	0	0	2,60126
VV37	0	2,56284	0	0	0,03844	0	2,60128
VV38	0	0,35308	0,81189	0,63845	0,72162	0	2,52504
VV39	0	1,69665	0,38252	0,52209	0	0	2,60126
VV40	0	2,57453	0,01391	0	0,01283	0	2,60127
VV41	0,04767	0,53128	2,02102	0,0013	0	0	2,60127
VV42	0	1,99439	0,36225	0	0,24464	0	2,60128
VV46	0	2,30637	0	0,29492	0	0	2,60129
VV47	0	0	2,19893	0,27228	0	0	2,47121
VV49	0	0,84511	1,41911	0,33693	0	0	2,60115

WPP No.	Forest land use and age groups in the area of the assembly site to be transformed (including access roads, turns in the assembly site), ha (Alternative B)						Area to be deforested, ha
	Excerpt	Age group					
		Young people	Middle-aged stand	Briestaudze	A mature grove	Overgrown stand	
VV50	1,01641	0	0,12148	1,4633	0	0	2,60119
VV51	0	2,07978	0,18561	0	0,3358	0	2,60119
VV61	0	2,53616	0	0	0,0650	0	2,60118
VV64	0	1,18315	0	1,41802	0	0	2,60117
VV65	0,14211	1,44209	0,32928	0,17315	0,51453	0	2,60116
VV66	0	0	1,96241	0,63873	0	0	2,60114
VV67	0	1,01221	1,58896	0	0	0	2,60117
VV68	0	2,28521	0,19049	0	0,12543	0	2,60113
VV70	0	2,42574	0,1587	0,01671	0	0	2,60115
VV81	0	1,69207	0	0	0,90931	0	2,60138
VV82	0	2,56197	0	0,03927	0	0	2,60124
VV84	0	0	2,15979	0,44149	0	0	2,60128
VV85	0	1,24621	1,14442	0,0203	0	0	2,41093
VV86	0	0,76925	0,00165	1,83042	0	0	2,60132
VV88	0,284	2,25358	0,06373	0	0	0	2,60131
VV91	0,56761	0,5676	0	1,32319	0,14277	0	2,60117
Kopā	2,36476	61,5968003	19,93509	13,49529	6,0504974	0,2114	103,6538

Table 7.1.5. Area to be deforested for the construction of new access roads under Alternative A

WPP No.	New access roads to be built, m	Forest land use and age group of new roads to be built area of land to be transformed, ha (alternative A)						Area to be deforested , ha
		Excerpt	Age group					
			Young people	Middle-aged stand	Briestaudze	A mature grove	Overgrown stand	
VV1	32,534	0	0	0	0	0	0	0
VV16	82,09	0	0,04323	0	0	0	0	0,04323
VV20	163,927	0	0	0	0	0	0	0
VV21	77,351	0	0	0	0	0	0	0
VV22	371,171	0	0,05427	0,04874	0,24417	0	0	0,34718
VV24	22,477	0	0	0	0	0	0	0
VV26	196,603	0	0	0	0	0	0	0
VV28	46,19	0	0,00005	0	0	0	0	0,00005
VV30	57,336	0	0	0	0	0	0	0
VV31	427,906	0	0,64081	0	0	0	0,0762	0,71701
VV32	89,775	0	0	0	0	0	0	0
VV33	75,33	0	0,01513	0	0,03602	0	0	0,05115
VV36	160,882	0	0,43573	0	0	0	0	0,43573
VV37	222,707	0	0	0	0	0	0	0
VV38	199,921	0	0	0	0	0	0	0

WPP No.	New access roads to be built, m	Forest land use and age group of new roads to be built area of land to be transformed, ha (alternative A)						Area to be deforested , ha
		Excerpt	Age group					
			Young people	Middle-aged stand	Briestaudze	A mature grove	Overgrown stand	
VV39	69,487	0	0,21809	0	0	0	0	0,21809
VV40	1283,366	0	2,22417	0,00095	0,12403	0,35374	0	2,70289
VV41	93,607	0,00288	0,07006	0,01045	0	0	0	0,08339
VV42	142,605	0	0	0	0	0	0	0
VV44	56,87	0	0	0,00014	0	0	0	0,00014
VV47	336,74	0	0	0,41163	0,10342	0	0	0,51505
VV81	912,901	0	0,79736	0,00718	0	0,69577	0	1,50031
VV82	655,516	0	0,55054	0	0	0,56503	0	1,11557
VV84	164,761	0	0	0	0	0	0	0
VV85	112,374	0	0	0	0	0	0	0
VV86	94,906	0	0,00322	0,00007	0	0	0	0,00329
VV88	140,454	0	0	0	0	0	0	0
Kopā	6598,464	0,00288	6,12824	1,31757	0,00322	0,44673	0,51907	8,41771

Table 7.1.6. Area to be deforested for the construction of new access roads under Alternative B

WPP No.	New access roads to be built, m	Forest land use and age group of new roads to be built area of land to be transformed, ha (alternative B)						Area to be deforested, ha
		Excerpt	Age group					
			Young people	Middle-aged stand	Briestaudze	A mature grove	Overgrown stand	
VV1	32,534	0	0	0	0	0	0	0
VV7	2996,039	0,53317	2,6497	1,79866	0,58117	0,28434	0	5,84704
VV9	260,134	0	0,05584	0	0,00022	0	0	0,05606
VV16	82,09	0	0,04323	0	0	0	0	0,04323
VV20	163,927	0	0	0	0	0	0	0
VV21	77,351	0	0	0	0	0	0	0
VV22	371,171	0	0,05427	0,04874	0,24417	0	0	0,34718
VV24	22,477	0	0	0	0	0	0	0
VV26	196,603	0	0	0	0	0	0	0
VV28	46,19	0	0,00005	0	0	0	0	0,00005
VV30	57,336	0	0	0	0	0	0	0
VV31	427,906	0	0,64081	0	0	0	0,0762	0,71701
VV32	89,775	0	0	0	0	0	0	0

WPP No.	New access roads to be built, m	Forest land use and age group of new roads to be built area of land to be transformed, ha (alternative B)						Area to be deforested, ha
		Excerpt	Age group					
			Young people	Middle- aged stand	Briestaudze	A mature grove	Overgrown stand	
VV33	75,33	0	0,01513	0	0,03602	0	0	0,05115
VV36	160,882	0	0,43573	0	0	0	0	0,43573
VV37	222,707	0	0	0	0	0	0	0
VV38	199,921	0	0	0	0	0	0	0
VV39	69,487	0	0,21809	0	0	0	0	0,21809
VV40	1283,366	0	2,22417	0,00095	0,12403	0,35374	0	2,70289
VV41	93,607	0,00288	0,07006	0,01045	0	0	0	0,08339
VV42	142,605	0	0	0	0	0	0	0
VV46	365,547	0	0,68477	0	0	0	0	0,68477
VV47	336,74	0	0	0,41163	0,10342	0	0	0,51505
VV49	72,375	0	0	0,00593	0	0	0	0,00593
VV50	196,247	0	0	0	0	0	0	0
VV51	41,462	0	0	0	0	0	0	0
VV61	637,533	0	0,52894	0	0	0,01210	0	0,54104
VV64	80,504	0	0	0	0	0	0	0
VV65	101,69	0	0,00002	0	0,0001	0	0	0,00012
VV66	316,082	0	0	0,06772	0,11757	0,00518	0	0,19047
VV67	358,893	0	0,18562	0,0732	0	0	0,00135	0,26017
VV68	332,88	0	0,70697	0	0	0	0	0,70697
VV70	169,341	0	0,00623	0	0	0	0	0,00623
VV81	912,901	0	0,79736	0,00718	0	0,69577	0	1,50031
VV82	655,516	0	0,55054	0	0	0,56503	0	1,11557
VV84	164,761	0	0	0	0	0	0	0
VV85	112,374	0	0	0	0	0	0	0
VV86	94,906	0	0,00322	0,00007	0	0	0	0,00329
VV88	140,454	0	0	0	0	0	0	0
VV91	44,098	0	0	0	0	0	0	0
Kopā	12205,742	0,00288	9,62365	2,09199	0,00322	0,93789	0,69307	13,3527

Table 7.1.7. Area to be deforested for turning extensions under Alternative A

Forest land use and age groups within the turning radius area to be transformed (including access roads within the turning radius area), ha (Alternative A)						Area to be deforested, ha
Excerpt	Young people	Middle-aged stand	Briestaudze	A mature grove	Overgrown stand	
0,047686	1,579049	0,648272	1,090669	0,788923	0,253374	4,407973

Table 7.1.8. Area to be deforested for turn extensions under Alternative B

Forest land use and age groups within the turning radius area to be transformed (including access roads within the turning radius area), ha (Alternative B)						Area to be deforested, ha
Excerpt	Young people	Middle-aged stand	Briestaudze	A mature grove	Overgrown stand	
0,06747	2,25368	1,64085	2,09305	1,18185	0,24405	7,48095

7.2. Changes in noise and vibration levels

7.2.1. Assessment and significance of changes in noise levels

The planned area of the WPP is large (approximately 100 km² for Alternative B and 60 km² for Alternative A) and covers the municipalities of Valka and Plani. There are about 15 farmsteads in the area of the WPP Park.

An overview of the noise propagation forecast is attached in Annex 7 of the EIA Report. The Nordex 175-6.8 WPP model was selected to model the noise variations, as it has a high noise power level and very low dependence on wind speed (compared to other high noise WPP models which are more dependent on wind speed) (see Table 7.2.1). Given that, on average, a statistical wind speed of 3-8 m/s (when this pattern is loudest and noise levels increase significantly) is expected in 50% of cases, while higher wind speeds (when other patterns become louder, and not significantly so) are expected in only 42% of cases (see Section 3.3).

The WPP as a noise source is modelled as a point source at the gondola height (hub height) according to the sound pressure specified in the WPP Noise Technical Specification: the technical specification takes into account that the WPP generates noise not only in the nacelle but also in the entire wing sweep, which is much lower than the nacelle in the lower position (less noise reaching the ground) and much higher than the nacelle in the upper position (less noise reaching the ground), and is therefore averaged at the nacelle height.

Table 7.2.1. Comparison of noise levels of three WPP models as a function of wind speed

Wind speed, m/s	3	4	5	6	7	8	9	>10
WPP model								
Vestas V172-7.2 dB	97,8	97,8	98,4	101,8	105,4	108,8	110,1	110,1
Nordex 175-6.8 dB	98,2	102,4	107,3	108,9	108,9	108,9	108,9	108,9
Nordex 163-6.8 dB	97,5	97,5	97,5	100,8	100,8	105,7	109,2	109,2

The noise levels from the WPPs have been modelled for the whole calendar year, for both planned WPP siting alternatives. The modelling was carried out taking into account the prevailing wind direction, speed and associated noise power of the WPP, with daily average wind speeds with no statistically significant differences between day, evening and night, resulting in noise maps showing the constant noise level during all periods of the day, and applying the nighttime thresholds, which are the lowest, to the assessment.

Noise propagation has been modelled for both alternatives A and B, where B fully encompasses A. For sub-alternatives A' and B', where the only difference is an increased mast height for part of the WPP, noise propagation has not been modelled separately, as a higher mast reduces the noise level from the WPP operation in the built-up area near the ground by about 1 dB. An increase in wind speed of about 0.2 m/s for every 25 m of altitude does not practically increase the noise level. The main alternatives are therefore slightly louder than the sub-alternatives, but this difference is less than 1 dB (see Annex 7) and is considered to be insignificant and only noise-reducing compared to the modelled alternatives.

In addition to the planned wind turbines in the south-eastern part of the WPP Park, a BESS is planned to be installed on the site, as described in Chapter 4.4 of the EIA Report, and the noise from these installations has also been included in the noise modelling. The batteries themselves do not make noise, but the ancillary HVAC equipment associated with the BESS does.

Noise propagation has been modelled separately for WPP without background noise, and the results have then been summed with background or traffic noise (Section 6.7) and analysed (at the end of this chapter). Since the last amendment of 3 November 2023 to Cabinet Regulation No 16 of 7 January 2014 "Procedures for the assessment and management of noise", which increased the threshold values for traffic noise, there has been no methodology for comparing the cumulative noise from different noise sources with different threshold values, such as the WPP + motorways in the case of this project, and therefore no threshold values for the cumulative noise.

Separately, infrasound is not considered in this prediction because according to the standard LVS ISO 389-7:2007 "On thresholds for assistive listening", hearing sensitivity in this range (below 20 Hz) is more than 60 dB lower than in the basic hearing range (160-14000 Hz). In addition, according to LVS ISO 1996-2:2018 "Acoustics. Ambient noise characterisation, measurement and assessment. Part 2: For the purposes of paragraph 10.4 of the 'Determination of sound pressure level', if the difference between two noise sources is greater than 10 dB, the noise contributing to the cumulative noise shall be the greater of the two and the contribution of the lesser shall be negligible. In this case, when the difference between a person's hearing sensitivity (sound perception level) in the infrasound range and in the basic hearing range is about 60 dB, this part of the noise (infrasound) cannot be perceived. The noise spectrum of the WPP model also includes most of the infrasound: 6.3-20 Hz.

Figure 7.2.1 provides a noise propagation map for Alternative B with 40 WPP, which also includes Alternative A with 25 WPP in its entirety.

The results of the noise calculations indicate that no potential problems with exceedances of the noise limit values are expected:

1. In the existing situation, the noise level (traffic noise only) fully complies with Cabinet Regulation No 16 of 7 January 2014 "Noise Assessment and Management Procedures": the traffic noise limit values are not exceeded (and the low traffic noise does not exceed the noise limit values for industrial sites);

2. In the existing situation (traffic noise), in one homestead area, measuring point 1, the WHO guideline²¹² for road traffic noise recommends a daily_{LDV} value < 53 dBA (see Table 7.2.2.);
3. Calculation of the noise level at night during operation of the 27 WPPs (Option A): the permissible noise level in the homestead areas at all times of the day (see Table 7.2.3) is complied with in accordance with the Cabinet of Ministers of the Republic of Latvia Regulation No 16 of 07.01.2014 "Noise assessment and management procedure";
4. Calculation of the noise level at night when operating 40 WPP (Option B): the permissible noise level in the homestead areas at all times of the day (see Table 7.2.4.) is ensured, in accordance with the Regulation No 16 of the Cabinet of Ministers of the Republic of Latvia of 07.01.2014 "Noise assessment and management procedure";
5. In some homestead areas (Option A, measuring points 1, 4, 6, 8, Option B, measuring points 1, 4, 6, 8, 13) the WHO guidelines²¹³ for wind turbine noise do not meet the recommended daily_{LDV} value < 45 dBA;

To comply with the daily_{ADI} values recommended in the WHO guidelines:

Option A for WPPs VV88, VV85, VV84, VV47, VV46, VV37, VV21, VV16: when selecting WPPs, the project promoter should select WPPs whose noise emissions comply with WHO recommendations, install WPPs with the lowest possible noise emissions or aerodynamically improved wings;

Option B for WPP VV88, VV85, VV84, VV66, VV47, VV46, VV37, VV21, VV16: when selecting WPP, the project promoter should select WPP with noise emissions that comply with WHO recommendations, install WPP with the lowest possible noise emissions or aerodynamically improved wings;

6. As it stands, the night-time traffic noise (43.2 dB(A)) at the "Bērzi" development is considered to be zero according to acoustics laws compared to the night-time traffic noise limit value (55 dB(A)) and does not reach the limit value for industrial sites (45 dB(A)). The nearest WPP (mostly WPP No VV85: The noise level (43,7 dB(A)) from the same development at a distance of 892 m in both alternatives also constitutes its own noise level, that of the industrial site, which also does not reach the limit value. In order to determine the cumulative noise level in this area, a logarithmic summation of these two noise levels has to be carried out: cumulative night noise $L_{night} = 46.4$ dBA, which is very slightly (1.4 dBA) above the limit value for noise from industrial sites, although it is much (8.6 dBA) below the limit value for traffic noise. However, no overall limit value has been set for this cumulative noise level in accordance with Regulation No 16 of the Cabinet of Ministers of the Republic of Latvia. For the purposes of an EIA, therefore, it is logical to deduce at least roughly what this should be.

The limit value for the aggregate noise should be a variable value depending on the contribution of traffic noise (which individually has a higher limit value) and industrial noise (which individually has a lower limit value): the aggregate limit value should be closer to one or other of the individual limit values the greater the contribution of one or other of the individual noise sources to the aggregate. In a situation where the two noise sources are equivalent, the limit value for the total noise should be midway between the two individual limit values: $L_{night} = 50$ dBA. The situation under assessment is close to this average case: the noise from the two sources is practically the same (0,5 dBA difference), so the limit value should be 50 dBA (or 49,75 dBA by including the 0,5

²¹² Compendium of WHO and other UN guidance on health and environment, 2022 update

²¹³ Compendium of WHO and other UN guidance on health and environment, 2022 update

dBA higher intensity of the industrial noise and consequently shifting the combined limit value of the two different sources by 0,25 dBA closer to the limit value of the noise which is 0,5 dBA higher) and in this case the combined noise of 46,4 dBA does not approach this limit value convincingly.

The exceptional situation described in the previous paragraph is not relevant for the other development areas of the WPP park, as the cumulative noise level in each case does not even reach the lowest noise limit value for industrial sites.

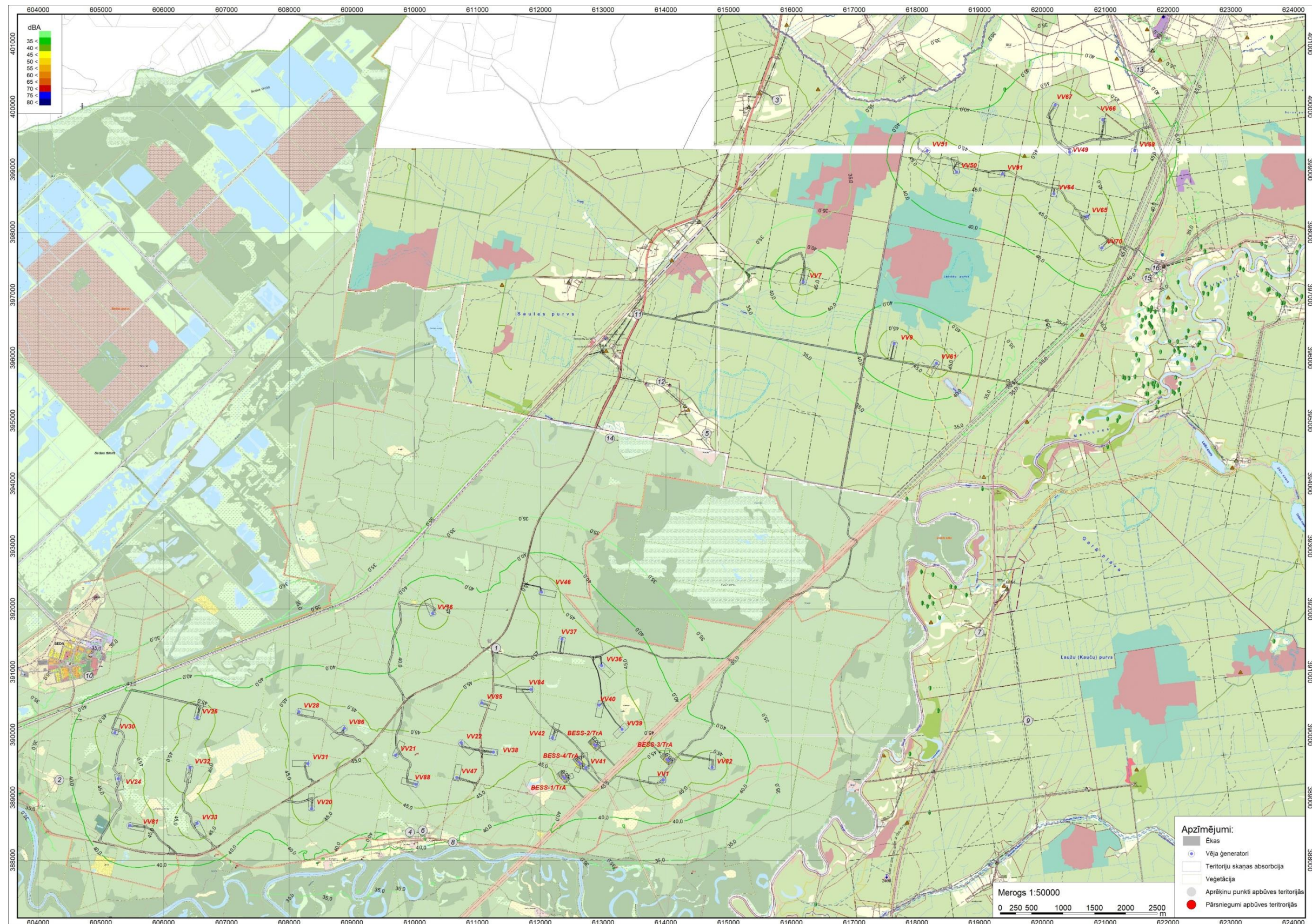


Figure 7.2.1. Long-term noise indicator L_{day} , $L_{evening}$, L_{night} Alternative B with 40 WPP.

Table 7.2.2. Current ambient sound

Designation of calculation points on the map	Designations of calculation points characterising built-up areas	Height of calculation point above site, m	Long-term ambient noise indicator level, L_{day} dBA	Long-term ambient noise indicator level, L_{vakars} dBA	Long-term ambient noise indicator level, L_{night} dBA	Limit value for the long-term environmental noise indicator of the Building Regulation 016, L_{day}	Difference in level of environmental noise indicator L_{dien} compared to the normative limit values of the Cabinet of Ministers of the Republic of Latvia, dB	Long-term environmental noise limit value of the noise limit value of the building regulation 016 of the Cabinet of Ministers of the Republic of Latvia, L_{vakars}	Difference of the level of the environmental noise indicator L_{vakars} with respect to the normative limit values of the Cabinet of Ministers of the Republic of Latvia, dB	Limit value of the long-term environmental noise indicator of the Building Regulation 016, L_{night}	Difference of ambient noise indicator L_{night} level compared to the normative limit values of the Cabinet of Ministers of the Republic of Latvia, dB	Ambient noise indicator L_{avg} level compared to the WHO guidelines
1	Bērzi, Plāņu pag.	4	51	49	44	65	-14	60	-11	55	-11	53
2	Dreimaņi, Plāņu	4	26	23	19	65	-39	60	-37	55	-36	27
3	Kalnģulbj, Valkas pag.	4	30	28	23	65	-35	60	-32	55	-32	32
4	Kūmiņas, Plāņu	4	30	17	22	65	-35	60	-33	55	-33	31
5	Madaras 1, Valkas pag.	4	21	19	14	65	-44	60	-41	55	-41	23
6	Melderi, Plāņu pag.	4	31	28	23	65	-34	60	-32	55	-32	32

Designation of calculation points on the map	Designations of calculation points characterising built-up areas	Height of calculation point above site, m	Long-term ambient noise indicator level, L_{day} dBA	Long-term ambient noise indicator level, L_{vakar} dBA	Long-term ambient noise indicator level, L_{night} dBA	Limit value for the long-term environmental noise indicator of the Building Regulation 016, L_{day}	Difference in level of environmental noise indicator L_{dien} compared to the normative limit values of the Cabinet of Ministers of the Republic of Latvia, dB	Long-term environmental noise limit value of the noise limit value of the building regulation 016 of the Cabinet of Ministers of the Republic of Latvia, L_{vakars}	Difference of the level of the environmental noise indicator L_{vakars} with respect to the normative limit values of the Cabinet of Ministers of the Republic of Latvia, dB	Limit value of the long-term environmental noise indicator of the Building Regulation 016, L_{night}	Difference of ambient noise indicator L_{night} level compared to the normative limit values of the Cabinet of Ministers of the Republic of Latvia, dB	Ambient noise indicator L_{avg} level compared to the WHO guidelines
7	Mieriņi, Vijciema pag.	4	44	41	36	65	-21	60	-19	55	-19	45
8	Oliņas, Plāņu pag.	4	20	18	13	65	-45	60	-42	55	-42	22
9	Ozoli, Vijciema	4	27	25	20	65	-38	60	-35	55	-35	29
10	Parka iela 23, Seda	4	20	17	13	65	-45	60	-43	55	-43	21
11	Saule 4, Valkas	4	57	54	50	65	-8	60	-6	55	-5	59
12	Skujas, Valka	4	24	21	17	65	-41	60	-39	55	-38	25
13	Vēverzemnieki	4	49	47	42	65	-16	60	-13	55	-13	51
14	Vīksnupes, Plāņu pag.	4	36	34	29	65	-29	60	-26	55	-26	38
15	Zīle 4, Valkas p	4	28	25	21	65	-37	60	-35	55	-34	29

Table 7.2.3. Long-term night-time noise performance of WPPs L_{night} in homestead areas: Alternative A

Designation of calculation points on the map	Designations of calculation points characterising built-up areas	Height of calculation point above site, m	Long-term ambient noise indicator level, L_{day} dBA	Long-term ambient noise indicator level, L_{vakars} dBA	Long-term ambient noise indicator level, L_{night} dBA	Limit value for the long-term environmental noise indicator of the Building Regulation 016, L_{day}	Difference in level of environmental noise indicator L_{dien} compared to the normative limit values of the Cabinet of Ministers of the Republic of Latvia, dB	Long-term environmental noise limit value of the noise limit value of the building regulation 016 of the Cabinet of Ministers of the Republic of Latvia, L_{vakars}	Difference of the level of the environmental noise indicator L_{vakars} with respect to the normative limit values of the Cabinet of Ministers of the Republic of Latvia, dB	Limit value of the long-term environmental noise indicator of the Building Regulation 016, L_{night}	Difference of ambient noise indicator L_{night} level compared to the normative limit values of the Cabinet of Ministers of the Republic of Latvia, dB	Ambient noise indicator L_{avg} level compared to the WHO guidelines
1	Bērzi, Plāņu pag.	4	43	43	43	55	-12	50	-7	45	-2	50
2	Dreimaņi, Plāņu	4	38	38	38	55	-17	50	-12	45	-7	45
3	Kalnģulbj, Valkas pag.	4	0	0	0	55	-55	50	-50	45	-45	6
4	Kūmiņas, Plāņu	4	41	41	41	55	-14	50	-8	45	-4	47
5	Madaras 1, Valkas pag.	4	19	19	19	55	-36	50	-31	45	-26	25

Designation of calculation points on the map	Designations of calculation points characterising built-up areas	Height of calculation point above site, m	Long-term ambient noise indicator level, L_{day} dBA	Long-term ambient noise indicator level, L_{vakar} dBA	Long-term ambient noise indicator level, L_{night} dBA	Limit value for the long-term environmental noise indicator of the Building Regulation 016, L_{day}	Difference in level of environmental noise indicator L_{dien} compared to the normative limit values of the Cabinet of Ministers of the Republic of Latvia, dB	Long-term environmental noise limit value of the noise limit value of the building regulation 016 of the Cabinet of Ministers of the Republic of Latvia, L_{vakars}	Difference of the level of the environmental noise indicator L_{vakars} with respect to the normative limit values of the Cabinet of Ministers of the Republic of Latvia, dB	Limit value of the long-term environmental noise indicator of the Building Regulation 016, L_{night}	Difference of ambient noise indicator L_{night} level compared to the normative limit values of the Cabinet of Ministers of the Republic of Latvia, dB	Ambient noise indicator L_{avg} level compared to the WHO guidelines
6	Melderi, Plāņu pag.	4	42	42	42	55	-13	50	-8	45	-3	49
7	Mieriņi, Vijciema pag.	4	17	17	17	55	-38	50	-33	45	-28	23
8	Oliņas, Plāņu pag.	4	39	39	39	55	-16	50	-11	45	-6	46
9	Ozoli, Vijciema	4	0	0	0	55	-55	50	-50	45	-45	6
10	Parka iela 23, Seda	4	37	37	37	55	-18	50	-13	45	-8	43
11	Saule 4, Valkas	4	14	14	14	55	-41	50	-36	45	-31	20
12	Skujas, Valka	4	18	18	18	55	-37	50	-32	45	-27	24
13	Vēverzemnieki	4	0	0	0	55	-55	50	-50	45	-45	6
14	Vīksnupes,	4	26	26	26	55	-29	50	-24	45	-19	33

Designation of calculation points on the map	Designations of calculation points characterising built-up areas	Height of calculation point above site, m	Long-term ambient noise indicator level, L_{day} dBA	Long-term ambient noise indicator level, L_{vakar} dBA	Long-term ambient noise indicator level, L_{night} dBA	Limit value for the long-term environmental noise indicator of the Building Regulation 016, L_{day}	Difference in level of environmental noise indicator L_{dien} compared to the normative limit values of the Cabinet of Ministers of the Republic of Latvia, dB	Long-term environmental noise limit value of the noise limit value of the building regulation 016 of the Cabinet of Ministers of the Republic of Latvia, L_{vakars}	Difference of the level of the environmental noise indicator L_{vakars} with respect to the normative limit values of the Cabinet of Ministers of the Republic of Latvia, dB	Limit value of the long-term environmental noise indicator of the Building Regulation 016, L_{night}	Difference of ambient noise indicator L_{night} level compared to the normative limit values of the Cabinet of Ministers of the Republic of Latvia, dB	Ambient noise indicator L_{avg} level compared to the WHO guidelines
	Plāņu pag.											
15	Zīle 4, Valkas p	4	0	0	0	55	-55	50	-50	45	-45	6

Table 7.2.4. Long-term indicator of noise from WPPs at night L_{night} in homestead areas: Alternative B

Designation of calculation points on the map	Designations of calculation points characterising built-up areas	Height of the calculation point above the site, m (according to Building Regulation 016, Annex 1, paragraph 1.4.1)	Long-term ambient noise indicator level, L_{day} dBA	Long-term ambient noise indicator level, L_{vakar} dBA	Long-term ambient noise indicator level, L_{night} dBA	Limit value for the long-term environmental noise indicator of the Building Regulation 016, L_{day}	Difference in level of environmental noise indicator L_{dien} compared to the normative limit values of the Cabinet of Ministers of the Republic of Latvia, dB	Long-term environmental noise limit value of the noise limit value of the building regulation 016 of the Cabinet of Ministers of the Republic of Latvia, L_{vakars}	Difference of the level of the environmental noise indicator L_{vakars} with respect to the normative limit values of the Cabinet of Ministers of the Republic of Latvia, dB	Limit value of the long-term environmental noise indicator of the Building Regulation 016, L_{night}	Difference of ambient noise indicator L_{night} level compared to the normative limit values of the Cabinet of Ministers of the Republic of Latvia, dB	Ambient noise indicator L_{avg} level compared to the WHO guidelines
1	Bērzi, Plāņu pag.	4	43	43	43	55	-12	50	-7	45	-2	50
2	Dreimaņi, Plāņu	4	38	38	38	55	-17	50	-12	45	-7	45
3	Kalngulbjī, Valkas pag.	4	0	0	0	55	-55	50	-50	45	-45	6
4	Kūmiņas, Plāņu	4	41	41	41	55	-14	50	-8	45	-4	47
5	Madaras 1, Valkas pag.	4	19	19	19	55	-36	50	-31	45	-26	25
6	Melderī, Plāņu pag.	4	42	42	42	55	-13	50	-8	45	-3	49
7	Mieriņi, Vij-	4	17	17	17	55	-38	50	-33	45	-28	23

Designation of calculation points on the map	Designations of calculation points characterising built-up areas	Height of the calculation point above the site, m (according to Building Regulation 016, Annex 1, paragraph 1.4.1)	Long-term ambient noise indicator level, L_{day} dBA	Long-term ambient noise indicator level, L_{vakar} dBA	Long-term ambient noise indicator level, L_{night} dBA	Limit value for the long-term environmental noise indicator of the Building Regulation 016, L_{day}	Difference in level of environmental noise indicator L_{dien} compared to the normative limit values of the Cabinet of Ministers of the Republic of Latvia, dB	Long-term environmental noise limit value of the noise limit value of the building regulation 016 of the Cabinet of Ministers of the Republic of Latvia, L_{vakars}	Difference of the level of the environmental noise indicator L_{vakars} with respect to the normative limit values of the Cabinet of Ministers of the Republic of Latvia, dB	Limit value of the long-term environmental noise indicator of the Building Regulation 016, L_{night}	Difference of ambient noise indicator L_{night} level compared to the normative limit values of the Cabinet of Ministers of the Republic of Latvia, dB	Ambient noise indicator L_{avg} level compared to the WHO guidelines
	ciema pag.											
8	Oliņas, Plāņu pag.	4	39	39	39	55	-16	50	-11	45	-6	46
9	Ozoli, Vijciema	4	0	0	0	55	-55	50	-50	45	-45	6
10	Parka iela 23, Seda	4	37	37	37	55	-18	50	-13	45	-8	43
11	Saule 4, Valkas	4	14	14	14	55	-41	50	-36	45	-31	20
12	Skujas, Valka	4	18	18	18	55	-37	50	-32	45	-27	24
13	Vēverzemnieki	4	0	0	0	55	-55	50	-50	45	-45	6
14	Vīksnupes, Plāņu pag.	4	26	26	26	55	-29	50	-24	45	-19	33
15	Zīle 4, Valkas pag.	4	0	0	0	55	-55	50	-50	45	-45	6

7.2.2. Assessment and significance of low-frequency noise

There are no laws and regulations in Latvia that set limit values for low-frequency noise. For the assessment of low-frequency noise in this EIA, the Danish limit values and the procedure for setting them for WPP development projects have been used as a basis. The cumulative low-frequency (10-160 Hz) noise level from WPP in residential buildings must not exceed 20 dB at wind speeds of 6 m/s and 8 m/s. The predicted low-frequency noise of the WPPs has been calculated for all 84 WPPs initially evaluated at the same time, fully covering the two alternatives evaluated in more detail, using the WindPro software with up-to-date data from WPP manufacturers on the latest models for which low-frequency noise measurements have been carried out²¹⁴: see Annex 7. The results do not exceed the Danish limit values (see Figure 7.2.2). However, these results would have no real use even if the Danish (not Latvian) thresholds were exceeded.

As discussed in the previous section, hearing sensitivity in the infrasound range (below 20 Hz) is more than 60 dB lower than in the basic hearing range (160-14000 Hz). And in accordance with LVS ISO 1996-2:2018 "Acoustics. Ambient noise characterisation, measurement and assessment. Part 2: In the case of the "Determination of sound pressure level", in relation 10.4, if the difference between two noise sources is greater than 10 dB, the noise contributing to the total noise is the greater and the lesser contribution is negligible or zero, so in this case, when the difference between the ear's perception in the infrasound range and the basic hearing range is ~60 dB instead of 10 dB, there is no possibility of perceiving this part of the noise (infrasound). However, the WPP noise spectrum modelled in the previous section also includes most of the infrasound, 6.3-20 Hz, and therefore even more of the low-frequency sound: 6.3-160 Hz (only the very bottom is missing: 0-6.3 Hz), except that it is not assessed separately, but only as a minor component of the overall sound emission.

²¹⁴ WindPRO 3.6.366 by EMD International A/S, SIA "Environment" licence (client) No 8797.

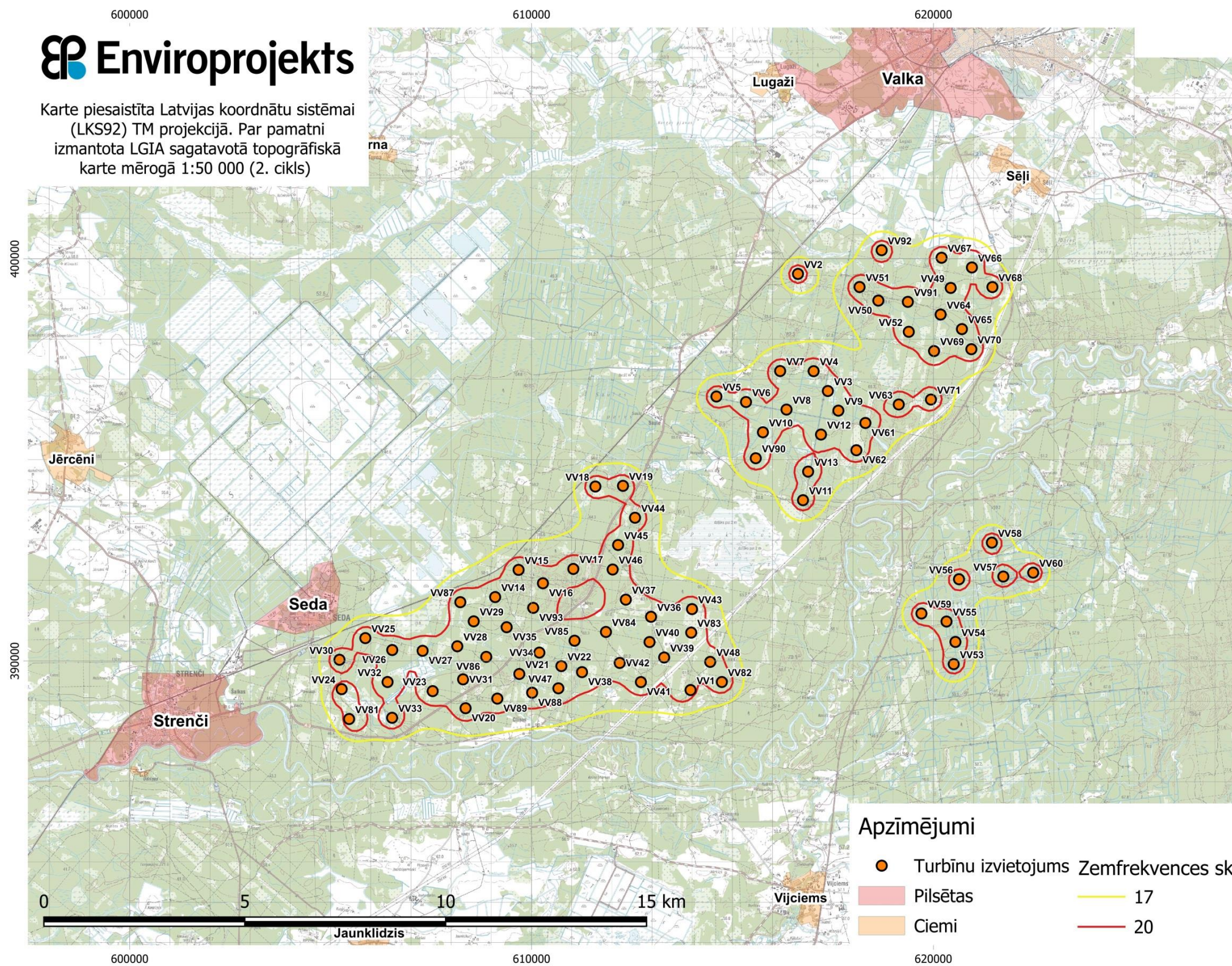


Figure 7.2.2. Long-term value of low-frequency night-time noise from WPPs at wind speeds of 8 m/s according to the Danish methodology: 84 WPP.

It is believed that WPP produce strong low-frequency sounds in the range inaudible to humans (infrasound), which travel long distances and do not harm health. However, *"EU and global studies show that noise from wind farms generally causes disturbance to people living near them, but there is no scientific evidence of harmful effects on human health"*²¹⁵. Other sources (Guidelines for the Environmental Impact Assessment of Wind Power Plants and Recommendations on Requirements for the Construction of Wind Power Plants) confirm this: *"Several studies have shown that even lower sound pressure levels from wind farms disturb people more than higher sound pressure levels from road traffic. The pulsed nature of sound from wind turbines has been cited as a key reason for this exacerbated noise perception"*²¹⁶.

Ibid, "Guidelines for the Environmental Impact Assessment of Wind Power Plants and Recommendations on Requirements for the Construction of Wind Power Plants",²¹⁷, states that *"sound pressure levels in the frequency range below 10 Hz can exceed 60 dB(A) even at a distance of 750 m from a wind power plant"*, quoting G.P. Van Den Berg (2004)²¹⁸, however, this study does not find any direct effects on people (neither health nor comfort) from this inaudible sound, but deals with a completely different issue: infrared sound, while inaudible itself, can cause vibration of building elements (e.g. open windows), transforming this sound into an already higher frequency audible sound, whose pressure level is negligible, although it may be slightly audible.

There is some information in the literature on health symptoms attributed by some people to wind turbines, particularly in relation to audible noise, low frequency noise, infrasound and electromagnetic fields, but several studies link this to the *nocebo* effect, which can lead to expectations of undesirable effects or symptoms coming true, as well as misattribution of existing or new symptoms to a new technology.²¹⁹

A study²²⁰ by Finnish scientists looking at the potential impact of wind turbines on human health found that the infrasound they produce does not affect human health and does not cause any symptoms. The project consisted of three sub-projects: a long-term measurement campaign, surveys and listening tests. The study focused on locations where local residents reported symptoms that they themselves associated with infrasound emitted by nearby wind turbines. In the infrasound measurement campaign, the researchers aimed to investigate the levels and variations of infrasound inside dwellings adjacent to wind farms. On the other hand, according to the survey results, symptoms associated with infrasound from wind turbines were common: ~15% of respondents living near wind turbines.

Measurements in the two regions continued for 308 days. The continuous infrasound pressure levels in the residential homes were found to be 67-75 dB(A). The worst-case scenarios were then selected and used in listening tests, which divided participants into two groups based on their reports of symptoms caused by infrasound from wind turbines: people who suffered

²¹⁵ <https://pubs.aip.org/asa/jasa/article-abstract/116/6/3460/545245/Perception-and-annoyance-due-to-wind-turbine-noise?redirectedFrom=fulltext>

²¹⁶ <https://www.vpnb.gov.lv/lv/media/827/download>

²¹⁷ <https://www.vpnb.gov.lv/lv/media/827/download>

²¹⁸ <https://eolmernormandie.debatpublic.fr/images/documents/bibliotheque-debat/22.do-wind-turbines-produce-significant-low-frequency-sound-levels.pdf>

²¹⁹ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6121031/>

²²⁰ https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/162329/VNTEAS_2020_34.pdf?sequence=1&isAllowed=y

from them and people who did not. None of the participants were able to distinguish the frequencies of the infrasound in the wind turbine noise, nor did the presence of infrasound make any difference to how disturbing they found the wind turbine noise. The participants' autonomic nervous system also did not react to the infrared sound. No evidence was found on the health effects of infrasound from wind turbines.

Extensive national epidemiological studies on the public health effects of low-frequency noise from WPP have been carried out in Denmark, analysing the effects of WPP noise on cardiovascular disease, pregnancy and diabetes. The results of the studies have been published in 2018^{at221, 222, 223, 224}. During these studies, which analysed public health related aspects in the vicinity of all the WPPs deployed in Denmark (height of distance of up to 40 WPPs) where ~615,000 residents lived during the reporting period, during the period from 1982 to 2013, the initial hypotheses that the noises generated by WPPs, including that of low frequency, would have a negative impact on public health were not confirmed. The authors note that some observations suggest that potentially higher relative risk factors could be observed in areas where the ambient noise level from the WPP is above 42 dB(A) and the indoor low-frequency noise level is above 15 dB(A).

The low-frequency outdoor noise modelled in this EIA does not reach even the lowest indoor levels in any of the nearby developments mentioned in all these studies: 15 dB(A).

7.2.3. Assessment and significance of changes in vibration levels

During operation, the imbalance and friction of the rotating parts cause vibrations that are undesirable not only from an environmental point of view, but above all for the operation of the WPP itself, which is why they are minimised in the design of the WPP. The main sources of vibration in a WPP are the generator, gearbox and bearing systems. The vibration of these rotating parts can also cause the nacelle and tower to vibrate. At high wind speeds, the level of vibration can be increased by imbalances in the WPP parts due to wind pressure and turbulent flows.

No significant effects related to vibrations from WPPs have been observed in studies to date. Studies in Canada^{225 226} indicate that vibration levels are no higher than 0.01 m/s^2 at a distance of about 300 m from the WPP. Vibrations from WPPs have not been studied in Latvia, and relatively few studies have been carried out in other countries. Most of these studies analyse solutions to mitigate vibration from the mechanical parts of the WPP to prevent damage to the WPP due to vibration, and only a few studies analyse the impact of vibration on areas close to the WPP. The nearest country where vibration studies have been carried out is Germany.

²²¹ A. H. Poulsen et al., Long-term exposure to wind turbine noise and redemption of antihypertensive medication: A nationwide cohort study. *Environment International* 121 (Pt.1), September 2018

²²² A. H. Poulsen et al., Pregnancy exposure to wind turbine noise and adverse birth outcomes : A nationwide cohort study, *Environment International* 167, September 2018

²²³ A. H. Poulsen et al., Long-term exposure to wind turbine noise at night and risk for diabetes: A nationwide cohort study, *Environmental Research* 165, April 2018

²²⁴ A. H. Poulsen et al., Short-term nighttime wind turbine noise and cardiovascular events: A nationwide casecrossover study from Denmark, *Environment international* 114, March 2018

²²⁵ J. G. Hurtado et al., Field monitoring and analysis of an onshore wind turbine shallow foundation system, *Geo Ottawa* 2017

²²⁶ W.N. Edwards, Analysis of Measured Wind Turbine Seismic Noise Generated from the Summerside Wind Farm, Prince Edward Island; Geological Survey of Canada, 2015

In 2009, the first guidelines in the world²²⁷ were approved in Germany, setting vibration limit values for the mechanical parts of WPPs. In 2015, these guidelines were updated to extend the thresholds to WPPs with a rated capacity of more than 3 MW. These guidelines and the limit values they set are taken into account by all major WPP manufacturers when developing new WPP models and by users when operating WPPs. The permissible limits for vibration velocity (*velocity*) and acceleration(*acceleration*) set by VDI 3834 are not met.

Short-term effects may arise from vibrations caused by construction machinery during construction.

WPPs do not directly cause mechanical vibrations (unlike, for example, the operation of a pneumatic hammer, or a vehicle travelling on a rough road, which directly causes vibrations). However, slight vibrations may occur due to imbalance and friction of the rotating parts. The main sources of potential vibration in a WPP are the generator, gearbox and bearing systems.

Vibration velocities (mm/s) and accelerations (m/s²) at different frequencies are determined for the WPP components that generate the vibrations: bearing system, gearbox, generator and nacelle.

A study on low-frequency noise and vibration was carried out in Germany in 2013-2015²²⁸ which, similar to the Canadian studies, found that vibration levels were slightly higher than 0.01 m/s at 285 m from the WPP². The vibration level on the foundations of the WPP was relatively high at 1 m/s² However, the vibration level decreased rapidly as the WPP was moved away.

There are no laws and regulations in Latvia that regulate the level of vibration in the environment. Until 2010, Cabinet Regulation No 341 of 25 June 2003 "Regulations on permissible values of vibration in residential and public buildings" (hereinafter - Cabinet Regulation No 341) was in force. 341), which laid down the permissible vibration values in the following areas of residential and public buildings: living rooms, rooms in hotels, guest houses (three-star category and above) and motels (category III and above), rooms in hotels and guest houses (two-star category and below), rooms in motels (category II and below), patient wards in medical and rehabilitation institutions, operating theatres, patient examination rooms, classrooms and library reading rooms, administrative and office premises, sales halls of commercial, catering and domestic service establishments, public event rooms, except sports halls, and sports halls and swimming pools. Comparing the permissible limits of Cabinet Regulation No 341 with the vibration values determined in Canadian and German studies, the vibrations from WPPs already at a distance of about 300 m from WPPs do not exceed the limits established until 2010, even in operating theatres of medical institutions, where the lowest permissible vibration level is 0.028 m/s² (at night).

Of course, operating theatres in medical institutions, which have very strict limits because of the significant effects of vibration, are not comparable to residential buildings. However, comparing the results of studies on vibration from WPP with the vibration limit values that were set in Latvia until 2010, it can be concluded that the vibration from WPP at a distance of 300 m is already lower than the lowest limit value set, i.e. in operating theatres at night. As the vibration level of the technical components of the WPP (bearings, gearbox, etc.) does not depend on the capacity of the WPP, and the major WPP manufacturers follow the guidelines of

²²⁷ VDI 3834 "Messung und Beurteilung der mechanischen Schwingungen von Windenergieanlagen und deren Komponenten - Onshore Windenergieanlagen mit Getrieben, March 2009

²²⁸ Ministerium für Umwelt, Klima und Energiewirtschaft Baden-Württemberg, 2016. Low-frequency noise incl. infrasound from wind turbines and other sources. Report on results of the measurement project 2013–2015

VDI 3834 when manufacturing WPPs, there is no reason to believe that the implementation of the proposed activity of Latvijas vēja parki Ltd will result in a higher vibration level than that specified in Cabinet Regulation No 341 or in the aforementioned studies where the vibration level was obtained by measurements. Therefore, the impact of vibration on the population is assessed as negligible.

The level of vibration caused by WPPs and their impact on nearby areas in Latvia are not limited by regulatory limits. Until 30 June 2010, vibration limit values were laid down in Cabinet Regulation No 341. No new legislation setting vibration limit values has been adopted since 30 June 2010, when these provisions expired. These regulations set lower vibration limits for operating theatres and wards in medical and rehabilitation facilities (night period), where the weighted vibration acceleration could not exceed 0.028 m/s^2 . In living areas, the weighted vibration acceleration must not have exceeded 0.04 m/s^2 at night and 0.07 m/s^2 during the day.

A comparison of the results of vibration measurements from WPPs with the vibration limits in force in Latvia until 30 June 2010 shows that vibration levels in the immediate vicinity of WPPs are higher than the former limits, while vibration levels as close as 300 m from WPPs are significantly lower than the lower limit for operating theatres and wards in medical and rehabilitation facilities (at night). Although no studies have been carried out on the vibration levels of the WPPs assessed in this EIA, given that the limit values for the mechanical parts of the WPPs are set independently of the capacity of the WPP, there is no reason to believe that the vibration levels of the proposed WPPs will approach the limit values that were in force in Latvia at the time and will cause any perceptible discomfort outside the former protection zones of the WPPs. Therefore, the proposed operation, which does not foresee any WPP closer than 800 m to any human dwelling, cannot by a large margin cause vibrations that would disturb people.

7.3. Effects of the flicker effect

One of the impacts that is considered important and always analysed when assessing the impact of WPPs on social welfare is the flicker effect of WPPs. The flickering effect (also known as "disco effect" or "shadow flickering") is caused by the movement of the rotor wings as they periodically block out the sun and create moving shadows on the ground and on the surface of objects, and can cause subjective discomfort for humans. However, the only objective adverse effect on human health found in the literature is that for epileptics, lighting changes of 3-60 Hz can trigger epileptic seizures. Modern high-power wind rotors produce much slower flicker: typically in the range of 0.2-1 Hz.

There are no laws and regulations in Latvia that set out how the flicker effect should be assessed and limited. Similarly, in other EU countries, where flicker exposure limits are set in guidelines rather than in legislation, the reason is that flicker is known and defined as a nuisance, but there is no scientific evidence of its effects on public health.

The environmental impact assessment of WPP in other countries and also in the latest Latvian "Guidelines for Environmental Impact Assessment of Wind Power Plants and Recommendations on Requirements for Construction of Wind Power Plants" (2023) set the following flicker impact targets (preferred, as they are not mandatory thresholds):

- 30 flicker hours per year if calculated using the worst-case scenario method;
- 10 flicker hours/year if calculated under a realistic scenario (Germany, Belgium and Sweden recommend a limit of 8 h/year);

- 30 minutes per day for both assessment scenarios (clearly an unreasonable figure, as in the real scenario modelling this figure decreases by about the same factor as the number of hours per year).

These targets are very strict: 10 hours per year means ~1 min. 40 s per day. Such a disturbance is difficult for the exposed person to notice even if a sharply contoured shadow of a nearby WPP flickers over his house for ~1.5 minutes a day (and he stays in the room or outdoor space where the shadow falls every day during that time): it is incomparably smaller than, for example, a disturbance of air pollution or noise levels (factors with proven health risks) that is recognised by law as acceptable. However, if the flickering shadow is only present for a minor part of the days of the year, e.g. 1 month, and the duration of the shadow is on average 20 minutes during that month, approaching half an hour for part of the month, it may already be (if the WPP is close and the shadow is sharp) a significant disturbance during this limited period of the year, the undesirability of which is understandable.

However, no objective harm has been proven from the flickering effect, only that the shadow can be subjectively annoying and make reading and other concentration-related activities more difficult. Even epilepsy patients are no longer harmed by the slow flickering of modern large WPP. This is apparently why no country has statutory limits for the flicker effect, because there is no scientific basis for them (unlike, for example, air pollution or noise, which have objective grounds). At the same time, there are guideline targets that are being pursued as a precautionary measure without a firm scientific or legal basis. Moreover, this minute and a half tends to be applied to a distance of ten WPP rotor diameters (see analysis below), at which point the shadow is actually no longer visible at all. These recommendations, unchanged for decades and untouched by the development of WPPs, must have been made in the early days of NPS impact assessment, when there was no methodology for realistic scenarios, and the shadows of small, rapidly rotating NPSs were assessed only by the worst-case scenario method and recommended not to exceed 30 hours per year (5 minutes per day), virtually always citing the risk of seizures in epileptics as the only justification. (For comparison: the law's objectively determined noise standards in Latvia have been changed in 2004, 2014 and 2023, so 3 times in the history of these VPP's flickering shadow law's vague subjective recommendations, even though noise as an environmental factor whose harm has been proven has existed unchanged for millions of years, while the nature and rotor diameter of VPP shadows have changed significantly over decades).

For a person to be exposed to such a harmless but potentially unpleasant shadow flicker, the following factors must coincide:

- 1) bright sun casting contrasting shadows,
- 2) the distance to the WPP is small enough for the shadow to reach a person and still have a perceptible contrast,
- 3) The rotor of a WPP is angled so that the shadows it produces oscillate: if the rotor plane is perpendicular to the direction of human vision, the flickering effect is visible over the entire area of rotor rotation, whereas if the rotor plane is parallel to the direction of human vision, the flickering shadow is virtually absent, except at the very tips of the wings, whose narrowness means that the shadow can be felt only at very short distances,
- 4) the rotor turns (but part of the year it doesn't: in no wind and too strong winds).

The flicker effect may only be potentially significant in places where a person is obliged to stay and cannot avoid it, i.e. in a place of residence, workplace or other place of permanent

residence: the flicker effect is irrelevant if a person is occasionally exposed to the rotor shadow area and briefly disturbed by it.

So, for a person to experience the inconvenience of the flicker effect at their place of residence or work, that place must be close enough to the WPP and the flickering shadow must hit that place for enough of the year.

In order to assess this situation, it is first necessary to define the shadow itself, as there is no specificity and no consensus as to how far the shadow of a WPP spot can be considered contrasting enough to meet the meaning of an uncomfortable flickering shadow. Different sources define this distance very differently.

In the British Isles, for the second decade there has been a conservative tendency to recommend that flickering shadows should be judged as a nuisance up to a distance of 10 rotor diameters^{229 230 231 232}. It is one of those recommendations without legal and, in fact, scientific basis, which is obvious from the lack of a direct correlation between rotor diameter and shadow intensity at a distance from the rotor. These recommendations were made 20 years ago, when WPPs were much smaller and the 10 rotor diameters were consequently a much smaller distance than, for example, the WPPs evaluated in this EIA, which are 2 km apart. It is understood that a larger rotor diameter does not in any way increase the contrast of the shadow at greater distances from it (only indirectly may there be a correlation, as a larger rotor diameter is usually associated with a larger wingspan).

Other international guidelines take a different approach: to be based on a fixed distance. *The Danish Wind Industry Association (2010)* recommends that at distances of 500-1000 m from a WPP, the rotor is no longer perceived simply as an object with the sun behind it, so there is no point in assessing shadow flicker at longer distances; *The South Australian Planning Bulletin (2002)* notes that flickering shadow is not an object of assessment at distances beyond 500 m - but WPPs were much smaller at that time. It should be noted that these recommendations are well in line with the minimum distance of a WPP from an individual residential building as set out in Cabinet Regulation No 240 of 30 April 2013 "General Regulations on Spatial Planning, Use and Development" (16.10.2020 version): "163.1. for wind power plants with a capacity of between 20 kW and 2 MW, the distance from the nearest planned boundary of the wind power plant and wind park to residential and public buildings shall be at least 500 m; 163.2. for wind power plants with a capacity greater than 2 MW, the distance from the nearest planned boundary of the wind power plant and wind farm to residential and public buildings shall be at least 800 m;" i.e. 500 m for small WPPs (as they were in 2002), 800 m for larger ones (as they are from ~2010).

It is remarkable that there was no contradiction between these different historical recommendations: their dating indicates that the rotor diameters of the WPPs common at the time of their creation were ~50 m, 80-100 m were still prospective models that did not exist in nature or were rare exceptions, and ten rotor diameters were broadly in line with the proposed fixed distances.

²²⁹ <https://cumbria.gov.uk/elibrary/Content/Internet/538/755/1929/17716/17720/17723/42130145839.PDF>

²³⁰ https://www.infrastructure-ni.gov.uk/sites/default/files/publications/infrastructure/Best%20Practice%20Guidance%20to%20PPS%2018%20-%20Renewable%20Energy_0.pdf

²³¹ <https://www.gov.scot/collections/planning-advice-notes-pans/>

²³² <https://www.gov.ie/en/collection/85b83-planning-guidelines-standards/>

In New Zealand, an assessment of specific WPPs with a maximum wingspan of 4.2 m by *Energy3 Services Ltd, New Zealand (Kaimai Wind Farm Shadow Flicker Analysis, 2018)*²³³ finds: *"International guidelines state that a practically meaningful distance to judge a flickering shadow is up to the largest 265 wingspan, or about 1.1 km"*. This reference is to much more up-to-date guidelines,²³⁴ obviously much more scientific, since the intensity of the shadow is independent of the diameter of the rotor, but depends on the size of the object casting the shadow, and of course the shadow cast by a wider wing spreads perceptibly over a greater distance than that cast by a narrower wing. The coefficient "265" describes the distance over which a longitudinal obstacle of constant width on its way over the solar disk (angular diameter 0.533° on average) obscures half the disk area at maximum phase, and is considered to be the threshold beyond which the shadow is practically no longer perceptible/noticeable due to light scattering (wrapping around the obstacle) in the atmosphere. By analogy: a partial solar eclipse, in which the Moon covers no more than half of the Sun's disk, is virtually imperceptible. The validity of this conclusion is also visually illustrated by an independent experiment carried out in Latvia already in 2010 (see below).

There is just one important nuance to note: the wing width, which varies continuously throughout its length, is close to the maximum (although on average less than it) until about one third of the wing length from the rotor axis, after which it narrows rapidly. For example, for the power turbines evaluated in this EIA, the wing has a maximum width of ~5.5 m, and the first third of its length can be considered to be about this wide (rounded up). The wing width then decreases rapidly and reaches only ~1.3 m at 10% of the wing tip. Consequently, the factor of 265 recommended in the Australian Guidelines (2018) as the criterion for the distance to be judged, by which the maximum wing width is to be multiplied, is the maximum precautionary factor, since shadows cast by a wing with a much smaller width over the same distance will also be judged significant at the same distance. In addition, all these widths are only valid in situations where the wing plane is exactly perpendicular to the observer's gaze and the wing casts a shadow from its full width: in reality, such situations are rare, the wing is mostly at an angle to the observer's gaze and is therefore narrower as a shadow-casting object. The wing projects on average a statistical 45° angle relative to each individual location, or $\sqrt{2}$ times narrower, so that the widest part of a 5.5 m wide wing projects on average 3.9 m wide, with a corresponding assessment distance of $3.9 \times 265 = 1033$ m.

However, the unscientific nature of all the guidelines listed above (including the most recent one) in relation to flickering shadow duration modelling programmes is further illustrated by the following observation. It is clear that at a distance of 10 rotor diameters (some guidelines recommend even further) or at a distance of 265 maximum wing widths, the shadow intensity will be much weaker and therefore less intrusive than at a much shorter distance near the WPP itself. However, the guidelines only specify specific hours to a specific distance: from zero to 10 rotor diameters (or 265 wingspan) distance - 100%, from 10.01 rotor diameters (or 265.1 wingspan) distance - 0%. Of course, guidelines that claim to be scientific should establish a relationship between shadow intensity and duration: the closer to the WPP, the more contrasty the shadows and the fewer hours allowed; the further from the WPP, the weaker the shadows and the more hours allowed, up to some threshold after which there is no point in counting (but even before that, the shadow has become almost imperceptible and the number of hours allowed must be very high). Analogy - noise modelling: The long-term radiated noise level is calculated from the duration of noise exposure in relation to its intensity

²³³ https://www.hauraki-dc.govt.nz/assets/services_documents/WindFarm/B-Technical-reports/B16-Shadow-Flicker.pdf

²³⁴ <https://assets.cleanenergycouncil.org.au/documents/advocacy-initiatives/community-engagement/wind-best-practice-implementation-guidelines.pdf>

(determined by the distance from the noise source and the intensity of the source), while for a flickering shadow only the duration is calculated, ignoring the intensity of the shadow determined by the width of the object casting the shadow (which is only considered in the most up-to-date Australian guidelines) and the much different distance from the shadow source (which is not considered in any guidelines). For example, if the maximum judging distance is determined to be the distance at which the shadow casting object covers half the solar disk at maximum phase, or 265 times the width of the object, the next logical limiting point would be, is the last distance at which the shadow would momentarily become 100% sharply contoured, at least in vacuum (light scattering in the atmosphere makes it illuminated anyway), which is 107.5 times the width of the object, which in this case would be only 591.25 m.

In the following we present the conclusions of one of the EIA report authors' (V. Felsbergs) observations from a field study carried out in Latvia. The study sought to answer the question: what is a "shadow", the distance of which is debated in international sources, without describing what it is, i.e. how intense is it from a distant object compared to the shadow of a close object.

A "shadow" means that less light from a light source falls on a location due to an obstruction than on surrounding locations that are unobstructed from the light source, and there is a clear boundary between the shadow and the non-shadow, i.e. the shadow has a definable geometric shape or at least an obvious (literally, since a shadow only makes sense if you can see it with your eyes) drop in light intensity compared to the non-shadow. From a scientific point of view, there should be a quantitative description of the difference that distinguishes a shadow from the adjacent non-shadow. In 2018, this is implicit in the current Australian guidelines - the shadow starts from covering half of the entire solar disc - but in 2010, it was sought visually experimentally in Latvia.

The shadow is characterised by the Latvian Radio and Television Tower in Zaķusala, which casts a shadow on Lucavsala in the morning hours. The experiment was carried out on 23 May 2010 at ~8am on Lucavsala Street ~630 m from the axis of the TV tower (Figure 7.3.1)

Figure 7.3.2 shows which part of the TV tower antenna casts the shadow used for the experiment. Total height of the cylindrical antenna (source: www.lvrta.lv) is 146 m, the sun shading point is 310 m, the antenna diameter at the sun shading point is approximately equal to the average wing width ($\frac{1}{3}$ - $\frac{1}{2}$ maximum width) of the WPPs assessed in this EIA. According to the Pythagorean theorem, the distance of a shadow from the object casting it is ~700 m. In addition, the TV tower antenna casts its shadow from one and a half times the height of the shadow of the average VES, which makes the shadow more sharply contoured than in more oblique light. The shadow of this TV tower antenna is shown in Figure 7.3.3. Knowing in advance what to look for, the image shows a barely perceptible blurred strip of low-intensity light across the road, in the middle of which the cyclist stands and casts her own sharply contoured shadow onto this shadow, which is the virtually unshaded surface of the road and grass.

The distance to which the effect of the flickering shadow must be judged, calculated from the maximum wing width of 5.5 m, is $5 \times 265 = \sim 1460$ m, and the shadow that could reach it is already very faint, close to invisible: even more invisible than the shadow of the nearest TV tower, more than twice as visible in Figure 7.3.4, which is just visible.



Figure 7.3.1. Diagram of the situation with the Riga TV tower in Zaķusala and Lucavsala Street: with a cross at the indicated point on 23 May 2010 at 23:00 the shadow of the TV tower falls over Lucavsala Street (this situation is illustrated in nature in the next two pictures)

The current Latvian "Guidelines for Environmental Impact Assessment of Wind Power Plants and Recommendations on Requirements for Construction of Wind Power Plants" (2023) state: "To minimise the human impact of flicker, the distance from the wind turbine to the dwelling should not be less than 500 m or 5 times the maximum height of the wind turbine."



Figure 7.3.2. The solar disc behind the TV tower antenna, which casts the shadow shown in the next image (the disc is much smaller than the blurry patch of light in the image).

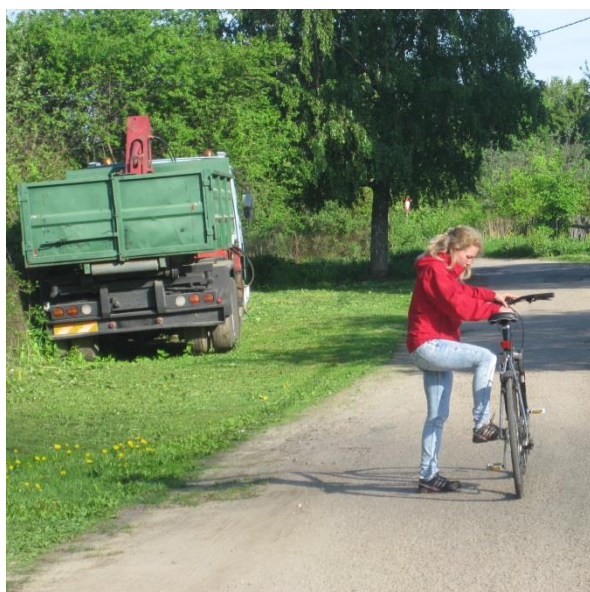


Figure 7.3.3. Shadow on Lucavsala Street of the TV tower antenna



Figure 7.3.4. The photo shows the shadow area on Lucavsalas Street from the part of the TV tower antenna seen in the previous picture

Obviously, the 500 m minimum applies to WPPs with a maximum height of less than 100 m. On the other hand, larger WPPs, such as the ones evaluated in this EIA, are subject to the distance "5 times the maximum height of the wind turbine". In this case, it is $300 \text{ m} \times 5 = 1500 \text{ m}$. This is perfectly in line with the 1460 m mentioned above as a result of the previous considerations.

To further illustrate what the shadow of a WPP at 500 m means (but the smallest distance assessed in this EIA is 816 m, see below), Annex 8 is attached: a video showing the shadow of the WPP of the Targale wind farm on the road and the forest wall at 500 m. As can be seen, the shadow is similarly faint and blurred as in Figure 7.4: when the video is paused, it is just as imperceptible; in motion, of course, the shadow is more eye-catching. As can be easily understood, at a distance of 1 km twice as great, such a shadow will be invisible even in motion, while at a distance of 1.46 km three times as great, there is no doubt that it will disappear altogether: this assessment distance is certainly consistent with the principle of maximum precaution.

A total of 95 rural farmsteads are located within a radius of 1460 m from at least one WPP, the closest of which ('Residential house 145 km') is located at a distance of 816 m (from WPP No VV30). A simple coefficient system has been developed for the evaluation of the shadow intensity: it assigns a coefficient of "1" or 100% to the shadow intensity on the nearest house at a distance of 816 m, i.e. all hours from the WPP to this house are counted as 100% shadow duration in the modelling. The intensity of the shadow at the limit of its complete disappearance at a distance of 1460 m has been assigned a factor of "0". Accordingly, all other shadow durations from a given WPP to a given house are given decreasing coefficients in an inverse linear relationship with increasing distance: for example, if the distance between the WPP and the house is 1138 m (halfway between 816 m and 1460 m), the coefficient is 0.5 or 50% and 1 hour of shadow from the modelling is calculated as half an hour in the interpretation of the results in Annex 8.

This method uses the following relative assumption as a precautionary principle, which makes the result significantly worse (longer shadow durations) than would be scientifically justified: the sharpest shadow in a given situation with a given minimum distance to the house of 816 m

is considered to be 100%. If the distance to the nearest house was different (smaller), 100% would be different. In fact, the blurriness of a shadow at this distance is vividly illustrated by the experiment already mentioned: it can in no way be considered 100% shadow. A more correct definition of a 100% shadow would be at least that falling from the widest point of the wing at the minimum possible height, so ~ 200 m (rotor axis height) minus ~ 33 (one third of the wing length) = ~ 167 m, at the smallest possible distance from the WPP, which in Latvia is ~ 92 m (in the middle of the summer solstice day), and consequently at a distance of 816 m its intensity would not be 100% but only 47%, which is significantly less and certainly more scientifically representative of the true effect of the shadow as a function of distance.

Assumptions so unfavourable to the deterioration of the situation for computational convenience are justified further on: the results obtained with them are also so "innocuous" for the operation of the WPP park and for the population that a higher complexity would not be a useful result.

There are two ways to get the duration of the shadow: the worst-case scenario and the real scenario. The worst-case scenario method (preferably no more than 30 hours per year) assumes that the sun shines continuously during daylight hours and is always perpendicular to the rotor, which rotates continuously.

However, in a realistic scenario (preferably no more than 10 hours per year), all the factors that affect shadow duration at any given point are taken into account:

- 1) hours of sunshine,
- 2) wind direction (which determines the orientation of the entire rotor),
- 3) wind speed (which determines how much of the year the rotor will not turn),
- 4) the overall relationship between wind direction and speed (which determines the orientation of the wing planes themselves),
- 5) natural obstacles (buildings, trees, etc.)

Shadow durations on all houses within a radius of 1460 m around each WPP have been modelled with WindPro (results of the modelling in Annex 8) and the analysis of the results is summarised in detail in Annex 8.

The flicker impact calculations are for the potential WPPs to be constructed, corresponding to the Valmiera-Valka park location alternative A with 29 WPPs and location alternative B with 43 WPPs. For the public consultation version of the EIA report, an assessment of physical impacts (flicker, landscape impact), a calculation of climate change impacts and a calculation of socio-economic benefits were carried out for these alternatives for the location of the WPP park. It is envisaged that during the public consultation of the EIA report, the NPSs that are currently recommended for construction may be refined, taking into account the proposals submitted by the public and other institutions and the results of the public consultation. In the updated version of the EIA report, which will be submitted to the NEB for its opinion, the assessment of the impact of flicker will be updated according to the number of recommended WPPs, but it can already be said that the updated results will have a lower potential impact.

This chapter summarises the main findings, conclusions and recommendations of the flicker modelling. The modelling on which the calculations are based is based on a scenario that is closer to the worst case than the real one: of all the factors that reduce shadow duration in the real scenario, only the proportion of sunny weather (Table 7.3.1) and the windless period (see Annex 8) are taken into account.

The direction of the wind, which determines the orientation of the rotor, is not taken into account, but it is calculated that the rotor casts the shadow in a full circle perpendicular to the direction of the shadow fall, as if its orientation follows the path of the sun in the sky all the

time, in order to shade a house for as long as possible, which is completely impossible, especially in relation to several houses at the same time. The variable orientation of the wing planes oblique to the wind, as determined by the correlation between wind direction and speed, is not taken into account, but it is assumed that they are always oriented perpendicular to the direction of view at their maximum width, which is impossible in principle in relation to the orientation of the whole rotor, also perpendicular to the direction of view, because the wing planes can never be parallel to the plane of the rotating rotor, they are always at an angle to it. No account is taken of natural obstructions, which in particular block the sun much of the time when it is low on the horizon, as is the case when shadows reach buildings only in low slanting sunlight (which in the morning/evening and/or winter months is exactly the case).

Table 7.3.1. *Average number of hours of sunshine per day by month at the Skulte observation station over the whole observation period: 1988.–2004²³⁵*

Month	Average number of hours of sunshine per day
January	0,96
February	2,07
March	4,32
April	6,59
May	9,64
June	9,55
July	9,82
August	8,35
September	5,52
October	3,17
November	1,24
December	0,85

Of all these factors, only one can be quantified without complex calculations: assuming that the rotor plane is, on average, facing the observer at an angle of 45°, the area and therefore the shadow duration are reduced by a factor of $\sqrt{2}$ or 1.414. All others are not analysed further in order not to further complicate the already complex calculations (and even more: not to complicate the verification of the calculations by the competent authorities).

Effect of the Flashing Shadow

Overall, the shadow duration target of 10 hours per year is not exceeded in any of the houses (see worksheets "Shadowing times with distance attenuation" in Annex 8). The maximum annual shadow duration for all alternatives is 2 h 16 min, or less than a quarter of the target: the house "Birches" from WPP VV85. There is no difference between alternatives A and B because the source of the shadow in both cases is the same WPP VV85, nor between A' and B' because the heights of these WPPs do not differ (and even if they differed by 25 m, the shadow duration would differ by a few minutes, which would make no difference).

In addition, it should be noted that the methodology with a shadow intensity factor depending on the distance of the house to the shading WPP was applied in this EIA from the very beginning, when a fleet of 84 WPPs was provisionally assessed, which also led to some minor shadow duration overruns that would have to be addressed by mitigation measures (shutting

²³⁵ LEQMC dati – <https://videscentrs.lvqmc.lv/>

down some WPPs during sunny periods). At the current stage, when there are two alternatives with significantly fewer WPP and among the selected ones are exactly those that cast the longest shadows from closer distances, no shadow duration approaches the threshold even without such a factor (see 8. The longest shadow is 4 h 46 min in alternative B' on the house "Liepkalni" at a distance of 1246 m from WPP VV92 - a very weak shadow, close to the invisibility limit.

7.4. Impact on air quality

During the construction of the WPP, construction equipment and vehicles will cause insignificant, local, temporary and episodic air pollution, which will be localised in the construction zone, which is not located in the immediate vicinity of a residential area.

The air quality impacts of the construction process have been assessed on the basis of the guidelines below and information available on the public web:

- *Guidance on the assessment of dust from demolition and construction. January 2024 (Version 2.2) - IAQM Guidelines*²³⁶;
- *Discover The Vital Role of Air Quality In Construction Sites Worldwide. From Understanding Pollution Sources to Implementing*²³⁷;
- *Local Government Air Quality Toolkit. Air quality guidance note. Construction sites*²³⁸ ;
- *Sustainability & Environment Appraisal. LA 105 Air Quality. Design Manual for Roads and Bridges - (hereinafter - DMRB). Published June 2024*²³⁹.

The guidance applies to the assessment of air pollution from demolition and construction. At the construction sites, the works can be divided into four phases, which reflect:

- Dismantling;
- Earthworks;
- Construction;
- Spreading mud and dust on roads.

The three groups of potential impacts that may be affected by the construction process are:

- 1) disturbance from dust pollution (property impact)
- 2) damage to the ecosystem
- 3) impact on human health.

When assessing the impact of dust on the area of the proposed activity, the presence of *receivers* in the vicinity of the proposed activity is an important consideration. The IAQM distinguishes between three levels of *sensitivity*: high, medium and low. Examples of high-sensitivity receivers include residential buildings, heritage sites where dust has a direct impact on property values. Users expect high quality amenities. Examples of medium sensitivity receivers are parks and workplaces, where users expect a reasonable level of comfort, but lower than in their own homes. Indicative examples for low-sensitivity receivers are agricultural land, footpaths, car parks and roads.

²³⁶ <https://iaqm.co.uk/wp-content/uploads/2013/02/Construction-Dust-Guidance-Jan-2024.pdf>

²³⁷ <https://neuroject.com/air-quality-in-construction/>

²³⁸ <https://www.environment.nsw.gov.au/resources/air/mod3p3construc07268.pdf>

²³⁹ <https://www.standardsforhighways.co.uk/search/af7f4cda-08f7-4f16-a89f-e30da703f3f4>

When assessing the impact of dust, including PM₁₀ and PM_{2.5}, on human health, there are three levels of sensitivity - high, medium and low - similar to the impact on property. High-sensitivity receivers are places where people stay for long periods of 8 hours or more, such as residential areas, hospitals, schools, care homes. Medium sensitivity receivers are places where people stay for up to 8 hours. These are usually workplaces. Indicative examples for low-sensitivity receivers are places where people are occasionally present - walking trails, playgrounds, parks.

There are also three levels of receptors for assessing damage to ecosystems: high, medium and low. High sensitivity receptors are habitats or species of international or national importance that are of special conservation concern, where dust deposition directly affects these plant habitats. These plants may be listed in the Red Data Book, such as vascular plants or lichens in the immediate vicinity of the construction site. Medium-sensitivity receptors are ecosystems where the effects of dust have not been clearly studied. Nature parks are an indicative example of low-sensitivity receivers.

Additional factors to be taken into account in determining the sensitivity of a site are the existing or background level of contamination, the season in which the works will be carried out, the local topography (topography), the duration of the potential impact.

During the construction process, the following have been identified as temporary air pollutants:

- Dust. These pollutants are produced by construction activities such as excavation, drilling and the movement of machinery. These activities can produce dust particles of different sizes, from coarse to fine.
- Diesel exhaust gases from heavy machinery and equipment powered by diesel engines. The main pollutants emitted by diesel-powered machinery are nitrogen oxides, PM particulates, including PM₁₀ and PM_{2.5}.

The criteria according to the receptor used to assess the impact of the construction process on air quality are given in Table 7.4.1.

Table 7.4.1. Evaluation criteria

Sensitive receiver/receptor	Criterion
"Human" receivers/receptors (places where people spend time and dust can affect real estate)	250 m from the boundary of the construction site
	50 m from a road used by vehicles involved in the construction process up to 250 m from an entrance to the construction site
Ecological receptors (habitats of protected plants or species, protected habitats)	50 m from the boundary of the construction site
	50 m from a road used by vehicles involved in the construction process up to 250 m from an entrance to the construction site

The assessment of the sensitivity of a site is based on information on the distance to sensitive *receptors*, their number and the background concentrations of pollutants present. Both the harm caused by the dust itself (deposition, impact on real estate) and the impact of PM₁₀ fine particles on the health of the population as well as the impact on the ecosystem are assessed. The criteria are summarised in Tables 7.4.2 to 7.4.4 below. The limit values for PM₁₀ used in

the IAQM guidelines are consistent with the limit values of 40 $\mu\text{g}/\text{m}^3$ of the Cabinet of Ministers Regulation No 1290 of 3 November 2009 "Regulations on Air Quality"²⁴⁰. The concentration ranges used for the sensitivity assessment are 80%, 70% and 60% of the limit value, respectively.

Table 7.4.2. Site sensitivity criteria for dust effects on humans and real estate depending on the number of receivers/receptors and the distance to the construction site according to the IAQM Guidelines²⁴¹ Table 2.

Receiver/ Sensitivity	Number of receivers	Distance from the emission source (construction site), m			
		<20	<50	<100	<250
High	>100	High	High	Medium	Low
	10–100	High	Medium	Low	Low
	1–10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 7.4.3. Site sensitivity criteria for the effects of dust on human health depending on the number of receivers/receptors and the distance to the construction site according to the IAQM Guidelines²⁴² Table 3

Receiver/ Sensitivity	Annual average PM ₁₀ concentrations	Number of receivers	Distance from the emission source (construction site), m			
			<20	<50	<100	<250
High	>32 $\mu\text{g}/\text{m}^3$	>100	High	High	High	Medium
		10–100	High	High	Medium	Low
		1–10	High	Medium	Low	Low
	28–32 $\mu\text{g}/\text{m}^3$	>100	High	High	Medium	Low
		10–100	High	Medium	Low	Low
		1–10	High	Medium	Low	Low
	24–28 $\mu\text{g}/\text{m}^3$	>100	High	Medium	Low	Low
		10–100	High	Medium	Low	Low
		1–10	Medium	Low	Low	Low
	<24 $\mu\text{g}/\text{m}^3$	>100	Medium	Low	Low	Low
		10–100	Low	Low	Low	Low
		1–10	Low	Low	Low	Low
Medium	>32 $\mu\text{g}/\text{m}^3$	>10	High	Medium	Low	Low
		1–10	Medium	Low	Low	Low

²⁴⁰ <https://likumi.lv/ta/id/200712-noteikumi-par-gaisa-kvalitati>

²⁴¹ <https://iaqm.co.uk/wp-content/uploads/2013/02/Construction-Dust-Guidance-Jan-2024.pdf>

²⁴² <https://iaqm.co.uk/wp-content/uploads/2013/02/Construction-Dust-Guidance-Jan-2024.pdf>

Receiver/ Sensitivity	Annual average PM ₁₀ concentrations	Number of receivers	Distance from the emission source (construction site), m			
			<20	<50	<100	<250
	28-32 µg/m ³	>10	Medium	Low	Low	Low
		1-10	Low	Low	Low	Low
	24-28 µg/m ³	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
	<24 µg/m ³	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Low	-	≥1	Low	Low	Low	Low

Table 7.4.4. Sensitivity criteria for impacts on ecosystems according to the IAQM Guidelines²⁴³ Table 4

Sensitivity of the receiver	Distance from the emission source (construction site), m	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Taking into account the available information on existing background levels of pollutants, the size of the built-up area, the condition of access roads (asphalt or gravel), the location of the nearest receivers/receptors (Table 7.4.5 summarises the amount of dust generated by construction activities per construction site), Table 7.4.6 summarises the potential impacts from the construction of the WPP.

Table 7.4.5. Assessment of the impact of construction dust per construction site

Activities	Significance of the issue volume	Criterion	Background
Earthworks	Low	Low: built-up area <18000 ^{m2} Medium: Building area 18000-110000 ^{m2} High: built-up area > 110 000 ^{m2}	The construction area of the WPP per construction site is planned at 2600 ^{m2}
Construction	Low	Low: building volume <12000 ^{m3} Medium: building volume 12000-75000 ^{m3} High: building volume >75000 ^{m3}	~1100 ^{m3} of reinforced concrete will be used in the construction of one foundation foot of the WPP
Spreading mud and	High	Zems: Length of roads without hard	Unpaved roads are more

²⁴³ <https://iaqm.co.uk/wp-content/uploads/2013/02/Construction-Dust-Guidance-Jan-2024.pdf>

Activities	Significance of the issue volume	Criterion	Background
dust on roads		surface < 50 m Medium: Length of roads without hard surface 50-100 m High: Length of unpaved roads > 100 m	than 100 m long.

Table 7.4.6. Sensitivity assessment of surrounding areas

Potential impact	Sensitivity of surrounding areas					
	Earthworks	Background	Construction	Background	Kneeling material	Background
Dust pollution	Low	The nearest receivers/receptors are at least 800 m from the construction site	Low	The nearest receivers/receptors are at least 800 m from the construction site	Medium	Only a few receivers/receptors (farmsteads) are located in the immediate vicinity of dirt roads
Impact on human health	Low	The nearest receivers/receptors are at least 800 m from the construction site; the annual mean background concentration of dust shall not exceed 13,55 µg/m ³	Low	The nearest receivers/receptors are at least 800 m from the construction site; the annual mean background concentration of dust shall not exceed 13,55 µg/m ³	Low	The annual mean background concentration of dust shall not exceed 13,55 µg/m ³
Damage to the ecosystem	Low	The nearest ecological receptors (protected plant or species habitat, protected biotopes) are more than 50 m from the construction site boundary	Low	The nearest ecological receptors (protected plant or species habitat, protected biotopes) are more than 50 m from the construction site boundary	Low	The nearest ecological receptors (protected plant sites or species habitats, protected habitats) are located more than 50 m from construction vehicle traffic routes

The overall level of risk of impacts is low according to the IAQM guidelines used²⁴⁴. The construction process of the WPP, including the movement of vehicles involved in the construction process, will have a negligible impact on the health, property and ecosystem of the population. Localised dust abatement measures (e.g. road dusting for nearby farmsteads) should be considered during the construction process.

²⁴⁴ <https://iaqm.co.uk/wp-content/uploads/2013/02/Construction-Dust-Guidance-Jan-2024.pdf>

Criteria for assessing the impact of road traffic are defined in the DMRB guidelines²⁴⁵. Paragraph 2.60 of the guidance states that the *impact on air quality from the movement of construction vehicles on roads should be assessed if the duration of the works exceeds 2 years*. The total time needed to build the WPP park is expected to be no more than 2 years. Similarly, the criterion is set out in point 2.1 of the guidelines: *if the annual average daily traffic volume is less than 1 000 vehicle units or if the truck traffic volume does not exceed 200 vehicle units per day, the impact on air quality should be assessed as negligible*. Based on the information provided in Section 4.3.1, none of the criteria for an air quality assessment for vehicles involved in the construction of the WPP are met. Note that Table 4.3.1 provides information on the number of transport units for each phase of the project. All these stages do not add up at the same time (see Figure 4.3.1 of the EIA Report).

Overall, the air pollution from the construction process is assessed as insignificant, with negligible environmental damage and a more significant co-benefit from the constructed renewable energy facility, which will not cause air pollution in future operation.

7.5. Protection zones and their impact

In accordance with the Law on Protection Zones, four protection zones have been established in the spatial plan of Strenči municipality (2012-2023) and in the spatial plan of Valka municipality (from 2017):

1. Environmental and natural resource protection zones;
2. Operational protection zones;
3. Sanitary protection zones;
4. Safety buffer zones.

Environmental and natural resource protection zones are established around objects and territories that are important from the point of view of the protection and rational use of the environment and natural resources. Their main purpose is to reduce or eliminate the adverse anthropogenic effects on the features for which protection zones have been established, including the protection zones for surface water bodies.

Environmental and natural resource protection zones:

- Surface water protection zones are established for water bodies, watercourses and artificial water bodies to reduce the negative impact of pollution on aquatic ecosystems, prevent the development of erosion processes, restrict economic activities in flooded areas, and preserve the characteristic landscape of the area.
- Protection zones around water abstraction points are established to ensure the conservation and replenishment of water resources and to minimise the negative impact of pollution on the quality of the water resources to be abstracted during the lifetime of the water abstraction point **(not within the area of the proposed activity)**.
- The buffer zones around the marshes are established to preserve biodiversity and stabilise the moisture regime in the forest-marsh interface (transition) zone **(not in the area of the proposed activity)**.

²⁴⁵ <https://www.standardsforhighways.co.uk/search/af7f4cda-08f7-4f16-a89f-e30da703f3f4>

- Protection zones around cultural monuments are established to ensure the protection and preservation of cultural monuments, as well as to reduce various types of negative impacts on immovable cultural monuments **(not within the area of the proposed activity)**.

Operational protection zones are established along transport lines, along electronic communications networks and other communication lines, and around facilities that support the operation of various public services. The main purpose of operational protection zones is to ensure the efficient and safe operation and development of these communications and facilities.

Operational protection zones:

- Protection zones along streets, roads and railways are established to reduce the negative impact of streets, roads and railways on the environment, to ensure the operation and safety of transport arteries, as well as to create a construction-free zone necessary for the reconstruction of streets and roads **(not within the territory of the proposed activity)**.
- Protection zones along telecommunication lines and their facilities of all types and affiliations are established to ensure their maximum protection from unwanted influence of man, nature or other factors, which may result in disruption of normal operation of telecommunication lines, damage to the national economy and the state **(not within the territory of the proposed activity)**.
- Protection zones along electrical networks, their equipment and structures of all types and belonging to any jurisdiction are established to ensure the operation and safety of electrical networks, their equipment and structures.
- The operational protection zones along the heat networks, their equipment and structures are established to ensure the operation and safety of the heat networks, their equipment and structures **(not within the territory of the proposed activity)**.
- Protection zones around geodetic network points are established around points of the national geodetic network and local geodetic network for which a permanent geodetic point centre has been established in the locality to ensure access to and geodetic work on the geodetic network points, long-term preservation, stability and structural stability of the geodetic network points **(not within the area of the proposed activity)**.
- Protection zones around drainage structures and installations are established to ensure the operation and safety of drainage structures and installations.
- Protection zones along heat, water and sewerage networks are established to ensure the operation and safety of their equipment and structures **(not in the area of the proposed activity)**.
- Operational protection zones around gas pipelines, gas supply facilities and structures, gas warehouses and storage facilities are established to ensure the operation of gas pipelines, gas supply facilities and structures, gas warehouses and storage facilities **(not within the territory of the proposed activity)**.

Sanitary buffer zones are established around facilities that have higher sanitary requirements. Their main task is to ensure sanitary requirements.

Sanitary protection zones:

- Protection zones around cemeteries are established to prevent the deterioration of the sanitary conditions of adjacent areas.
- Protection zones around landfills, dumps and wastewater treatment plants are established to ensure the protection of adjacent areas from potential or existing negative impacts **(not within the area of the proposed activity)**.

The main purpose of the safety buffer zones is to ensure the safety of the environment and people during the operation of the facilities and in the event of potential accidents, as well as the safety of the facilities themselves and those in their vicinity **(not within the area of the proposed activity)**.

7.6. Impacts on natural values and mitigation measures

7.6.1. Habitats and vascular plant species

The factors identified as threatening nature values in relation to protected plant species, protected freshwater, grassland, marsh and forest habitats include direct destruction of protected habitats as a result of construction of the WPP and associated infrastructure, fragmentation of habitat areas by power plant assembly/operation sites and access roads, and potential drainage impacts from ditching around assembly sites and access roads where necessary for drainage.

The proposed action includes the construction of assembly/operation sites and access roads for the WPPs and for their construction and operation, or the reconstruction of existing road turns and connections, as well as the creation of ditches around assembly sites and along access roads where necessary for drainage of the areas. An assembly/construction site typically covers a rectangular area up to 260 m long and 100 m wide, the exact configuration and position of which in relation to the WPPs located at one end of the site depends on the location of the access road and the WPP model chosen (it may be smaller, but as a precautionary principle, this EIA calculates such an area of up to 2.6 ha to accommodate the assembly sites of all major WPP manufacturers after design). The approximate configuration of the WPP mounting area is shown in Figure 4.3.9. The proposed action also includes the construction of electricity cables along the roads (the possible construction on both sides of the roads has been assessed in order to select the optimal option).

In assessing the potential impacts on the identified natural values, the area of the proposed infrastructure (building sites, roads and their junctions, power transmission cable routes, potential substation and energy storage system sites) and the area around them has been assessed as an area of potential direct impact, 5 m around medium voltage cable routes along roads (the width of the cable route itself is 6 m in the cartographic material), storage and substation sites, depending on the technical solution. In the area of direct impact associated with the cable routes, excavation works are planned, after which understorey vegetation will be temporarily destroyed, and the cable routes are to be maintained free of tree cover in accordance with the regulatory enactments. The cable routes in the assessed material are marked on both sides of the road to allow the selection of the most appropriate route, so that the area actually affected will be smaller.

The potential development sites (turbine sites, storage and substation sites) have been assessed according to the cartographic material (see Annex 1 of the species and habitats expert opinion, available in Annex 6), as their exact configuration is unknown, but the total area required for the development site must fall within the delineated area. The data analysis uses approximate configurations of the building plots, assuming that they will be sited in such

a way as to cause the least possible disturbance to natural assets. The turning radii and alignments of the new roads have been assessed assuming corridors up to 30 m wide.

The potential impact on the hydrological regime of protected forest habitats and habitats of protected species has been assessed according to the impact distances for a 1.5 m deep ditch given in the "Guidelines for certified experts in the field of species and habitat conservation on the assessment of proposed activities for the construction of forest roads and the establishment, rehabilitation and reconstruction of forest drainage systems" (unpublished material, prepared for the Nature Conservation Agency). Impacts have also been assessed for existing gravel roads, assuming that some of them may need to be rebuilt to increase their carrying capacity (only for roads that will be used to transport turbine components and construction materials). The maximum impact distance can be up to 180 m under certain conditions, but the assessment selects those habitats and species habitats where such impacts are likely to occur, and for each habitat polygon or species habitat, assesses whether impacts are likely to occur under the given terrain conditions and vegetation type.

The habitat expert has tentatively identified potential impacts on some SPNA habitats related to hydrology and the hydrologist provided an assessment in synergy with the information in the habitat expert's opinion, later the habitat expert revised the hydrologist's comments and provided an assessment in the report.

Specific effects of dewatering can only be modelled at the design stage and mitigation measures planned accordingly, taking into account the natural values identified in the opinion, avoidable and unavoidable effects of dewatering have been identified in the opinion as approximate, based on the experts' knowledge of possible engineering solutions (unavoidable effects are mainly identified as the construction of new infrastructure in conditions where it is not possible to build the facilities on higher terrain). No permanent impacts on the hydrological regime are expected from the construction of the electricity transmission cable, as no dehumidification of the site is required after burial. Potential impacts on the microclimate of the forest stand in habitats and protected species of EU importance have been assessed up to 50 m from the edge of the new development, in line with the distance specified in the above guidelines.

It should be emphasised that measures to avoid and minimise potential impacts on natural values have already been taken during the preparation of this EIA by assessing the initial location of the WPP and infrastructure and providing planners with information on the identified natural values, possible alternative locations for the WPP and associated infrastructure, as well as explaining the basic principles for planning the location of the WPP to avoid impacts on natural values. Compared to the original layout, the length of access roads to be newly constructed has been significantly reduced, the number of WPP sites has been reduced and at least some WPP sites have been planned as far away as possible from habitats that need to be kept undisturbed. In the case of the recommended WPP locations for Alternatives A and B, the number of sites has been further reduced by removing the Gauja Left Bank group of sites, as well as specifying the location of infrastructure facilities in relation to habitats and species habitats. The assessment identifies the impacts that are still identifiable as adverse to nature values and makes recommendations for mitigation, see Table 7.6.1.

Table 7.6.1. Characteristics of the potential impacts of the surveyed WPP sites and associated infrastructure

Grey indicates non-recommended WPP sites

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
VV1 (5)	Alternative location A,B.	C_VV1_48	The WPP site and access road are planned in pine plantations on dry mineral soils. The western end of the site is planned to be partially within an old woodland stand where a protected forest habitat has been identified.	Along the western side of the access road habitat 9010*_1 (also habitat of Heller's hellebore <i>Anastrophyllum hellerianum</i>).	The potential cable route area would destroy habitat 9010*_1 and the habitat of Heller's pipistrelle (polygon 18LM156_1158) in an area of approximately 0.2 ha. <u>To reduce the impact</u> , the cable route should be located on the north side of the road.
VV2 (8)	Not recommended	VV2 C_VV2_3	WPP site and construction site in dry pine coppice. Access road - existing woodland road, without side ditches, should be rebuilt. Road VV2_3 is an existing dolomite crushed stone road, interspersed with dry and dried wet pine stands of various ages on uplands and downlands.	Along the access road C_VV2 habitat 91T0_1. The access road passes along and through the area of the wood grouse micro-reserve No 769 and its buffer zone. No occurrences of SPA species. Along the road C_VV2_3 habitats 91T0_1, 9010*_1, affecting the Natura 2000 site "Boulevard's groove" (to the east of the road), the sites of the yearling <i>Lycopodium annotinum</i>	Construction of a turn-off from CVV2_3 would destroy habitat 91T0_1 (polygon 18LM156_1250) in an area of 0.2 ha, construction of a cable route and widening of road C_VV2 in an area of 0.7 ha (18LM156_1254). Along the road C_VV2_3 (from the turn to VV4) on the west side the cable route impact zone up to 0.4 ha 91T0_1 and 0.02 ha 9010*_1, as well as the annual and creeping bent and on the east side 0.5 ha 91T0_1 and 0.5 ha 9010*_1

²⁴⁶ Additional information on the conclusions of the EIA is attached - significant environmental effects have been identified and construction of the WPP is not recommended

²⁴⁷ The material provided by the client for the proposed action only includes information on the road bends to be straightened at the junctions, but it can be assumed that other existing forest roads may also need to have their sharpest bends straightened and/or deforested for the transport of turbine components.

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
				and the caterpillar <i>Lycopodium clavatum</i>	and 9010*_3. To mitigate the impact, it is possible to design the road C_VV2 in such a way as to leave the habitat 91T0_1 intact, as well as the cable route along the western edge of the road C_VV2_3, leaving the protected habitat areas intact or using trenchless technology.
VV3 (7)	Not recommended	C_VV2_3	WPP site and construction area in dry wet young and middle-aged spruce-birch stands. Access road - existing dolomite crushed stone road, with wet mature pine and birch stands along it.	No protected habitats found. Several occurrences of the annual fritillary <i>Lycopodium annotinum</i> have been recorded on the proposed WPP site. Along the access road, the Baltic cuckoo <i>Dactylorhiza baltica</i> .	No impact on protected habitats. The construction of the development site will destroy the annual pipistrelle. The construction of cable routes along the access road will have a short-term negative impact on the Baltic Cuckoo Salamander.
VV4 (7)	Not recommended	C_VV4 C_VV2_3	WPP site and construction area in dry pine coppice and adult dry pine stand. Access road - existing forest land road, with pine plantations and middle-aged stands along it, both on flat areas and on elevations. Road CVV2_3 is an existing dolomite crushed stone road, along which mainly young and middle-aged dry wet spruce-birch-pine forests interspersed with dry pine forests of different ages on inland dunes.	Along the access road habitat 91T0_2, habitat of the Baltic cuckoo <i>Dactylorhiza baltica</i> .	The development site does not affect the location of protected habitats or species. The road connection to C_VV2_3 affects 91T0_2 (landfill 18LM156_1107) with an area of about 01.1 ha. The habitat is a young stand, there will be minor negative effects on its future development. The construction of cable routes along the access road will have a short-term negative impact on the Baltic Cuckoo Salamander.

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
VV5 (6)	Not recommended	C_VV5_VV8	Siting and construction site of the WPP in spruce coppice and middle-aged spruce-birch coppice, partly also on the existing dolomite chippings access road. Along the road from VV5 to the junction with the Valmiera-Valka motorway, dry and dried wet pine stands and young stands are interspersed.	The development site does not affect protected habitats or SPA species. Along the access road, the Baltic cuckoo <i>Dactylorhiza baltica</i> site, the turn-off at the Valmiera-Valka road affects biotope 9010*_1.	The construction of the cable route will have a short-term negative impact on the Baltic cuckoo salmon. If a turn to the south of the Valmiera-Valka road connection is to be constructed, habitat 9010*_1 (landfill 18LM156_972) will be destroyed in an area of approximately 0.3 ha. <u>To reduce the impact</u> , assess possible supply routes and construct the turning north of the access road.
VV6 (7)	Not recommended	C_VV5_VV8	Siting and construction site of the WPP in wet, dried spruce-birch-alder coppice and middle-aged stands, partly also on an existing dolomite crushed stone access road. Interspersed along the VV8-VV6 road are middle-aged and mature stands of pine and spruce-fir, as well as young stands.	No protected habitats found. A locality of a protected lichen species, the common lungwort <i>Lobaria pulmonaria</i> , has been found on a large ash tree. Along the access road, the Baltic cuckoo <i>Dactylorhiza baltica</i> .	There will be no impact on areas of protected habitats. The development of the site would destroy the common fritillary. The construction of cable routes along the access road will have a short-term negative impact on the Baltic Cuckoo Salamander. <u>To minimise impacts</u> , it is necessary to preserve the columnar wasp found on the WPP construction site with the species of SPA lichen found on it. The western end of the WPP site could be shifted to the south of road C_VV5_8 into the existing coppice, maintaining the existing WPP site position.
VV7 (7)	Alternative location A,B.	C_VV7	WPP site and construction area in dry and dried wet pine coppice. Approximately 3 km of access road. The section from the	Habitat 9010*_3 in the vicinity of the development site, which is also the habitat of Heller's Warbler and parasitic Cladonia.	The dehumidification effect of the development site could affect habitat 9010*_3 polygons 18LM156_1215, 23AP116_400, 24TC182_6,

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
			dolomite crushed stone road to the farmstead "Medņi" follows an existing dirt road mainly along young and middle-aged dry wet spruce and spruce-birch stands, closer to the farmstead - a birch coppice on former agricultural land. The section of the road from Medņi farmstead to the WPP site passes through mainly dry wet spruce-pine-birch stands of middle age and young stands. The existing road is narrow, would need to be rebuilt and straightened, and a new road would need to be built behind "Medņi".	The access road runs along the nature reserve "Purgailē river forests", at the "Medņi" house there is a common ash tree on the roadside; the road reconstruction may affect biotopes 7140_2, 9010*_1 (which is also a habitat of the cave sparrow <i>Schistostega pennata</i>), 91E0*_3 and 9080*_3 (which are also habitats of the chestnut-brown Arthonia <i>Arthonia spadicea</i> , wine-coloured Arthonia <i>A. vinosa</i> and the habitat of the extreme-flowered scarlet <i>Poa remota</i>) and 91D0*_1. Several annual milfoil sites have been found along the access road and on the planned WPP site.	24TC182_7 up to 2.9 ha. The dehumidification caused by the construction of the access road would affect habitats 91E0*_3 in the nature reserve (polygon 18LM156_970) up to 1.5 ha and 9080*_3 (18LM156_969) 0.3 ha, but this impact can be avoided as the habitats are located along the stream downstream of the road. The dewatering could also affect habitat 7140_2 (18JS178_870) by 0.1 ha, destroy habitat 91D0*_1 (18LM156_1216) by 0.15 ha and affect around 0.5 ha of this habitat. The reconstruction of the access road would affect the territory of a protected natural monument - a beech tree - near the Medņi houses. <u>Mitigation</u> is only possible in terms of the size of the area affected by dewatering through the choice of site and road options without side ditches, but is unlikely to be entirely avoidable. <u>In view of the impact on the SSSI, the Beechwood site, habitats and species habitats, the site should be refused.</u> If the site is implemented, residual impacts are expected on the beech tree area, destruction of habitat 91D0*_1 of

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
					0.15 ha, dewatering impacts on 7140 of 0.1 ha, 9010* of 2.9 ha, 91D0* of 0.5 ha.
VV8 (7)	Not recommended	C_VV5_VV8	Siting and construction of the WPP in both dry and wet dried middle-aged spruce and birch forests, partly on an existing dolomitic crushed stone access road. Access road - existing dolomite crushed stone road, along it (from the junction to the west) stands and clearings of middle-aged pine, spruce and spruce-birch of varying moisture conditions.	No protected habitats have been identified, no SPA species have been found on the development site. Along the access road, the Baltic cuckoo <i>Dactylorhiza baltica</i> .	There will be no impact on areas of protected habitats. The construction of cable routes along the access road will have a short-term negative impact on the Baltic Cuckoo Salamander.
VV9 (10)	Alternative B	C_VV61	The location and construction site of the WPP is in an area with variable topography in both dry pine and wet birch coppice. The construction site is partly located in an adult dry pine stand. Access road - existing dolomite crushed stone road, with a mosaic of pine and birch stands of different ages and growing conditions, including clearings, along it from the VV62 to the junction.	The biotopes 91T0_1 and 91T0_2, site of the annual pipistrelle, a species of SPA. Baltic Cuckoo Fritillary site along the access road.	The site as currently configured would destroy 0.2 ha of habitat 91T0_1 (polygon 18EO128_993) and 0.6 ha of habitat 91T0_2 (polygon 18EO128_997) and the annual pipistrelle site. Both habitats are of low quality, in 91T0_2 clearing. The construction of cable routes along the access road will have a short-term impact on the Baltic cuckoo salmon. <u>To reduce the impact</u> , it is desirable to reconfigure the development area to avoid disturbance to habitat 91T0_1.

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
VV10 (7)	Not recommended	C_VV10	Siting and construction site of a WPP in wet, dry pine coppice and middle-aged pine-fir stands. The access road follows a track through mature and overgrown pine stands and coppice under varying moisture conditions.	Protected forest habitats found along access roads -9010*_1 91D0*_1, 91D0*_2, 91D0*_3. Along the road there are localities of the SPA species <i>Lycopodium clavatum</i> and <i>Lycopodium annotinum</i> .	The construction of the development site will not affect protected species or habitats. The construction of the road C_VV10 will destroy the habitat 91D0*_3 (landfill 18JS178_877) in an area of 0.5 ha and could also affect the following habitats (91D0*_3 18JS178_877, 91D0*_31 18JS178_876, 91D0*_2 18JS178_875, 18JS178_874) in an area of 1.5 ha. The construction of this road would destroy several sites of the annual and caterpillar quail. <u>To reduce the impact</u> , the access road to VV10 should not be built along the straight forest track as it crosses protected species sites and habitats, but along the existing forest track from VV90, continuing along the track as planned.
VV11 (7)	Not recommended	C_VV11_VV90	Siting and construction site of the WPP in an adult dry pine stand, in a semi-dry and dehumidified wet pine stand and on a dolomitic crushed stone access road. Along the access road between VV13-VV11, dry and dehumidified wet pine stands alternate.	Small habitat in the northern part of the planned WPP site 91T0_2 area. Along the road C_VV11_VV90 Baltic Cuckoo <i>Dactylorhiza baltica</i> .	The habitat affected by the development site is of low quality and a small area is affected, the development will not have an adverse effect on 91T0_2 polygon 18EO128_704. The construction of cable routes along the access road will have a short-term negative impact on the Baltic Cuckoo Salamander.

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
VV12 (7)	Not recommended	C_VV11_13	Siting and construction site of the WPP in a dry pine coppice, an adult dry and wet dry pine coppice, a middle-aged spruce-pine coppice, partly on an existing dolomite crushed stone access road. Dry and mossy wet pine stands have grown along the access road from the junction to the site.	No protected habitats found. The SPA species Baltic Cuckoo <i>Dactylorhiza baltica</i> has been recorded in the development site and several sites along access roads (see also VV11 and VV13).	There will be no impact on areas of protected habitats. The construction of cable routes along the access road will have a short-term negative impact on the Baltic Cuckoo Salamander.
VV13 (7)	Not recommended	C_VV11_VV90 C_VV11_13	WPP site and construction area in mature dry wet pine-fir-birch stands, partly also on existing dolomite crushed stone access road. Along the access road between VV12-VV13, mature dry pine stands, middle-aged dried wet spruce and pine stands and young stands are interspersed.	No protected habitats found. Along the access road, the Baltic cuckoo <i>Dactylorhiza baltica</i> .	There will be no impact on areas of protected habitats. The construction of cable routes along the access road will have a short-term negative impact on the Baltic Cuckoo Salamander.
VV14 (2)	Not recommended	C_VV14_87	WPP site on a slight elevation (inland dune), 65-70 g. in a pine stand in the mint type of growing conditions. The access road needs to be significantly widened and straightened (currently a natural carriageway).	Habitat 91T0_1 in the site and along the access road. Cauliflower <i>Lycopodium clavatum</i>	The site is planned in biotope 91T0_1 (polygon 18LS674_840, 18LS674_841); medium quality biotope with uniform forest cover but suitable topography and vegetation. Cowslip sites along the access track. The construction of the site will destroy part of the habitat area (approximately 1 ha) and the identified caterpillar habitat. Widening and straightening of the access road will affect habitat 91T0_1

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
					(polygon 18LS674_841 and LVM map 2017 without No.), 91TO_2 (landfill 22JS178_104), the extent of the impact depends on the specific technical solutions, but the habitat 91TO_1 could be destroyed up to 2.1 ha. Minimal mitigation is possible without completely changing the location of the site.
VV15 (4)	Not recommended	C VV15_16	The site is located in inland dune terrain on a slight elevation, forest stand - 71 g. pine forest. Part of the development site could be located in an adjacent clearing.	Habitat 91TO_1 at the site and along the access road. Along the access road on the south side there are no protected species, on the north side on both sides of the road there are abundant sandwort <i>Dianthus arenarius</i> and <i>Gypsophila fastigiata</i> , and in some places also <i>Lycopodium clavatum</i> .	Site in biotope 91TO_1 (polygon 18NK634_599). Habitat quality is medium - suitable topography and vegetation, but the stand is young and lacks structures characteristic of a natural forest. If the site is built, at least one third of the habitat polygon (approximately 0.6 ha) will be destroyed. The road from the turning to VV16 to the site is relatively narrow and the conversion could result in the destruction of habitat 91TO_1 in landfills 18NK634_599 and 18NK634_598 and in habitat without landfill No (approximately 0.4 ha in total). If the cable routes are constructed from the north, the potentially affected area is up to 3 ha in habitat 91TO_1 and 0.3 ha in 9010*_1. <u>To reduce the impact</u> , the cable route from the south side to the

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
					turning point is planned without felling trees in the 91T0_1 habitat. <u>No access road or cable routes on the north side</u> to avoid impacts on habitats and protected species. Habitat destruction in the development site and turning area cannot be prevented if the construction of the site is implemented.
VV16 (2,4)	Alternative A, B	C_VV16_93	The site is located in a coppice, on relatively flat terrain with an artificial earth bank. The construction site crosses an existing road and includes both a young forest and a 70-100 year old dry pine forest stand. The driveway is of sufficient width and bearing capacity, but will most likely need to be straightened on the turn to the site.	Along the access road habitat 91T0, in one place habitat 91D0*_1, which is also a habitat of Heller's Warbler. The road track and the parking area may contain sand espartgot <i>Onobrychis arenaria</i> (taxonomic affiliation of the species is not clear, it may also be <i>O.viciifolia</i>).	Up to 2.8 ha of habitat 91T0_1 may be destroyed by the cable routes and possible access road reconstruction; if the side ditches are dredged as part of the reconstruction, up to 1.6 ha of habitat 91D0* and the habitat of the Heller's pipit (22JS178_105) may be affected by dewatering. <u>To minimise the impact</u> , choose only one side of the road for the cable and locate it in the existing road route, reconstruct as little as necessary, do not deepen the road side ditches in the section along habitat 91D0*. Before starting work, check the location of the esparsetta and carry out a thorough taxonomic check of the species; in the case of the sand esparsetta, plan to replant individuals of the species (given that the phytocenosis of the existing

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
					location is not stable and will overgrow over time, a site with permanent moderate disturbance should be selected). Estimated residual impact on habitat 91T0 approximately 1.5 ha.
VV17 (4)	Not recommended	C_VV17 C_VV15_16	The site is gently undulating inland dune terrain, in young forest.	Habitat 91T0_1, 91T0_2 along the access road. Locations of protected species <i>Gypsophila fastigiata</i> and <i>Silene chlorantha</i> on the road C_VV17 connecting with the road Valmiera-Valka to the south of the site. C_VV15_16 at the junction with the Valmiera-Valka road - a site of the meadow grass <i>Pulsatilla pratensis</i> .	The construction site area corresponds to biotope 91T0_2, as lichen cover exceeds 25%. In case of construction, part of the habitat will be destroyed, but during operation most of the area can be maintained as habitat 91T0. The construction site slightly affects habitat 91T0_1 (polygon 18LS674_674). The construction of the access road turns may affect the same habitat polygon in the northern part, as well as habitat polygons 18NK634_567 and 18NK634_566 at the connection with the Valmiera-Valka road from the southern side and other habitat areas on the roadside if the road is widened and a cable route is constructed (total affected area up to 1 ha). The connections to the Valmiera-Valka road will destroy protected species sites, the southern connection for green-flowered sundews and the northern

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
					connection for meadow bluebells. As the Green-flowered Fritillary is a very rare species, the <u>construction of the southern connection is not acceptable to reduce impacts</u> . Replanting of meadow pipit individuals in suitable locations and maintenance of habitat favourable to them (open sandy areas on roadsides) should be carried out during the construction of the northern connection. Cable routes should be constructed on one side of the road only, avoiding tree felling as much as possible.
VV18 (4)	Not recommended	P_VV18 C_VV18_19	The location and construction site of the WPP are planned in pine stands, partly also affecting mature stands. The access road is planned through middle-aged, mature pine stands and young stands.	The access road crosses the biotope 91D0*_1, the SPA species <i>Lycopodium clavatum</i> has been found on the edge of the stile/forest carriageway on the planned construction site. Habitat 91T0_1 along the edge of the access road.	Construction of the access road in its current configuration will destroy habitat 91D0*_1 in an area of 0.12 ha, dewatering impact up to 0.2 ha. The caterpillar will be destroyed, but the population status of the species will not be affected. The construction of the cable route may affect habitats 91T0_1 (polygons 22JS178_134, 22JS178_135, 18LS674_887) up to 1.2 ha (see the relevant column in the table for the impact on the section of road up to the VV19 site). <u>To minimise impacts</u> , cable routes should be planned without felling trees. <u>Change the</u>

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
					<u>configuration of the site access road</u> , avoiding impact on habitat 91D0*_1. It is recommended that ecological trees from the development site be relocated to an adjacent stand after felling.
VV19 (6)	Not recommended	C_VV18_19	The WPP site and access road are planned in a pine stand. The construction site is planned in young and mature pine woodland.	Habitat 91T0 on the development site and along the access road, protected species - the creeping bent <i>Lycopodium clavatum</i> on the development site, the meadow buttercup <i>Pulsatilla pratensis</i> and the sandwort <i>Dianthus arenarius</i> along the access road.	The development site affects habitat 91T0_1 of approximately 0.1 ha and a caterpillar site. Along the access road and in the area of the cable route, biotopes 91T0_1 (south of the road), 91T0_2 (north of the road, landfill 22JS178_133) may be affected by the construction of the cable route. If a turning radius is constructed to the north of the connection with the Valmiera-Valka motorway, the sandwort and meadow sedge deposits will be destroyed. <u>To reduce the impact</u> , shift the development area slightly to the north of the road to avoid disturbance to the 91T0_1 habitat and the cowslip site, do not construct a turn to the north of the road connection, thus preserving the SPA species site, locate the cable route to the north of the road.
VV20 (2)	Alternative A, B	C_VV20_89	The site, construction area and access road are planned for wet	No protected habitats have been identified on the site, but a	<u>To reduce the impact</u> , large fallen trees from the development site

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
			mineral soils (Mrs), maintained pine stands. The access road is planned to be a recently reconstructed forest road (LVM old highway).	site of the protected species <i>Calcophora mariana</i> has been identified. On the northern side of the access road, extensive and abundant stands of the SPA species <i>Dianthus arenarius</i> and <i>Pulsatilla pratensis</i> were found	should be moved to the adjacent woodland, the road should not be widened and a cable route should not be constructed on its northern side; subject to conditions, there will be no negative impact on the protected species sites.
VV21 (2)	Alternative A, B	C_VV21_88	The WPP is planned to be located in a young stand, the construction site partly in a young stand, partly in middle-aged to mature stands. The access road is planned to follow an existing LVM road, which leads through a forested area dominated by intensively managed woodlands, with mature forest stands interspersed with clearings and copses.	The cable routes affect habitat 9010*_1.	The cable route area affects about 0.4 ha of biotope 9010*_1 *polygons 18SU869_354, 18LS674_670). To minimise impacts, the cable route should be constructed without felling trees in the habitat area (either by choosing the opposite side of the road or by locating the cables in the existing route).
VV22 (3)	Alternative A, B	C_V22_85	The WPP is planned to be located in a young stand, the construction site partly in a young stand, partly in middle-aged to mature stands. The access road is planned in a wooded area dominated by intensively managed woodlands with young, middle-aged and mature stands.	Habitat 91T0_1 near the planned WPP construction site. Several large diameter pine trees, dry trees, eco-wood were found in the planned construction area. On one of the fallen trees, we found the skeletons of a species of IBA - the Great Painted Beetle. Annual quail on the driveway track.	No effects are expected on habitat 91T0_1 (polygon 18LS674_693). It would be advisable to specify the WPP site to minimise the destruction of the large (04-0.5 m circumference) <i>Juniperus communis</i> (<i>Juniperus communis</i>) within the site. Large diameter fallen trees >25 cm should be moved to nearby stands during the work. The construction will destroy up to 25 ^{m2} of annual pipistrelle individuals, but will not

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
					have a negative impact on the population of the species. For the access road, see VV_85.
VV23 (2)	Not recommended	C_VV23	The site and most of the construction area is located in a relatively flat area, in a pine stand, the construction area affects a mature pine stand in the wet mint type of growing conditions. The access road is already sufficiently wide, the connection to the A3 may need to be rebuilt	Biotope 91T0_1, annual milfoil <i>Lycopodium annotinum</i>	The construction of the nursery will destroy the individuals of the annual pipistrelle. It is likely that part of the habitat 91T0_1 (LVM mapping 08.09.2017, no landfill No.) will be destroyed. The road connection may affect the biotope 91T0_1 (LVM mapping 08/09/2017), biotope quality - low. <u>To reduce the impact</u> , the construction site and the cable routes are planned outside the habitat 91T0_1, and the trees felled at the turning are to be left in the habitat. Area where it is not possible to avoid impacts on habitat 91T0_1 ~0.01 ha

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
VV24 (1)	Alternative A, B	C_VV24_30 (Captain Anton's Way)	The site is located in a pine coppice, the construction site affects several mature, economically managed pine and spruce coppices. Driveway of sufficient width and bearing capacity, but likely to need straightening.	Habitat 9010*_1 along the access road.	No protected habitats or species have been identified on the site; to the east of the site habitat 9010*_1 (LVM mapping 12.08.2016.) will not be affected by the proposed activity. Along the access road, biotope 9010*_1 (polygon 18VB850_174), if the road needs to be straightened, part of the biotope polygon may be destroyed, as well as if a cable route is created along this side of the road. <u>To reduce the impact</u> , do not straighten the road in the habitat area, build the cable route on the other side of the road.
VV25 (1)	Alternative A, B	C_VV25_27	Site on level ground, 70 g. in a pine stand of narrow-leaved hemlock type; the site also includes pine coppice. Driveway with sufficient width and bearing capacity, but may need straightening.	9010*_1 along access road	No impacts on protected habitats and species are expected from the construction of the site. No impact is expected from road straightening. If the cable route is planned along the eastern side of the road, impacts on habitat 9010_1 (polygons 18NK634_745, 18NK634_743) are expected. The habitat in these areas is of good to excellent quality, with a stable microclimate, abundant dead wood, and habitat specialist species (rose-sedge <i>Fomitopsis rosea</i> , Heller's sedge) occur deeper in the slope.

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
					To reduce the impact, the cable route should be planned on the opposite side of the road to the biotope.
VV26 (1)	Alternative A, B	C_VV24_30 C_VV25_27	Site and construction area in young (20-22 yr) spruce and pine stands in dry growth types. Driveway with sufficient width and bearing capacity, but may need straightening.	Habitats 9010*_3 (on the section of road required for this site), 9010*_1, 91D0*_1 (on the section shared with other sites), night violet <i>Platanthera spp.</i> , year-ling <i>Lycopodium annotinum</i>	Habitat 9050 (polygon 22JS178_63), approximately 70 m south of the site, no adverse effects on microclimate are expected as the site is sufficiently distant that the habitat would not be affected by the clearing of the development site. The construction will destroy individuals of nightjar and annual pipistrelle, but will not have a negative impact on the populations of the species. The construction of the access road and the construction of the parking area may have an impact on the hydrological regime in biotopes 9010*, 9050 and 91E0* if the depth of the side ditches is below the surface mark of the biotopes. The straightening of the access road and the construction of the cable route in the previous sections may have negative impacts on habitats

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
					9010*_1 and 91D0*_1, see tables VV24 and VV25, as well as habitat 9010*_3 (polygon 22JS178_61) if the cable route is constructed along the southern side of the access road. <u>To reduce the impact</u> , the cable route should be built on the opposite side of the road to the biotope, and the layout of the parking area and the road should be designed to avoid any dewatering effects on the biotope.
VV27 (1) (rejected)	Not recommended	C_VV24_30 C_VV25_27	Site and construction area in pine coppice in mint and narrow-leaved hemlock vegetation types, practically flat terrain. Driveway with sufficient width and bearing capacity, but may need straightening.	Habitats 9010*_3 (on the section of road required for this site), 9010*_1, 91D0*_1 (on the section shared with other sites)	Along the access road habitat 9010*_3 (polygon 22JS178_64), there may be an impact if the cable route is constructed on the southern side of the road. In sections shared with other sites, impacts on habitats 9010*_1, 9010*_3, 91D0*_1 (see sites VV24, VV25, VV26, VV30) are possible. <u>To reduce the impact</u> , the cable route should be built on the opposite side of the road to the biotope.
VV28 (2)	Alternative A, B	C_VV28	The site and the construction area are planned in a dry growing type (As), in a managed birch coppice. The access road (LVM Brükleņu Road) has recently been reconstructed with a chipped surface and drainage ditches.	Habitat 9010*_1 (which is also the habitat of Heller's Warbler and Pink-footed Skipper) south of the access road, in a built-up area, the site of the annual <i>Lycopodium annotinum</i> .	Reconstruction of the access road and construction of the site may have a dewatering effect on habitat 9010* (23GE079_52 and LVM2020) and the habitat of the Heller's pipistrelle. The site of the annual pipistrelle will be destroyed.

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
					For the impact of the driveway, see VV86. To minimise impacts, do not deepen side ditches below the current elevation mark during site construction and road reconstruction.
VV29 (2)	Not recommended	F_VV25 C_VV14_87	Site and construction area on slightly undulating terrain - site in a pine coppice under wet damson growth conditions, construction area also includes 80 g. pine and spruce stand in the damson growth type. Deep drainage ditch along the edge of the proposed development site. The access road in the last section needs to be practically rebuilt (currently a rarely used natural carriageway), and the section shared with other sites also needs to be significantly widened and straightened.	Biotope 91T0_1, annual quillwort <i>Lycopodium annotinum</i> , cuckoo quillwort <i>Lycopodium clavatum</i>	The construction of the site will result in the destruction of individuals of the annual pipistrelle and will have no negative impact on the population of the species. The construction of the access road will affect the habitat 91T0_1 (see VV14) and the habitat of the cowslip.
VV30 (1)	Alternative A, B	C_VV24_30	The site is on slightly undulating terrain, in pine coppice. Driveway with sufficient width and bearing capacity, but may need straightening.	Habitat 91D0*_1 near the site, 9010*_1 along the access road.	Habitat 91D0*_1 (polygon 22JS178_56), which is also the habitat of the Heller's helleborine <i>Anastrophyllum hellerianum</i> , is located approximately 30 m from the site; no significant effects on the habitat are expected as the site is located in a young stand at an elevation; there may be an impact if

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
					the assembly site is ditched and a section of road around the habitat has to be straightened (hydrological regime already affected from the construction of the existing road, ditch dug from the habitat to the road side ditch). The construction of an access road to this site may have a negative impact on habitat 9010*_1 up to site VV24 (see relevant column in the table). <u>To minimise impacts</u> , in the event of road realignment and the construction of a parking area, do not deepen the side ditch below the existing high water mark.
VV31 (2)	Alternative A, B	C_VV31	The site is planned on a dune slope, in a pine grove. The WPP site is planned partly on dune terrain and partly on flat terrain in a recent clearing. The access road is planned to be an unpaved forest carriageway.	Specimens and scat of the SPA species <i>Chalcophora mariana</i> have been found on pine litter at the planned WPP construction site and on the edges of the access road. The access road is planned through biotopes 91T0_2 and 9010*_1.	The road realignment may adversely affect habitat 9010*_1 (LVM2020 mapping without landfill No.), an area of about 0.1 ha, which is also the habitat of the parasitic cladonia. The construction of the turnings will have a minor negative impact on the biotope 91T0_2, changing the topography and undergrowth (up to 0.7 ha), but the biotope is a young stand, so no old trees will be felled. <u>To reduce the impact</u> it is recommended to plan the road through the area of habitat type 91T0_2, avoiding 9010*_1. Large-sized fallen trees should be moved to

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
					lighted parts of the residual stands, so that the habitat of the Great Crested Beetle will not be affected. Overall, a 0.7 ha road in the area of habitat 91T0_2 (habitat in the formative stage) will have a lasting effect.
VV32 (1)	Alternative A, B	C_VV32_33	Site in a pine coppice under wet damsack type of growing conditions. The construction site also affects a mature, recently maintained pine woodland in the lane. The access road is planned to follow an existing, recently constructed LVM road, which leads through a wooded area dominated by intensively managed forest areas with mature stands interspersed with young stands.	No protected habitats have been identified within the site area. On the edge of the access road (behind the road ditch on the forest side), on the P fallow, a locality of the parasitic lichen <i>Cladonia parasitica</i> was found. Along the access road habitats 9010*_1 and 9010*_3.	There may be a dehumidification effect on the habitat of parasitic cladonia. To minimise impacts, the site and road realignment should be designed so as not to alter the hydrological regime of the species' habitat. For the impact of the driveway, see VV33.
VV33 (1)	Alternative A, B	C_VV32_33	The WPP site and construction area is planned in a young stand, with a small corner of the site extending into the mature stand. The access road is planned to follow an existing LVM road, which leads through a forested area dominated by intensively managed woodlands, with mature stands	No protected habitats or species found in the site area, habitat 91T0_1 near the site. Along the access road habitats 9010*_1 and 9010*_3.	No effects are expected on habitat 91T0_1 (polygon 18VB850_191). Construction of driveway turnarounds and cable routes may affect biotopes 9010*_1 (22JS178_76, 0.06 ha), 9010*_3 (22JS178_75, 0.15 ha), construction of cable routes - biotope 9010*_1 (22JS178_77, <0.01 ha). The

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
			interspersed with young stands.		construction of the site may have a dewatering effect on habitat 9010*, which is also the habitat of the Heller's and Pink-footed Lapwing. To minimise impacts, cable routes should be planned without cutting trees in habitat areas (along the road), the location should be planned in such a way as to avoid the need for a side ditch, which may affect the hydrological regime in habitat 9010*). The construction of the turning will not be able to avoid impacts on habitat 9010* (landfills 22JS178_75 and 22JS178_76), totalling approximately 0.15 ha.
VV34 (2)	Not recommended	VV34	<p>The WPP is planned to be located in a young stand, the construction site partly in a young stand, partly in a middle-aged stand in a pronounced dune topography, in an area that has recently been clear-cut.</p> <p>The access road is planned to be an unpaved forest carriageway through very old (> 164 years) pine stands (protected biotopes).</p>	The construction site affects areas 91T0_1 and 91T0_2 of habitat 91T0_1 and 91T0_2: habitat 91T0_2 <i>Lichen-rich pine forests</i> , polygon No. No occurrences of SPA species.	<p>No impacts on known SPA species are expected, however areas of habitat 9010*_1 <i>Old-growth or natural boreal forest</i> are considered to be valuable habitats for SPA species.</p> <p>The 91T0_2 habitat area (landfill 22JS178_109) has recently been clear-cut, implementation of the proposed action would destroy the recovery potential of the habitat, however the negative impact would be assessed as insignificant at present. Habitat 91T0_1 (landfill 18LS674_673) would be destroyed in</p>

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
					an area of 0.3 ha, or most of its landfill. The access road would destroy the good quality habitat 9010*_1 (polygons 18LS674_668 and 18LS674_669) in an area of 0.4 ha and create an edge effect and fragmentation in the remaining part. <u>Mitigation is practically impossible</u> without abandoning the site.
VV35 (2)	Not recommended	C_VV35	Site in an adult (100 g.) pine stand in the Narrow-leaved Peatgrass type. The construction site includes, in addition to this plot, pine coppice in the mint growth type (configuration of the construction site to be clarified due to a change of location). A deep drainage ditch about 40 m south of the site. The access road needs to be widened and rebuilt, currently a fairly wide natural carriageway, possibly a connection to road C_VV16_93	Biotopes 91D0*_3, 91T0_2	The pine plantation where the construction site is planned corresponds to biotope 91T0_2 (polygon 22JS178_104); the construction will destroy part of the biotope (up to 1.3 ha), but the remaining area will allow the biotope 91T0 and its characteristic vegetation to persist and develop. The development area also includes 0.26 ha of habitat 91D0*_3 (polygon 22JS178_105). If the connection to the road section C_VV16_93 is to be made, the impact could be on the 91D0_3 habitat polygon 22JS178_105, both by destroying part of its area and by deteriorating the hydrological regime if the existing ditch is dredged, with a total potential dewatering impact of up to 0.9 ha. The section of access road C_VV16_93 to the A3 is unlikely to

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
					<p>have an impact on habitats as the existing road is wide and without sharp bends. Impact zone of cable routes in biotope 91T0_1 up to 0.4 ha.</p> <p><u>To minimise the impact</u>, the cable routes should be planned on one side of the road and without affecting the habitat areas, the site should be planned outside the 91D0* habitat area and in such a way that the hydrological regime of the habitat is not altered (by constructing the site on an elevation).</p>
VV36 (5)	Alternative A, B	C_VV37_43	The site is on flat terrain, in pine coppice in the Mint growth type (the site plot is actually wet Mint). Access road of sufficient width and bearing capacity, may need to be rebuilt to connect to other roads.	Cable route along the access road habitat 9010*_1, which is also the habitat of the Great Crested Beetle and the Schneider's Mantis.	<p>On the northern side of the access road, the cable route affects habitat 9010*_1 (landfill 22JS178_122) in an area of 0.1 ha.</p> <p><u>To minimise impacts</u>, the cable route should not be located in habitat 9010*_1.</p>
VV37 (3)	Alternative A, B	C_VV37_43	The WPP site, construction area and access road are planned in pine coppice in the dune flat.	No SPA species have been found, habitat 91T0_2 has been found in the area of the planned construction site. Along the access road habitat 91T0_1.	The development of the site is expected to result in the loss of further development of habitat 91T0_2 (landfill 22JS178_121) in this area of up to 1.3 ha. Habitat variant 91T0_2 is a successional habitat, with minor adverse effects expected from habitat destruction. The construction of the turn-off at the junction of

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
					roads C_VV37_43 and C_VV22_85 will destroy up to 0.2 ha of habitat 91T0_1. The cable route may affect habitat polygon 18NK634_676 up to 0.1 ha. <u>To minimise impacts</u> , the cable route should be planned without felling trees in the habitat.
VV38 (3)	Alternative A, B	C_VV22_85	The WPP is planned to be located in a young stand in a dry forest type. The construction site and access road are planned in pine stands and mature stands on dry mineral soils (Mr) and in stands of susinata forest types (As).	No protected habitats found. The SPA species <i>Lycopodium clavatum</i> and the annual clapper rail have been recorded in the area of the proposed development site.	No adverse effects on protected habitat areas are expected. The construction of the site is expected to result in the destruction of 20 ^{m2} of the annual pipistrelle site and 2 ^{m2} of the cuckoo pipistrelle site, but will not have a negative impact on the populations of these species.
VV39 (5)	Alternative A, B	C_VV39_40	The site is located in a practically flat area, in a pine coppice of the lhane type. The construction site also affects mature pine and pine-birch stands and a 35 year old pine coppice. The access road needs to be widened and rebuilt, currently a rarely used gravel road.	Habitat 9010*_4 in the construction site, habitats 9010*_1, 91D0*_1, 91T0*_1 along the access road (see VV40) annual milfoil <i>Lycopodium annotinum</i> , crab milfoil <i>Lycopodium clavatum</i> .	The site is not located in an area of protected habitats or species habitats. For the access road, see description of VV40, and additional dewatering impacts may affect habitat 91D0*_1 (18LM156_1150) up to 0.3 ha and cable route 9010*_4 up to 0.01 ha. <u>To reduce impacts</u> , the access road should be designed with an embankment, without dewatering of adjacent areas, but overall the access road cannot be constructed without impacting 91D0*_1 and the parasitic cladonia habitat (see description of

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
					ER 40).
VV40 (5)	Alternative A, B	C_VV39_40 C_VV40	The WPP site, construction area and access road are planned in young stands in dry and dry forest types. A drainage ditch has recently been restored along the planned route of the C_VV40 access road.	To the west of the boundary of the proposed development site is habitat 91D0*_1, along the access road are habitats 91T0_1 and 9010*_1, habitats of the annual and caterpillar caterpillar, habitat of the parasitic cladonia.	The development site may affect habitat 91D0*_1 (polygons 18LM156_1148, 18LM156_1150, 18LM156_1153) if it results in dewatering (up to 1.3 ha). The construction of the access road will have a direct impact on habitat 91T0_1 (23AP116_72, 23GE079_54) 0.3 ha and 91D0*_1 (23AP116_70) 0.1 ha. Road construction and realignment will have a dewatering impact on 91D0*_1 (23AP116_70 (low quality), 18LM156_1149 (habitat of excellent quality, including habitat of parasitic cladonia)) of up to 2.8 ha. Negative impact on microclimate 91D0*_1 over an area of 0.2 ha. The road realignment will destroy up to 0.04 ha of caterpillar habitat. <u>To minimise impacts</u> , cable routes should be planned on one side of the

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
					road only; drainage of waterlogged habitat areas should be avoided as part of road reconstruction; construction and operation of the VPP site without drainage systems (with embankment). Given that the site is located immediately adjacent to habitats and the existing road is to be substantially rebuilt, it is likely that even with mitigation measures, there could be residual impacts on the hydrological regime of habitats of up to 2 ha and direct impacts on 91T0_1 of 0.3 ha and 91D0*_1 of 0.1 ha.
VV41 (3)	Alternative A, B	C_VV41_84	The WPP is planned to be located in a coppice. The construction site is planned in middle-aged forest stands and partly in young forest on the dune terrain. The access road is planned to follow an existing LVM road, which leads through a forested area dominated by intensively managed forest areas with mature forest stands interspersed with clearings and young stands.	No protected habitats identified. The planned WPP site supports the SPA species annual pipistrelle, cuckoo pipistrelle and Baltic cuckoo <i>Dactylorhiza baltica</i> . Adjacent to the site is habitat 9010*_1, which is also the habitat of the Heller's Gull.	The construction of the site is expected to result in the destruction of the Baltic cuckoo (20 individuals), the annual pipistrelle (5 ^{m2}) and the cuckoo pipistrelle (5.5 ^{m2}) but will not have a negative impact on the populations of these species. The construction of the site will have an adverse effect on the microclimate of habitat 9010*_1 and the habitat of Heller's Warbler over an area of 0.3 ha. Some large stones have been found in the planned area, which would be preferably moved to the adjacent woodland during construction, preserving the original

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
					orientation of the stones towards the skyline.
VV42 (3)	Alternative A, B	C_VV41_84	The WPP site, construction area and access road are planned in stands of different ages.	No protected habitats or SPA species have been recorded within the development site. The access road affects the 91T0_1 biotope.	No adverse effects on protected natural values are expected, if the cable route passes through habitat 91T0_1 (polygon 22JS178_119) is planned without felling trees or on the south-west side of the road.
VV43 (5)	Not recommended	C_VV37_43	The WPP site, construction area and access road are planned in pine stands and mature stands in dry forest types.	No protected habitats identified. Baltic cuckoo <i>Dactylorhiza baltica</i> along the access road.	No adverse effects on habitats expected. The construction of the cable route will have a short-term negative impact on the Baltic cuckoo salmon.
VV44 (4)	Not recommended	C_VV44	Location and possible construction area (configuration to be specified) in young pine forest stands in mint vegetation type, terrain moderately sloping (inland dune massif). Driveway recently constructed with sufficient width and bearing capacity	Biotops 91T0_1	Site and construction area in biotope 91T0_1 (polygon 18LM156_1203, possibly also 18LS674_894), total area of the construction area about 1.4 ha. Habitats of low quality, with young forest cover and no structures, but distinct topography. The proposed action would result in the destruction of part of the habitat, but

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					the remaining area would allow the continuation of the 91T0 habitat and its characteristic vegetation. <u>Mitigation is not possible</u> if the location of the site is not changed.
VV45 (4)	Not recommended	C_VV45	The site is on flat to gently undulating terrain, in a pine coppice of the mint type. The construction area includes young and some mature pine plantations. The driveway is recently constructed with sufficient width and bearing capacity, possibly requiring straightening of one bend.	Habitat 9010*_1, caterpillar, great crested beetle.	The access road crosses habitat 9010*_1 (landfill 18LS674_708), where a road corridor is already established, but would require widening. The construction of the turn and the cable routes may destroy up to 0.2 ha of habitat, as well as a site for the cowbird. The existing habitat 91T0_1 at the A3 connection has already been affected by the road construction and is unlikely to be further affected. The impact on 9010*_1 cannot be reduced if the road turn is rebuilt.
VV46 (4)	Alternative A, B	C_VV46	Site in gently undulating terrain in a pine coppice in the mint growth type. The configuration of the construction area is not specified, and it is possible that mature pine trees may also be affected. The access road has to be rebuilt, connecting to the A3 motorway.	Habitats 91T0_1, 91T0_2, great crested newt	The topography and vegetation at the site at the time of the survey corresponds to biotope 91T0_2 (it is unknown how the vegetation will develop as the young pines grow).

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VV47 (3)	Alternative A, B	C_V22_85	The location and construction site of the WPP is planned in middle-aged forest stands. The access road is planned in a forested area, dominated by intensively managed woodlands, with middle-aged and mature stands.	No protected habitats identified. The stands of the SPA species, the annual pipistrelle, are widely distributed in the planned WPP site. A locality of the SPA species <i>Huperzia selago</i> has also been recorded. At the edge of the access road is a species of SSSI - Sand Carnation <i>Dianthus arenarius</i> .	In the case of the construction of the site and the access road, up to 165 ^{m2} of annual hen harrier habitat is expected to be destroyed and 0.5 ^{m2} of annual hen harrier habitat is expected to be lost, but no negative impacts on species populations are expected. The installation of a cable route along the access road would affect a 4 ^{m2} sandy marl deposit. <u>To reduce the impact</u> , install the cable route on one side of the road only (east side of the access road); the residual impact will be the destruction of approximately 80 ^{m2} of individuals per year per stalk and 0.5 ^{m2} per girth.
VV48 (5)	Not recommended	C_VV1_48	The WPP site, construction area and access road are planned in pine stands of different ages on dry mineral soils.	No protected habitats or SPA species have been recorded within the development site. Along the access road habitat 91T0_1.	The development site is not expected to have any adverse effects on protected natural values. The cable route may affect the biotope 91T0_1 (landfill 22GE079_51) on the northern side of the road in an area of 0.2 ha, and on the southern side (landfills 22GE079_51, 18LM156_1167, 22GE079_50) in an area of 0.2 ha. To minimise impacts, avoid cutting down trees in the habitat, install the cable route on one side of the road.

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
VV49 (9)	Not recommended	C_VV49_68	WPP location and construction site in a drying wet birch-fir stand, young and middle-aged pine-fir stands. The centre axis of the development site is along the existing dirt road. C_VV49_68 Narrow dirt road already under reconstruction, with young and middle-aged pine stands, coppice, clearings along it.	No protected habitats found. A locality of pink-edged pondweed has been identified, but it is located in a clearing, so the locality will disappear in the future due to the lack of suitable substrate.	The existing pink-ringed pondweed site will be destroyed. To reduce the impact, the protected species can be transferred to the adjacent forest stand.
VV50 (8)	Not recommended	C_VV51_70	Siting and construction site and access road in an area with relatively variable topography, in mature stands of dry-aged and dry-wet pine, partly on an existing access road. The WPP site crosses a valley depression of a small watercourse.	No protected habitats have been identified on the development site. Several species of SPA, the annual pipistrelle, have been recorded at the proposed WPP site. Along the access road habitat 91T0_1.	The construction of the site would destroy approximately 15 ^{m2} of the annual habitat, but would not have a negative impact on the population of the species. The cable route and road widening may affect habitat 91T0_1 (18EO128_1022) up to 0.1 ha, to reduce the impact the cable route is planned along the northern side of the road.
VV51 (8)	Not recommended	C_VV51_70	The WPP site and construction area is located in a dry pine stand, a dry-growing mature pine stand, a dry-wet-growing mature pine stand. Access via a recently reconstructed dolomite crushed stone road.	In the area of the WPP construction site, habitat 91T0_2, north of the site and along the road CVV51_70 habitat 9010*_3, also habitat of the Heller's Warbler.	The development site in its current configuration would destroy 0.4 ha of habitat 91T0_2 (habitat in the formative stage) on medium-high dune terrain. The construction of the site may adversely affect the microclimate in habitat 9010*_3, which is also the habitat of the Heller's pipit (18LM156_1258) up to 0.3 ha, with potential dewatering

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					effects up to 2.9 ha of the habitat. To minimise the impact, specify the configuration of the development area to minimise contact with biotope 9010*_3, and do not deepen side ditches below the top mark of the biotope during road reconstruction and construction of the site.
VV52 (9)	Not recommended	F_VV52 C_VV51_70	Siting and construction site of a WPP in a semi-dry wet birch coppice, semi-wet and fertile pine-spruce stands of middle and mature age. The site access road is along a track through stands of mainly fertile wet and dry wet pine, pine-fir coppice, young and middle-aged stands. Along the VV64-VV91 road, there are stands of both dry and dried wet pine of middle and mature age, as well as young stands.	A protected forest habitat has been identified at the beginning of the access road to the WPP VV91 site. Several SPA species have been recorded, including the annual cuckoo <i>Lycopodium annotinum</i> , the spotted cuckoo <i>Dactylorhiza maculata</i> and the fuchsia cuckoo <i>Dactylorhiza fuchsii</i> .	The proposed activity will destroy the habitats of protected species (annual pipistrelle, spotted cuckoo, Fuchs' cuckoo) and alter the hydrological regime, thus negatively affecting the habitats of these species up to 50 m away from the newly constructed road. The construction of the turn-off at the road connection will destroy the habitat 91T0_1 (landfill 18LM156_1268) in an area of 0.2 ha. To reduce the impact, the connection should be planned from the east, preferably on an embankment, minimising dehumidification of the surrounding area.

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
VV53 (14, 17)	Not recommended	C_VV53 C_VV53_59	Site in a young spruce-birch stand in a narrow-leaved peatland type; spruce trees are dead and already partially felled due to bark beetle. The configuration of the construction site is yet to be clarified, possibly affecting mature pine-fir stands. Access road through stile, along existing drainage ditch.	Heller's knapweed <i>Anastrophyllum hellerianum</i> , annual knapweed <i>Lycopodium annotinum</i> , creeping knapweed <i>Lycopodium clavatum</i>	The construction of the road and cable route in its current configuration will destroy the habitat of the annual and cuckoo pipits. Heller's wedge-leaved fritillary found on the fall of an ecological tree on the Quaternary Stygia is not considered to be a significant and long-term site.
VV54 (15)	Not recommended	C_VV54	The WPP is planned to be located in a middle-aged forest stand. The construction site is planned in young to middle-aged stands. The access road is planned to be a rebuildable forest road through a wooded area dominated by Scots pine forests with middle-aged and mature stands.	The access road is planned to pass through the <i>Tetrao urogallus</i> micro-reserve No 1202 and extensive polygons of continuous habitat 91T0. Along the road, several SPA species and habitat specialists have been recorded in the forest habitats, including the caterpillar <i>Lycopodium clavatum</i> , the parasitic cladonia <i>Cladonia parasitica</i> , <i>Boros schneideri</i> , and the variable mollusc, <i>Postia leucomallella</i> localities.	The development site would destroy 0.5 ha of habitat 91T0_1 (polygons 18JS178_792, 18JS178_793). The construction of the access road would affect biotope 91T0_1 up to 6.9 ha (polygons 18EO128_882, 18EO128_881, 18LM156_1136, 18JS178_792, 18JS178_793, 18EO128_883, 18EO128_880, 18LM156_1160). The road realignment would adversely affect habitats and SPA species by fragmenting and destroying them in the area of the road to be realigned. Mitigation can only be achieved by abandoning the access road (a southern access can be planned) and by adjusting the location of the site.

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
VV55 (14)	Not recommended	C-VV55_59 C-VV55	The site is located in undulating terrain in a pine coppice, mint type. The construction area includes young and mature pine plantations on inland dune elevations. The access road needs to be completely rebuilt, currently a natural carriageway.	91T0_1, 91T0_2, 9010_1, crab-grass <i>Lycopodium clavatum</i> .	The site is planned in biotope 91T0_2 (landfill 18JS178_798), lichen abundance is medium. Part of the habitat would be destroyed (1.1 ha), the rest would continue to develop naturally. Rest of the construction area in biotope 91T0_1 (0,96 ha, polygon 18JS178_797) The access road crosses the polygons of biotope 91T0_1, during the construction of the road and cable route a part of the biotope polygons 18JS178_797, 18LM156_1039 would be affected. 18JS178_799, 18LM156_1038, the extent depends on the technical solutions, as the natural carriageways and the power line already fragment them, but up to 0.62 ha in total. The access road also affects biotope 9010_1 (landfill 18LM156_1041) in an area of 0.1 ha, the extent of the impact depends on the width of the road to be constructed. The construction of the road would also destroy some of the identified caterpillar habitats, but this would not have a negative impact on the population of the species. <u>Mitigation is not possible with this site as the access road crosses protected habitats for long stretches.</u>

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
VV56 (15)	Not recommended	The way of the lane	The WPP site, construction area and access road are planned in coppice and coppice in dry forest types. The access road connects to the LVM road (Ielīcu ceļš).	No protected habitats identified. The habitat of the SPA species <i>Chalcophora mariana</i> (feces) has been identified on the proposed development site. A locality of the SPA species Fuchs's cuckoo <i>Dactylorhiza fuchsii</i> has been found in the area of the planned access roads.	Temporary adverse effects on the habitat of the Baltic cuckoo and the great crested newt are expected. <u>Mitigation measures</u> - large standing trees and fallen trees to be relocated to lighted parts of the residual stands.
VV57 (15)	Not recommended	C. VV58	The WPP site and access road are planned in coppice and clearings in dry forest types. The construction site is planned partly in young stands and clearings, and partly in mature forest stands where a protected forest habitat has been identified.	The SPA species Heller's knapweed <i>Anastrophyllum hellerianum</i> and the annual milfoil <i>Lycopodium annotinum</i> , as well as biotopes 9010*_3 and 91T0_2, have been recorded in the area of the planned development site.	The current layout of the development site is expected to result in the destruction of 0.5 ha of habitat 9010*_3 (landfill 18LM156_1138), 0.5 ha of habitat 91T0_2 (landfill 18EO128_873) and habitats of protected species. <u>To reduce the impact</u> , it is necessary to reconfigure the development site (to the west, parallel to the Ielīcu road, without affecting the habitat area.
VV58 (15)	Not recommended	C. VV58	The WPP site, construction area and access road are planned in young and middle-aged intensively managed forest stands significantly affected by deforestation. The access road is planned to be an un-surfaced carriageway along the block corner between Q192	No protected habitats or SPA species have been identified within the development site. Along the access road habitat 9010*_3, also habitat of Heller's hellebore <i>Anastrophyllum hellerianum</i> .	The development site will not affect protected habitats or species, but the construction of the access road will destroy up to 0.4 ha of habitat 9010*_3 (polygon 18LM156_1138) and may cause up to 1 ha of dewatering impacts. <u>Mitigation is not possible if the road is designed as it is.</u>

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
			and Q192. and 193 sq.		
VV59 (14)	Not recommended	C_VV56_59 C_VV53_59	Site and construction area in a flat pine coppice under mint growing conditions. The access road along the existing stigmas and the power line must be rebuilt.	Along driveways habitats 91T0_1, 9010*_3, crab-grass <i>Lycopodium clavatum</i>	The access road from the south would affect habitat 91T0_1 (landfills 18LM156_1039, 18LM156_1038) up to 0.43 ha, the road from the north would affect habitat 9010*_3 (landfill 18JS178_796) about 0.1 ha and 91T0_1 0.1 ha (landfill 18LM156_1140). In both cases, the road would destroy several sites of the clapper rail. <u>To minimise the impact</u> , it is recommended to plan the road from the north only.

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
VV60 (15)	Not recommended	The way of the lane	<p>The WPP site and access road are planned in a young stand in dry forest types.</p> <p>The site is planned in young and middle-aged stands in dry forest types on low dune terrain.</p>	<p>Habitat 91T0_2, no occurrences of SPA species.</p> <p>The planned area of the development site affects a protected habitat - 91T0_2 <i>Lichen-rich pine forests</i>, polygon No. 18EO128_867 and 18EO128_872.</p>	<p>The planned area of the development site affects 1.2 ha of the 91T0_2 habitat polygon 18EO128_872 and 0.4 ha of the 91T0_1 (polygon 18EO128_867). The cable routes along the road may affect up to 0.4 ha of habitat 91T0_1 and 0.1 ha of habitat 9010*_3 (landfill 18EO128_869). It is expected that further development of the protected habitat in this area will be lost due to the creation of the construction site. Habitat variant 91T0_2 is a successional habitat, with minor adverse effects expected from habitat destruction. To reduce the impact, the configuration of the construction area should be planned without affecting the biotope 91T0_1, as well as the cable routes - without cutting down trees in the biotope area.</p>
VV61 (10)	Alternative B	C_VV61	<p>The location and construction site of the WPP in an area with a dramatically changing topography in pine plantations of different ages. Access road - existing woodland road, dry pine coppice alongside.</p>	<p>Habitat 91T0_2 in the area of the development site. No occurrences of SPA species.</p>	<p>The construction of the site would destroy habitat 91T0_2 (landfill 18EO128_997), covering an area of about 1.8 ha, or most of the landfill, including the topsoiled dune terrain. <u>Mitigation is not possible without relocating the site.</u></p> <p>On the C_VV61 section of the road to the east of the site, up to 2.5 ha of</p>

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
					potential impact area on habitat 91T0_1 on the north side of the road, 2.15 ha on the south side, and 0.2 ha on habitat 9010*_1 (cable routes). <u>To minimise impacts</u> , cable routes should be located without cutting down trees in habitats.
VV62 (10)	Not recommended	§ VV62 C VV61	WPP site and construction site in dry pine coppice. Access road along existing forest land road, with pine coppice and middle-aged pine plantations in dry growing conditions.	Along the access road, habitat 91T0_1, no SPA species found.	The construction of the access road would destroy the habitat 91T0_1 (landfill 18EO128_987) in an area of 0.9 ha. <u>To reduce the impact</u> , the access road needs to be planned on a different trajectory.
VV63 (10)	Not recommended	§ VV63 § VV63_71	Siting and construction of the WPP on a site with moderate topography in a dry pine coppice as well as an adult dry pine coppice of 0.3 ha. Access road - stiga and natural carriageway. Along it, pine coppice and middle-aged stands under different moisture conditions.	Within the construction site area and along habitats 91T0_1 and 91T0_2. No occurrences of SPA species.	The development site and access road are located in biotope 91T0_2 (landfill 18EO128_944, 22GE079_40, 18EO128_1052) with an area of 2.8 ha, the construction of the site and the access road would also destroy up to 1 ha of biotope 91T0_1 (landfills 18EO128_938, 18EO128_942, 18EO128_943, 18EO128_950, 18EO128_951, 18EO128_948, 18EO128_947, 18EO128_946). <u>Mitigation is not possible</u> if a site is implemented in this area.

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
VV64 (9)	Not recommended	C_VV64 C_VV51_70	Site and access road in clearing and coppice; the section of road C_VV51_70 on either side of the connection is a recently constructed dolomite crushed stone road, with mature stands of wet pine, pine-fir, pine and birch coppice along it.	No protected habitats or species within the development site, along the east side of the road C_VV51_70, one Baltic Cuckoo Fritillary site.	No impacts on specially protected habitats and species are expected.
VV65 (9)	Alternative B	C_VV65 C_VV51_70	Siting and construction of the WPP in mature birch-fir coppice and young stands under wet growing conditions, with a small area of mature pine coppice. Access road - dolomite crushed stone road, mainly wet woodland - pine coppice, middle-aged and mature pine-fir stands.	No protected habitats found. The site of the planned WPP is a site of the SPA species, the annual pipistrelle. Along the access road from the west, habitat 9010*_1.	The development site does not affect protected species and habitats, but is crossed by a larger drainage ditch. In order to avoid the impact of the redevelopment of the drainage system in the wider area, it would be necessary to relocate the planned WPP site ~ 80 m to the south. Install a cable route along the southern side of the access road.
VV66 (9)	Alternative B	C_VV66 C_VV49_68	WPP site and construction area in middle-aged pine-fir stands, young stands and clearings. WPP site - in a wet birch coppice at low elevation. The access road follows a forest track through middle-aged wet pine-fir forests. C_VV49_68 Narrow dirt road already under reconstruction, with young and middle-aged pine stands, coppice, clearings along it.	At the beginning of the access road to the site, one site of the Annual Swift. Along the access road, habitat 9010*_1, which is also the habitat of the chestnut-brown Arthonia, the cat's foot Arthonia Arthonia <i>leucopellea</i> and the scented groundsel <i>Geocalyx graveolens</i> .	The construction of the access road turn-off will destroy one site of the annual pipistrelle. Reconstruction of the access road, if necessary, may cause dewatering effects in habitat 9010*_1 (18JS178_995). <u>To reduce impacts</u> , do not deepen the side ditch along the habitat.

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
VV67 (9)	Alternative B	C_VV67 C_VV49_68	Siting and construction of a WPP in a pine stand and young pine plantations with fertile and relatively moist growing conditions. C_VV49_68 Narrow dirt road already under reconstruction, with young and middle-aged pine stands, coppice, clearings along it. Road C_VV67 shall be constructed.	No protected habitats found in the construction site, along the access road habitat 9010*_1. Several species of SPAs have been recorded in the vicinity of the proposed WPP development site and access road, including the annual cuckoo, fragrant night violet and Fuchs' cuckoo <i>Dactylorhiza fuchsii</i> .	The construction of the site and road would destroy the habitats of the Annual Cuckoo, the Scented Night Violet and the Fuchs' Cuckoo, but would not adversely affect the populations of these species. The construction of the cable route would affect habitat 9010*_1 up to 0.1 ha. Negative effects on the microclimate of the habitat are expected in an area of 0.3 ha and up to 1m6 ha of dewatering. <u>To reduce the impact</u> , the cable route should be installed along the eastern side of the road, on an embankment, without altering the hydrological regime of the biotope, but dewatering impacts of up to 0.5 ha are most likely.
VV68 (9)	Alternative B	C_VV68 C_VV49_68	The WPP site and the construction area were maintained in both dry and wet pine forest stands. The access road is a dirt track, with medium-aged mixed tree stands (pine, spruce, birch, aspen) and clearings along it.	No protected habitats, no SPA species or suitable habitats have been identified. A pine tree of large dimensions in the centre of the site. Along the eastern edge of the development site for a distance of approximately 15 m, protected woodland habitats 91D0*_2 and 9010*_1.	The development site in its current configuration would have a negative impact on the future microclimate of habitat 9010*_1 (18JS178_997), as the opening in the stand <15 m from the habitat (0.4 ha) would remain. The construction could have a dewatering impact on the habitat 91D0*_2 (18JS178_998) of approximately 1.9 ha. <u>No mitigation is possible if the site is not moved</u> >50 m from habitat 91D0*.

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
VV69 (9)	Not recommended	C_VV69 C_VV51_70	The WPP site, the construction area and the access road are planned to be located in forest stands on wet mineral soils (forest type Mrs). The area is dominated by young, artificially regenerated forest stands, although some patches of mature and overgrown stands remain. The area has a poorly functioning network of drainage ditches and drains, and waterlogged conditions persist.	The development site affects biotope 91D0_2, the access road - biotope 9010*_1, which is also the habitat of the Heller's helleborine <i>Anastrophyllum hellerianum</i> .	The development site would destroy habitat 91D0*_2 (22AP116_407) by 0.3 ha, with a potential dewatering impact of at least 0.7 ha. The construction of the access road would destroy habitat 9010*_1* (landfill 22AP116_405) and the 0.6 ha habitat of the Heller's wedge. <u>Mitigation is not possible without significant changes to the location of the WPP and the access road.</u>
VV70 (9)	Not recommended	C_VV51_70	WPP location and construction site in wet-growing managed pine plantations. Access road - dolomite crushed stone road, pine coppice and middle-aged stands along it, high-voltage power line.	Adjacent to the planned WPP construction site, there is habitat 9010*_1, which is also the habitat of the Heller's Warbler and the Cave Sparrow, and habitat 91D0*_2, which is the habitat of the Chestnut-brown Dartford Warbler and the Vine-coloured Dartford Warbler, the site has been found to harbour the SPA species, the Annual Warbler. Along the access road habitat 9010*_1.	The development site will destroy the annual pipistrelle site, may have a negative impact on the microclimate of habitat 9010*_1 (18JS178_976) of approximately 0.3 ha and a dewatering impact on this habitat of up to 1 ha and habitat 91D0*_1 (24TC182_10) of 0.4 ha. The cable route along the access road may affect habitat 9010*_1 up to 0.3 ha. <u>To minimise impacts</u> , the road reconstruction should not deepen the side ditches below the existing mark and the site should be designed without side ditches, but it is still possible that the hydrological regime in the habitats will not be maintained, at least in part of the

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
					potentially affected area. The residual area affected is likely to be around 0.5 ha of habitat 9010*_1, which is also the habitat of the Heller's pipistrelle and the cave spurge. Cable route to be installed without felling trees in habitat areas.
VV71 (9)	Not recommended	C_VV71 C_VV63_71 (10)	The WPP site and construction area is mainly in dry pine coppice, some middle-aged wet alder-pine-birch coppice and young dry pine coppice. Access road - an existing dolomite crushed stone road branching off the regional road Smiltene-Valka, with pine plantations growing along both sides towards the inland dunes. The shared access road to VV71 and VV63 follows a forest track through dry pine coppice, as well as young and mature pine coppice, to inland dunes.	There are no protected habitats or species within the development site, along the access road C_VV63_71 habitat 91T0_1. No occurrences of SPA species.	The construction of the access road would destroy part of the 91T0_1 habitat (polygons 18EO128_943, 18EO128_946, 18EO128_947, 18EO128_948, 18EO128_950, 18EO128_951), habitat of medium to good quality, on medium-high inland dunes. Total area to be destroyed 1 ha. <u>To reduce the impact</u> , the road may be shifted slightly to the west, reducing the affected area, depending on the technical solutions available.
VV72 (13)	Not recommended	C_VV72_80	The WPP site and access road are planned in young stands in dry and dry forest vegetation types, with a mature stand at the southern end of the site.	Habitat 9010*_3 and the habitats of the SPA species <i>Lycopodium annotinum</i> , <i>Anastrophyllum hellerianum</i> and <i>Fomitopsis rosea</i> have been recorded on the planned WPP development site. Along the access road habitats 9010*_1 and 91T0_1.	The current configuration of the development site and access road will destroy habitat 9010*_3 (polygon 19EO128_242) and the habitat of approximately 0.4 ha of protected species. The access road from VV73 affects habitats 9010*_1 0.1 ha and 91T0_1 0.5 ha. Significant adverse effects on a

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
					protected habitat are expected from maintaining the current location of the development site. <u>To reduce the impact</u> , it is recommended that the location of the development site should be clarified by designing it outside areas of protected habitats. It is not possible to avoid the impact of widening the access road.
VV73 (18)	Not recommended	C VV73	The WPP site, construction area and access road are mainly planned in young stands of dry forest growth types, the construction area affects a middle-aged artificial spruce stand in a dry forest type and a small area of mature stand in a dry forest type.	A locality of the SPA species <i>Chalcophora mariana</i> (large carpet beetle) has been identified on the proposed WPP development site. The proposed development site affects a small area of protected habitat 91T0_1 <i>Lichen-rich pine forests</i> , polygon No 19EO128_235.	The proposed action may avoid negative impacts on the habitat of the IBA species by moving large-sized fallen trees to lighted parts of the residual forest stands. It is recommended that the location of the construction site be clarified to prevent the destruction of an area of protected habitat.
VV74 (13)	Not recommended	C VV73_74	The WPP development area is mainly planned in young stands in dry forest types. The access road is an existing dirt road and should be rebuilt and widened.	Habitat 91T0_1 on the development site, 91T0_1 and 9010*_1 along the access road. No occurrences of SPA species.	The construction of the development site would destroy the habitat 91T0_1 in an area of 0.3 ha (polygons 19EO128_251 and LVM2022 mapping without No.). The access road eastwards to the turn-off to the VV72 affects habitats 91T0_1 (up to 1 ha potentially affected) and 9010*_1 (0.1 ha). The configuration of the site can be refined <u>to minimise impacts</u> , but

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
					impacts on habitats around the access road cannot be avoided as it will need to be widened.
VV75 (17)	Not recommended	C_VV75 C_VV75_79	Site and construction area in a secondary spruce-birch stand in a broadleaved peatland vegetation type. The access road is straight, of sufficient width and bearing capacity, partly to be newly constructed in an area of coppiced woodland.	No identified natural values.	The construction of the site will not affect any protected natural values. For the access road see VV79.
VV76 (17)	Not recommended	C_VV76	The WPP is planned to be located in a coppice. The construction site is planned in a young and middle-aged forest stand. The access road is planned to follow an existing stile in a wooded area dominated by intensively managed woodland, with middle-aged and mature stands interspersed with clearings and copses.	Habitat 9050 is located adjacent to the proposed WPP site, along the access roads 91T0_1 and 9010*_1. No occurrences of SPA species.	No significant adverse effects on habitat 9050 are expected (minor fragmentation effects in the long term due to the retention of the opening in the development site). The access road may destroy up to 0.1 ha of habitat 91T0_1 (landfill 23GE079_28) and up to 0.2 ha of habitat 9010*_1 (18IP658_10). <u>To minimise impacts</u> , plan the route of the road without affecting habitats.
VV77 (17)	Not recommended	C_VV77 C_VV77_79	The WPP is planned to be located in a coppice. The construction site is planned in young, middle-aged and mature stands. The access road is planned to follow an existing forest road in a wooded area dominated by intensively managed woodlands,	No protected habitats identified. A single occurrence of the SPA species <i>Lycopodium annotinum</i> has been recorded on and in the immediate vicinity of the proposed WPP site.	In the event of the construction of the construction site, it is expected that the species' habitats will be destroyed.

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
			with middle-aged and mature stands interspersed with clearings and copses.		
VV78 (17)	Not recommended	C_VV78 C_VV75_79	The access road is planned in areas of thinned and intensively managed forest stands, in a long stretch parallel to the thinning ditch, in some sections along the ditch backfill. The WPP site and construction area are planned in a young stand in a dry forest type.	No protected habitats identified. The planned route of the access road affects a small site of the SPA species <i>Lycopodium annotinum</i> .	The current layout of the access road is expected to result in the destruction of the SPA.
VV79 (17)	Not recommended	C_VV75_79	The location, access road and construction site of the WPP are planned in young and intensively managed middle-aged stands in dry forest growth types.	No protected habitats identified. Along the driveway - Baltic Cuckoo <i>Dactylorhiza baltica</i> .	The construction of the site will not affect any protected natural values. Cable route may affect the Baltic Cuckoo's nesting site along the road, destruction of individuals will have no impact on the population of the species.
VV80 (13)	Not recommended	C_VV80 C_VV72_80	The location, site and access road of the WPP are mainly planned in young stands in dry forest types.	No protected habitats or SPA species found on the development site, access road through habitat 91T0_1.	No negative impacts on protected nature values are expected. The access road from VV72 would affect habitat 91T0_1 (19EO128_241) in an area of about 0.7 ha, for previous sections see VV72. <u>To mitigate the impact</u> , consider reconfiguring the C_VV80 access road to avoid disturbance to protected habitats.

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
VV81 (1)	Alternatives A and B	C_VV81	Site in a pine coppice in the lhan type. The development site also affects mature, old pine forest. The access road needs to be completely rebuilt (currently a rarely used natural carriageway)	The site affects a small area of habitat 91T0.	The construction of the assembly area may affect biotope 91T0 (polygon 22JS178_72). To minimise the impact, the site configuration should be planned without affecting the habitat.
VV82 (5)	Not recommended	C_VV82 C_VV1_48	The WPP site, construction area and access road are planned in pine plantations. The access road from LVM Road (Wolf Road) to the construction site is planned to follow the natural carriageway along the quarter-way between 286 sq. and 296 sq., through mature forest stands with protected habitats.	The site of the proposed WPP is known to contain the SPA species, the caterpillar. Habitat 9010*_1, which is also the habitat of Heller's and Pink-headed Fritillary, is located along the planned access road. To the east of the site habitat 91D0*_2.	In the event of the development site being built, it is anticipated that the caterpillar will be destroyed (6 ^{m2}). The planned construction of the access road will destroy the habitat 9010*_1 with an area of 0.64 ha (landfills 23GE079_55, 18EO128_915) is expected to have a negative impact on the microclimate of the habitat and species habitats in an area of up to 2.5 ha. Potential impact of dewatering on habitat 91D0*_2 (18EO128_916) up to 2.1 ha) <u>To mitigate the impact</u> , redesign the access road from the north-west without affecting the protected habitats, and either redirect the building footprint to the north-west or design the site so as not to affect the hydrological regime of habitat 91D0*_2.
VV83 (5)	Not recommended	C_VV83 C_VV37_43	The WPP site, construction area and access road are planned in	No protected habitats or SPA species found, see VV43 for	No negative impacts on protected nature values are expected.

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
			pine plantations in dry forest types on flat terrain (possibly dune flats).	access road.	
VV84 (3)	Alternatives A and B	C_VV41_84	The WPP is planned to be located in a middle-aged forest stand. The construction site is planned in middle-aged stands, partly also in mature stands. The access road is planned to follow the existing LVM road.	No protected habitats identified. The site of the planned WPP is a site of the SPA species caterpillar. Roadside site of Schneider's <i>Boros schneiderii</i> .	If the construction site is constructed, it is anticipated that the 5 ^{m2} caterpillar site will be destroyed, but this will not have a negative impact on the population of the species. <u>To reduce the impact on the Schneiderian Miskill site on the south side of the road, the cable route should be installed on the north side of the road.</u>
VV85 (3)	Alternatives A and B	C_V22_85	The WPP is planned to be located in a coppice. The construction site is planned in young and middle-aged stands. The access road is planned to follow the existing LVM road and further through a wooded area dominated by woodlands with young trees.	No protected habitats found on the construction site, habitat 91T0_1 along the access road at "Bërziem". A large fallen tree was found on the site of the planned WPP, where the IBA species <i>Chalcophora mariana</i> was found.	The installation of the cable route may affect habitat 91T0_1 in an area of 0.17 ha along the access road. <u>To mitigate the impact</u> , install the cable route on the western side of the access road. During the construction of the site, fallen trees >25 cm in diameter would need to be retained and relocated to adjacent stands.
VV86 (2)	Alternatives A and B	C_VV86	The WPP site and access road are planned in a coppice. The construction site is planned in middle-aged to mature forest stands, partly also in young forest.	The planned WPP site partially covers the area of the habitat 'Lichen-rich pine forests' 91T0_1 (habitat polygon). Access road and cable routes through biotope 91T0_1. At the access road to the A3 motorway, a site of the green-	In the case of the construction of the site, 0,05 ha of the area of habitat 91T0_1 (landfill 22JS178_102) would be destroyed. Up to 0.46 ha of habitat 91T0_1 (polygon 18VB50_209) may be affected by the construction of the turnpikes and cable routes. The reconstruction of

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
				flowered <i>Silene chlorantha</i> .	the access road may destroy the Green-flowered Fritillary site (55 individuals), which would have a significant negative impact on the species population. Select one cable route <u>to reduce the impact</u> and plan it along the existing route of the road. <u>No disturbance of the undergrowth in the Green-flowered Hellebores site</u> , only removal of vegetation within the turning radius; if it is necessary to lower the terrain, this should be done on the south side of the access road. 91T0_1 The area that cannot be undisturbed by the construction of the turnings could be around 0.25 ha.
VV87 (2)	Not recommended	C_VV87, C_VV14_87	Site and construction area in low relief, site in a clearing in a narrow-leaved peatland type, construction area could also affect mature pine-fir woodland in a damselfallow type. The access road in the last section needs to be practically rebuilt (currently a rarely used natural carriageway), and the section shared with other sites also needs to be significantly widened and straightened.	Habitats 9080*_1 (near the shed), 91T0_1, 91T0_2 (driveway), Annual Cuckoo <i>Lycopodium annotinum</i> , Cowslip <i>Lycopodium clavatum</i> , Fuchsia Cuckoo <i>Dactylorhiza fuchsii</i> .	About 80 m south of the turbine site is habitat 9080*_1 (polygon 18LS674_839, actually more like 9080*_3, only part of the habitat with adequate hydrological regime, corresponding to a medium quality potential natural forest habitat). 80 m to the north-east also habitat 9080*_1 (polygon 18LS674_838, rather 9080*_3, good quality potential natural forest habitat). The site will require dewatering and the site infrastructure will be even closer

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
					to the habitats, so there is likely to be a negative impact on the 9080* habitat polygons (at least 0.5 ha, possibly more). The construction of the access road will destroy individuals of the cuckoo warbler, annual warbler and Fuchs' cuckoo warbler, but there will be no adverse effects on the populations of these species. The upstream access road will have a negative impact on habitat 91T0 and the cowslip site (see VV14). <u>Mitigation measures</u> are possible by moving the site away from habitats 9080* and locating it on an elevated site, but impacts from the access road remain.
VV88 (2)	Alternatives A and B	C_VV88	The WPP site, construction area and access road are planned in a coppice and a clearing, with a small part in a mature stand.	In the area of the site, the SPA species <i>Chalcophora mariana</i> and the annual beetle were found on the pine litter. The cable route along the access road affects habitat 9010*_1, which is also the habitat of Heller's warbler, pink-cheeked fritillary and green box elder <i>Buxbaumia viridis</i> .	The access road cable route affects about 0.2 ha of habitat 9010*_1 (landfill 22JS178_111), which is also a habitat for SPA species. <u>To reduce the impact</u> , the cable route should be planned along the eastern edge of the road, with large-sized fallen trees to be moved to the lighted parts of the residual forest stands.
VV89 (2)	Not recommended	C_VV89	The WPP is planned to be located in a coppice. The construction site is planned to be located mainly in mature forest stands, partly also in	The planned WPP construction site and access road affect the area of biotope 91T0_1 (biotope polygon 22JS178_86).	In case of construction of the site and the access road, a part of the habitat 91T0_1 (polygons 22JS178_86, 22JS178_85) would be destroyed

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
			young forest stands. The access road is planned to follow an existing stile in a wooded area dominated by woodland with predominantly mature stands.	The planned WPP construction site has been found to support SPA species such as the large scarlet beetle <i>Chalcophora mariana</i> on pine litter, the sandwort <i>Dianthus arenarius</i> and the meadow grass <i>Pulsatilla pratensis</i> on the northern side of the access road , and the annual milfoil <i>Lycopodium annotinum</i> on the southern side of the road.	(about 1 ha in total). In its current location, the development site touches two dune ramparts. On the northern side of the road, biotope 91T0_1 (polygons 22JS178_88, 18VB850_211), biotope 91T0_2 (22JS178_87). <u>To minimise the impact</u> , the road widening and cable routes are not planned to the north of the existing road (which would not affect the protected species site and part of the 91T0_1 habitat), however it is not possible to construct the site without affecting areas of the 91T0_1 habitat and without significantly altering the dune topography.
VV90 (7)	Not recommended	C_VV90_Saule C_VV10_90 C_VV90	Siting and construction site of the WPP on an elevated terrain in dry pine-fir-birch coppice, dry pine coppice and dry adult pine coppice. Access road - existing woodland road, interspersed with mature dry pine plantations and coppice.	No protected habitats or protected species have been identified on the development site. Along the road C_VV90_Saule Baltic Cuckoo <i>Dactylorhiza baltica</i> .	The construction of cable routes along the access road will have a short-term negative impact on the Baltic Cuckoo Salamander.

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
VV91 (9)	Alternative B	C_VV51_70	Siting and construction of the VPP in an area with relatively variable topography, in dry wet-grown pine coppice, mature dry wet-grown pine coppice, dry mature pine coppice and on an existing access road. Access road through mature pine forest.	Along the access road habitat 91T0_1. No occurrences of SPA species.	No impacts on specially protected habitats and species are expected.
VV92 (8)	Not recommended	C_VV93 C_VV2_3	WPP site and construction area mainly in mature dry pine stands, some also in mature wet dry pine-fir stands. The site has a varying topography with a slope towards the site. The access road runs along forest stigmas through dry mature pine stands, middle-aged dried pine-fir stands, dried wet birch coppice. The access road in the middle is impassable due to high humidity (floodplain of the river Seda).	No protected habitats found. A site of the SPA species Cuckoo Caterpillar was found on the roadside, and Annual Caterpillar was found in the construction site.	The construction may result in the destruction of the annual and caterpillar habitats (approximately 10 ^{m2}) but will not have a negative impact on the populations of the species. It is desirable to specify the access road to be located outside the floodplain of the Seda River (where the road turns east).
VV93 (2)	Not recommended	C_VV16_93 C_VV93	The site is located in a pine coppice in a silo type of growing conditions, the construction area also affects mature pine stands. The access road to the site should be rebuilt, with sufficient width and bearing capacity to the A3, but may need to be straightened.	91T0_1 in the parking area and along the access road	The construction site and the access road would destroy part of the habitat 91T0_1 (landfills 18NK634_561 and 2017. LVM mapping without No), up to 1.7 ha. <u>Mitigation measures</u> can be kept to a minimum without abandoning the site.

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
Transformer substation 1 (3)			The substation's connection to the high-voltage power line runs across a small dune, the substation site is partly in a clearing, partly in an overgrown coniferous forest stand.	The connection crosses the habitat 91T0_1, the substation area in the habitat 9010*_1, which is also the habitat of the Heller's pipit.	The construction of the substation would destroy the 91T0_1 (18LM156_1164) habitat on 0.7 ha and the 9010*_1 (24AP116_11) habitat on 0.7 ha and would have a negative impact on the microclimate of the 9010*_ and Heller's pipistrelle habitats on 1.8 ha. <u>To reduce the impact, choose substation option 3.</u>
Transformer substation 2 (3)			Connection site and location in dry pine-fir stands, mostly middle-aged and mature stands, some mature stands. Partially overlaps with site VV41.	To the south of the substation is habitat 9010*_1, which is also the habitat of Heller's Warbler. At the connection point to the high voltage line, the SPA invertebrate species Schneider's minnow and <i>Stephanopachys linearis</i> striped hooded warbler were recorded.	Construction would have a negative impact on the microclimate of habitat 9010*_1 and the habitat of the Heller's pipistrelle of approximately 0.5 ha (0.2 ha more than for site VV_41 only). At the connection to the high voltage power line, the habitat of the Schneider's Wort and the Striped Hooded Cherry will be adversely affected by felling part of the trees in the habitat. <u>To reduce the impact, choose substation option 3.</u>
Transformer substation 3 (3, 5)			The substation site is partly in a clearing, partly in coniferous stands and mature stands.	Adjacent to the substation area, habitat 91T0_1. Site of the annual pipistrelle, a species of SPA, at the connection to the high-voltage power line.	The construction of the substation will not adversely affect areas of protected habitats. A 1 ^{m2} site of the annual pipistrelle will be destroyed, which will not adversely affect the population of the species.
Transformer substation 4			The transformer substation and energy storage area is planned at	The habitat of the SPA species <i>Chalcophora mariana</i> (large	The proposed activity, if connected to the 330 kV power line, could

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
(original location)			262 sq. Leg 2. The site is subject to clear-cutting in 2023. The substation is planned to be connected to the high-voltage overhead power line via overhead or cable transmission lines through young and middle-aged forest stands in dry forest growth types.	carpet beetle) has been identified on the planned substation site. The location of the planned transmission lines crosses the habitat 91T0_1.	destroy up to 1.6 ha of habitat 91T0_1 (landfills 18JS178_780 and 18EO128_910). The proposed action may avoid negative impacts on the habitat of the SPA species - large-sized fallen and standing trees should be relocated to the lighted parts of the residual forest stands. Information on possible connections to roads and other WPP infrastructure is currently unknown.
	VES Not recommended, no construction works required	C_VV72_80	The access road is planned to follow a natural carriageway at natural elevations. The road passes through young and mature forest stands where protected habitats have been identified.	The planned access road is adjacent to habitat 9010*_1 <i>Old or natural boreal forest</i> polygon No 19EO128_242, the road crosses habitat 91T0_1 <i>Lichen-rich pine forest</i> polygon No 19EO128_241.	The cable route is to be located on the western side of the road (Q377). The possibility of re-routing the road alignment outside the area of protected habitat 91T0_1 - 377 sq. Leg 10, 353 sq. 13 and 14 nog.
		Cable route north of Gailisi road (7,11) (only the cable route, no road reconstruction)	An existing dolomite crushed stone road passes through pine and spruce stands of different ages and growing conditions, perennial grasslands and a high voltage line.	Protected biotopes 91T0_1 have been identified along the road, 18EO128_696, 91T0_2, <i>Lichen-rich pine forests</i> . 18LM156_1092, 91D0*_2, <i>Swamp forests</i> . 17AP116_982, 6270*_3, <i>Species-rich grassland and grazed meadows</i> . 18EO128_682, 7410_1, Transitional marshes and slopes,	No road realignment is foreseen and therefore no impacts on habitats from road widening or dewatering are foreseen. A cable route is planned along one side of the road, which may affect habitats and species habitats. To minimise impacts on habitats and species habitats, cable routes should be installed in areas where no habitats exist, especially in the area

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
				~40 m from the road track. 18JS178_608, 91D0*_1, 18JS178_609, 91D0*_2, <i>Swamp forests</i> , ~10-30 m from the track. 18JS178_606, 91T0_1, <i>Lichen-rich pine forests</i> .	of the Northern Gauja AAP. It is not possible to avoid the impact by crossing the biotope 91T0_1 (18EO128_696, 18EO128_702 or 18EO128_703, 18EO128_827), which is outside the Northern Gauja AAP, the western side of the road should be selected, the affected area 0.8 ha.
		Boulevard (8)	An existing dolomite crushed stone road crosses the massif in a south-north direction, including the dune topography, which has been altered by the road construction.	On both sides of the road habitats 9010* (including habitats of baldcypress and Heller's chat), 91D0*, 91T0	Road widening and ditch deepening would affect protected habitat areas and the hydrological regime, but road widening is unlikely given the dimensions of the road. The installation of the cable route may affect areas of protected habitats as they are located on both sides of the road. The installation of the cable route on the western side of the road will adversely affect 0.6 ha of habitat 91T0_1 and 0.05 ha of habitat 9010*.
		E-line (6,7,10)	An existing dolomite crushed stone road with side ditches crosses the forest massif in a west-east direction, including the dune terrain which has been altered by the road construction.	Along the roadside ditches there are many Baltic Cuckoo Fritillary sites. At the eastern end, the road crosses the biotope 91T0_1, and along the roadside also biotope 9010*_1.	If the road needs to be widened, there is the potential for negative impacts on habitat 91T0_1 by reducing its area, but widening is unlikely given the size of the road. The installation of the cable route will reduce the area of the habitat to 2.8 ha by choosing to install the cable on the northern side of the road. Disturbance of the Baltic Cuckoo is expected, but the species recovers

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
					well in areas where earthworks have been carried out, if areas are left free of black earth.
		A3 Valmiera-Valka (1, 2, 3, 4, 6)	The road crosses inland dune massifs, flat terrain and several depressions with small watercourses. A strip has been cut along the roadside and is kept clear of vegetation.	Baltic cuckoo flower <i>Dactylorhiza baltica</i> , sandwort <i>Dianthus arenarius</i> , long-leaved gypsophila <i>Gypsophila fastigiata</i> , wood-grass <i>Pulsatilla patens</i> , meadow-grass <i>Pulsatilla pratensis</i> , green-eyed Susan <i>Silene chlorantha</i>	The road is not to be rebuilt, but cable routes are planned along its edge. During their excavation, the habitats of protected plant species will be affected, destroying some individuals. As most species are disturbance-dependent and require open ground in the habitat for seed germination, disturbance of the understorey will have a positive effect in the long term by delaying succession, but may have a significant negative effect on the habitats of species with few individuals (green fritillary, woodlark). <u>To minimise impacts</u> , no disturbance of understorey vegetation should be allowed in the Green-flowered Helleborine and Wood-rush sites; trenchless technology should be used in the larger Sand Carnation and Long-

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
					necked Gypsum sites.
	No construction work will be required	Oliņi road	An existing dolomite crushed stone road passes through mainly mature dry pine plantations on variable topography.	In the areas adjacent to the road, biotopes 9010 and 91T0, micro-reserves have also been established to protect forest habitats. Natura 2000 area, AAA "Ziemeļgauja"	No road realignment or cable routes along the road edges are foreseen, so potential impacts are not assessed further; <u>no road widening or deforestation along the road edges is allowed.</u>
	VES Not recommended, no construction works required	The Old House	Existing dolomite crushed stone road, crossing inland dune massifs and stands of wet vegetation types.	Along the road habitats 91D0* and 91T0.	No road widening or cable routes are foreseen, so impacts are not assessed further. As there are long stretches of protected habitats along the road, it <u>is not allowed to rebuild or deforest the roadsides.</u>
	WPP not recommended, no construction work required	C_VV11_Spic frame	An existing dolomite crushed stone road passes through mainly mature dry pine plantations on variable topography.	Protected biotopes 18EO128_828, 18EO128_830, 91T0_1, <i>lichen-rich pine forests</i> are found along the road . 18EO128_829, 18EO128_825, 18EO128_823, 18LM156_1081, 18JS178_684, 91T0_1, <i>Lichen-rich pine forests.</i> 18EO128_824, 91D0*_2, <i>Swamp forests</i> , ~20 m from the planned route. 18JS178_680, 18JS178_685, 91T0_1, <i>Lichen-rich pine forests.</i> 18JS178_686, 18JS178_682, 18JS178_690, 91T0_1, <i>Lichen-rich pine forests.</i>	Medium quality, on low inland dunes. In habitat 18EO128_828, along the road, protected species. Road widening would reduce habitat cover and increase fragmentation. Good quality, on low and medium inland dunes. Road widening would reduce habitat cover and increase fragmentation. Medium quality. Additional dehumidification during road construction would not be desirable.

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
				Along the road, several species of SPA have been found - the cowslip <i>Lycopodium clavatum</i> , the meadowbuttercup <i>Pulsatilla pratensis</i> .	Medium quality. The road widening will affect strips along the road where the vegetation and dune topography characteristic of the biotope are absent. Medium quality, on low, medium and high inland dunes, is a protected species site very close to the boundary of the road to be widened. Road widening would reduce habitat cover and increase fragmentation. The road section is located in the Natura 2000 area "Ziemeļgauja". <u>It is recommended that this section of road is used only for cable route of minimum width and with trenchless technology in habitats and species sites, straightening and widening the road would have a negative impact on the Natura 2000 site.</u>
		Road P-24 Smiltene-Valka (9, 10, 11,) (from E-line to C_VV49_68)	The national regional road P24 Smiltene-Valka passes through stands of pine and spruce trees of different ages and growing conditions.	Along the roadside habitats 9018*, 9020*, 9050, 91T0. To the north of the Gauja Bridge, several SPA species have been found along the road - long-necked gypsum, sandwort, Fuchs' cuckoo-flower.	A fairly wide strip along the roadside without vegetation; if a wider strip is needed for cable routes, <u>trenchless technology should be chosen</u> in sections with habitats and protected species to avoid increasing fragmentation impacts and reducing the area of protected habitats.

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
	WPP not recommended, no construction work required	C_VV59_P24 (14)	Existing dolomite crushed stone road through dry pine woodland.	Along the road habitats 9010* and 91T0, roadside European larch.	No road realignment or cable ducting is foreseen, so no further detailed assessment is required. <u>No road reconstruction and deforestation on the sides of the road</u> , which would affect the areas of beech trees and protected habitats.
	WPP not recommended, no construction work required	The Medibus Road,	Dolomite crushed stone road with sufficient width and bearing capacity, but may need to straighten curves.	Roadside Baltic Cuckoo <i>Dactylorhiza baltica</i> , Fuchsia Cuckoo <i>Dactylorhiza fuchsii</i>	The construction of the cable route will affect the Cuckoo Thrush habitat; as the species grows in the roadside ditch and has adapted to the disturbance, the habitat is expected to recover after completion of the works.
	WPP not recommended, no construction work required	Bajarini road	Existing dolomite crushed stone road, crossing stands of different vegetation types in relatively flat terrain.	Habitat 91E0* (one polygon), caterpillar <i>Lycopodium clavatum</i> .	No road realignment or cable ducting is foreseen, so no further detailed assessment is required. <u>No road reconstruction and deforestation on the sides of the road</u> , which would affect the areas of protected habitats, <u>is allowed</u> .
	WPP not recommended, no construction work required	The way of the lane	There is an existing dolomite crushed stone road, but the section from Ķauķīšu Road to Ielīcu houses is not wide enough to accommodate cable routes and WPP components.	In the section from Ķauķīšu road to the turn to VV59 the road crosses the Natura 2000 site AAA "Ziemeļgauja", biotopes 9010*, 91T0, 6210 along its edge.	If it is necessary to straighten the turn at the junction of Ielīcu Road and Ķauķīšu Road, as well as to install cable routes along the road, <u>protected biotopes 9010*, 91T0, 6210, located in the Natura 2000 area, will be affected</u> . To <u>avoid such impacts</u> on the Natura 2000 site, it is possible to plan the cable connection

WPP site no. on map, (map no.)	WPP construction ²⁴⁶	Roads (existing ²⁴⁷ , to be built)	Characteristics of the area	Protected habitats, SPA species and natural values identified	Potential impacts on protected habitats, SPA species and natural values, mitigation measures
					to the Smiltene-Valka road as a continuation of the C_VV56_59 road through the forest stigma (the annual and creeping bentgrass sites will be affected), and the access of the WPP components and construction materials through the C_VV74_P24 road and further along other roads in the WPP area.
	WPP not recommended, no construction work required	Chickadee Road	An existing dolomite crushed stone road crosses a wooded inland dune massif interspersed with flat, wet woodland.	On the northern and eastern sides of the road Natura 2000 area AAA "Ziemeļgauja", on the sides of the road microreserves established for bird protection, as well as biotopes 3150, 9010*, 91D0*, 91E0*, 91T0 and habitats of protected species.	No road realignment or cable routes are foreseen, the road may be used for transport, so it is not assessed in detail. <u>No road widening or deforestation on the sides of the road that would</u> affect protected habitats or micro-reserve areas, as well as Natura 2000 sites.

According to 7.6.1. Table 6.6.6 shows that the greatest impact on protected species habitats is not expected from the siting of WPPs, but from the construction of associated infrastructure, mainly cable routes, although it should be noted that the calculations are for cable routes on both sides of roads; infrastructure design is likely to be limited to one side of the road and the area of direct impact on at least some roads will be smaller than estimated in the assessment (assuming that the number of cables to be laid is small on road sections serving one or two turbines and that a narrower trench can be designed accordingly). It is natural that the species that will be most affected by activities along the road route are those that, due to the inherent disturbance of roadsides and ditches, have a common habitat, such as Baltic cuckoo, meadow pipit, sandwort and long-necked gypsum. All types of infrastructure, including building sites, affect the sites of the annual and cuckoo quail. The area of influence of the proposed development contains habitats of some protected species that depend on the hydrological regime and microclimate of the forest stand, but it should be noted that habitats of these species are or may be present in other areas of forest habitats affected by the proposed development. Therefore, habitats 9080*, 91D0* and 91E0*, as well as the wet and dry variants of habitat 9050 and 9010*, as well as habitats 9010* and 9050 in wetland vegetation types, should also be considered as potential habitat for protected species that could be affected by dehumidification.

Table 7.6.2 summarises the potential impacts on habitats; as with the species sites, the impacts of the cable routes have been calculated for both sides of the road, although it is likely that only one side of the road will be selected for the cable route. The largest areas directly affected are 91T0 "Lichen-rich pine forests", including areas affected by the planned WPP development sites planned within the habitat. The direct impact is greater for cable routes, which, as mentioned above, can be reduced by choosing only one side of the road for the cable. Habitat 9010* also has large areas of predicted direct effects, mostly in the areas of planned cable routes. Of the habitats potentially affected by dewatering, the largest areas are 9010* boreal forests (Option 3) and wetland forests (Option 3). Option 2 has been flagged for potential dehumidification impacts because, although the biotope was formed on dehumidified soils and it is not desirable to return its hydrology to its original state, often in these biotopes the microclimate with increased humidity is formed by ancient ditches where water migration is slow and stagnant water lagoons form in the ditches), as well as 91D0* swamp forests. The largest areas of this habitat affected are due to the construction of substations, which can be reduced by selecting only one of the substation sites.

d action, sites included in Alternatives A and B

A summary of the protected species sites and habitats likely to be affected by the proposed action if all 84 WPPs are constructed is given in Table 7.6.3. According to 7.6.2. Table 6.6.6 shows that the greatest impact on protected species habitats is not expected from the siting of WPPs, but from the construction of associated infrastructure, mainly cable routes, although it should be noted that the calculations are for cable routes on both sides of roads; infrastructure design is likely to be limited to one side of the road and the area of direct impact on at least some roads will be smaller than estimated in the assessment (assuming that the number of cables to be laid is small on road sections serving one or two turbines and that a narrower trench can be designed accordingly).

Species that are most likely to be affected by activities along roads will be those that have a common habitat along roadsides and ditches due to the inherent disturbance of these areas, such as Baltic cuckoo, meadow pipit, sandwort and long-necked gypsum. All types of infrastructure, including building sites, affect the sites of the annual and cuckoo quail. The dewatering impact zone contains habitats of some protected species that depend on the hydrological regime and microclimate of the forest stand, however it should be noted that habitats of these species are or may be present in other forest habitat areas affected by the proposed activity, therefore the dewatered habitats 9080*, 91D0* and 91E0* as well as the dewatered version of habitat 9050 wet and 9010* should be considered as potential habitats of protected species that could be affected by the dewatering impact.

Table 7.6.3

The potential direct impacts on Natura 2000 areas will be limited to Alternative B and the following protected habitats of EU importance may be affected (see Chapter 7.9 for further information with images showing the location of the affected habitats):

- 6270* Fennoscandian lowland species-rich dry to mesic grasslands, 0.12 ha (LPA "Ziemeļgauja", cable route along "Pukšu purvs");
- 91D0* Bog woodland , 0,1 ha (LPA "Ziemeļgauja", cable route along the section of "Pukšu purvs");
- 9010* Western taiga, 0,046 ha, (LPA "Ziemeļgauja", cable route along "Pukšu purvs");
- 91TO Central European lichen scots pine forests, 0,03 ha (LPA "Ziemeļgauja", cable route along "Pukšu purvs");
- 9010* Western taiga, 0,12 ha ("Bulvāra riests" gar Bulvāra roud).

Impacts on protected habitats in Natura 2000 sites are entirely avoidable, as the maximum impact was assessed during the EIA, with cable routes on both sides of the road and considering the possibility of a cable route along Gailīši Road crossing the LPA "Ziemeļgauja". To exclude impacts, it is possible to locate the cable routes on the opposite side of the road from the habitats and species sites, along the side of the road where no habitats of EU importance are affected, and the cable connection to the substation can be located along the A6 road, connecting to the substation via the connection that would be made if the Group A alternative WPP connection were to be constructed (see Chapter 11, Figure 11.2).

Potential effects of dewatering in the SPNA include:

- 9080* Coniferous forests 0,3 ha ("Purgaile River forests");
- 91E0* Alluvial forests 1.5 ha ("Purgaile River forests").

Impacts on protected habitats and species sites in the SPNA can be fully avoided by choosing to lay the cables on the road side, on the other side of the SPNA NR "Purgailes upes meži " during the design phase of the roads and cable routes, see Table 7.6.3.

The unavoidable impacts of the Proposed Action are on three protected habitats of EU importance under Alternative A and on five protected habitats of EU importance outside SPNAs under Alternative B, see Table 7.6.4. As indicated above, the calculations of habitats likely to be affected by the construction of the cable routes have been made for the cable routes on both sides of the roads. If the infrastructure is constructed, it will only be on one side of the road and the area of direct impact, at least on part of the roads, will be smaller than estimated in the assessment.

Table 7.6.4. Affected habitats of EU importance outside SPNAs.

Habitat	Affected habitats under Alternative A (ha)	Affected habitats under Alternative B ²⁴⁸ (ha)
9010* Western taiga	1,75	2,65

²⁴⁸ Affected habitats under Alternative B also include habitats affected under Alternative A

Habitat	Affected habitats under Alternative A (ha)	Affected habitats under Alternative B ²⁴⁸ (ha)
91TO Central European lichen scots pine forests	3,35	7,25
91D0* Bog woodland	0,05	0,1
9050 Fennoscandian herb-rich forests with <i>Picea abies</i>	-	0,01
91E0* Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnion incanae, Salicion albae)	-	0,005
KOPĀ	5,15	10,005

The proposed action affects the following protected species outside the SPNA:

- The most affected species by the Proposed Action will be the protected species *Lycopodium annotinum* and *Lycopodium clavatum*; individuals of these species will be destroyed during implementation of the Proposed Action. In Latvia, the populations of these species are stable and widely distributed, therefore the complete or partial destruction of local localities in the area of the Proposed Action will not have a significant negative impact on the population of the species. The information contained in the report to the European Commission on the conservation status of habitats and species of EU importance in Latvia²⁴⁹, assessed for the period 2013-2018, confirms that the population status of the species is considered to be stable. The report indicates that species of the *Lycopodium spp.* class occur in at least 7120 localities in Latvia (currently there are data on a much larger number of localities). The status of the populations of the species of the quail class is assessed as stable and the future conservation outlook (conservation status) is assessed as favourable.
- In places, the Proposed Action will affect the habitat of the cuckoo *Dactylorhiza* sp., especially the Baltic cuckoo. The species often grows in roadsides and ditches, as it successfully colonises open ground in such areas, and the impact of disturbance on the species is expected to be short-lived and to recover, especially if other individuals of the species remain in the vicinity. The proposed activity will result in the destruction of approximately 2 *Platanthera bifolia* sites; this will not have a negative impact on the population of the species, as it is relatively common in suitable habitats, which is also the case in the areas adjacent to the area of influence of the proposed activity.
- The proposed activity could have a negative impact on the habitats of species associated with protected habitat 9010* Western Taiga and will be destroyed or fragmented (see above for the area of habitat 9010* potentially affected). The proposed activity may adversely affect the hydrological regime in habitats of species associated with habitat 91D0* Bog Woodland (see above on 91D0*).
- Throughout the WPP Park, dryland habitats support associated vascular plant species (sandwort *Dianthus arenarius*, long-leaved gypsophila *Gypsophila fastigiata*, meadow and woodland sedge *Pulsatilla pratensis* and *P. patens*, green-flowered sundew *Silene chlorantha*). The installation of cable routes may affect the

²⁴⁹ <https://cdr.eionet.europa.eu/Converters/lv/eu/art17/>

vegetation of these species, but in the long term the impact of disturbance to the understorey is positive, whereas the destruction of individuals of very rare species may have a negative impact and completely destroy the micropopulation, hence the significant conditions set out in Table 7.6.3.

In order to mitigate potential impacts on habitats and vascular plant species, the species and habitat expert has made recommendations that can be taken into account, where possible, in the construction of the proposed wind farm. The habitat expert's opinion assessed the worst case scenario of cable routes on both sides of the road, but based on the expert opinion, the impacts can be almost completely avoided during the design of the WPP, as the cable routes will only be built on one side of the road and in some cases it is possible to place the cables under the road surface, thus further reducing the impacts on species, habitats and reducing the deforested areas.

7.6.2. Effects on birds

A detailed analysis of 55 bird species was carried out to assess whether or not the construction of a WPP is recommended. The analysis was carried out for those bird species which, according to the conservation status assessment of the Nature Conservation Agency²⁵⁰, have one of the conservation features - the species is included in Annex 1 of the Birds Directive (Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds), the species is a "SPA trigger" species²⁵¹ (migratory bird species occurring in Latvia, for which special habitat protection measures should be provided), the species is included in the Latvian Specially Protected Species List - 2000. 14 November, Cabinet of Ministers Regulation No 396 "Regulations on the List of Specially Protected Species and Specially Protected Species of Restricted Use", Annex 1 or 2 (hereinafter - Annex 1 or 2 of Cabinet of Ministers Regulation No 396), or microreserves are to be established for a species - Cabinet of Ministers Regulation No 940 of 18 December 2012 "Regulations on the Establishment and Management of Microreserves, their Protection, as well as the Establishment of Microreserves and their Buffer Zones" (hereinafter - Cabinet of Ministers Regulation No 940).

To improve transparency, the list of species analysed in detail is divided into two groups - **Excluded species** and **Species to be assessed**. **Excluding** species are those whose presence means an area of generally fixed size around the species' site, where the recommendation not to deploy WPP is valid. For some species, there are even two areas - areas where the no WPP recommendation is valid and areas where the need for and feasibility of mitigation measures should be assessed but the no WPP recommendation is not valid in principle. **Species to be assessed**²⁵² are species for which the construction of a NPS in the vicinity of a site, mostly in a fixed size area around the site, should be assessed in combination with mitigation measures, but the recommendation not to construct a NPS only applies in certain cases, for example in areas with concentrations of multiple sites of species **to be assessed**. The analysis for each species indicates the reasons for including the species in one group or the other.

²⁵⁰ <https://www.daba.gov.lv/lv/media/12253/download>

²⁵¹ https://cdr.eionet.europa.eu/Converters/run_conversion?file=lv/eu/art12/envxh2nkg/LV_birds_checklist.xml&conv=611&source=remote

²⁵² Common Pochard *Glaucidium passerinum*, Shoveler *Aegolius funereus*, Buzzard *Bubo bubo*, Barn Owl *Strix uralensis*, White-backed Woodpecker *Dendrocopos leucotos* and Three-toed Woodpecker *Picoides tridactylus*

Exclusion

White-tailed eagle *Haliaeetus albicilla*

The sea eagle is a large soaring bird with a particularly high risk of mortality in collisions with WPP²⁵³, and is therefore considered to be a WPP-excluding species for the purposes of this Opinion. The results of the sea eagle observations are described in the expert opinion.

Overall, based on long-term, methodology-based observations, the occurrence of the White-tailed Eagle in the study area is assessed as occasional. There are no distinct concentrations of observations that would warrant the designation of areas where it is recommended that NPSs should not be located. In the expert's opinion, the threat to the population of sea eagles from the proposed wind farm is low.

Golden Eagle *Aquila chrysaetos*

The golden eagle is a large soaring bird with a particularly high risk of mortality in collisions with WPP²⁵⁴, and is therefore considered to be a WPP-excluding species for the purposes of this Opinion.

An artificial nest platform has been installed Limited access information In 2016, an artificial nest platform was installed Limited access information. In 2022, there were indications that the nest may have been visited without specifying the species. However, the suite of features was not considered sufficient and there were no clear indications of the species, so the platform was not designated as a conservation area in 2022 as practised by LVM. On 26 May 2023, the nest was surveyed and signs that the platform was inhabited by golden eagles were observed and "appropriate protection" was established.

According to additional information provided by U. Bergmanis (attached in Annex 4). from published information sources on golden eagle nesting biology it can be concluded that in Latvia one pair of golden eagles alternately nests in several nests²⁵⁵, the distance between nests of one pair can reach up to ~18 km (unpublished information by U. Bergmanis). In Latvia, golden eagles nest in the vicinity of medium to large raised bogs - on forest islands in bogs or in the forest belt adjacent to the bog, in all cases the bog adjacent to the golden eagle nests is clearly visible²⁵⁶.

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²⁵³ Langston, Pullan 2003, Smallwood, Thelander 2008, Rydell et.al. 2017, LAG VSW 2014, Morkūnė et. al. 2020

²⁵⁴ Langston, Pullan 2003, Smallwood, Thelander 2008, Rydell et.al. 2017, LAG VSW 2014, Morkūnė et. al. 2020

²⁵⁵ BERGMANIS, U. 2000: Return of the golden eagle *Aquila chrysaetos* to Teiči Marsh. *Birds in nature* 10.4: 6-11

²⁵⁶ BERGMANIS, U., KŪZE, J. 2023. Distribution, Population Dynamics, Ecology, and Protection of the Golden Eagle in Latvia. *THE GOLDEN EAGLE AROUND THE WORLD* (submitted and accepted for publication)

***Figure contains limited access
information***

Figure 7.6.1. *Golden Eagle nesting area of 3 km around Pukši Bog*

In the literature discussing the impact of WPP on golden eagles and the recommended minimum distances of WPP from golden eagle nests²⁵⁷), a radius of 3 km is considered to be a compromise between the threat to the species and the operation of the WPP. However, these sources are based on data that is at least 5-10 years old, when turbines were lower and WPP containment chamber systems had not yet been developed. In testing the effectiveness of camera systems (e.g. McClure et. al. 2021), they have been found to significantly reduce actual collisions of golden eagles with WPP, a conclusion based on the number of birds found dead, which is an indirect indicator of the number of collisions. At the same time, in 2005 (in wind farms with 660 kW turbines), researchers found golden eagles avoiding wind farms²⁵⁸

It is recommended not to install WPPs within a 3 km radius around the platform (Figure 7.6.2, red circle).

²⁵⁷ Rydell J., et.al. 2017. The effects of wind power on birds and bats. Swedish Environmental Protection Agency, Sweden.

²⁵⁸ Walker et. el. 2005 Resident Golden Eagle ranging behaviour before and after construction of a windfarm in Argyll. Scottish Birds. 25. 24-40.

**Figure contains limited access
information**

Figure 7.6.2. *Observations of golden eagles in the study area*

Lesser Spotted Eagle *Clanga pomarina*

The Lesser Spotted Eagle is a large soaring bird with a particularly high risk of mortality in collisions with WPP²⁵⁹, and is therefore considered to be a WPP-excluding species for the purposes of this Opinion.

Since 1 January 2020, 23 records of Lesser Spotted Eagles have been recorded in the study area, 18 of them in the open landscape zone between the N part of the study area and Valka town (Figure 7.6.3). However, there are examples from Estonia where the WPP and the Lesser Spotted Eagle coexist well and successfully²⁶⁰.

²⁵⁹ Bergmanis U. 2019. Lesser Spotted Eagle *Clanga pomarina* conservation plan in Latvia. Latvian Fund for Nature, Riga.

²⁶⁰ <https://www.utilitas.ee/en/together-with-nature-a-lesser-spotted-eagle-whose-habitat-is-near-saarde-wind-farm-got-into-trouble-in-ukraine/>

Figure contains limited access information

Figure 7.6.3. *Lesser Spotted Eagle sightings in the study area WPP classified according to the recommendations for the conservation of the Golden Eagle*

The bird expert concludes that the proposed wind farm only threatens the population of Lesser Spotted Eagles in the N part of the study area. In the rest of the study area, due to the considerable amount of surveys, there are few records of Lesser Spotted Eagles and it can be assumed that the threat here is already comparable to that of any other anthropogenic factor.

In order to reduce the threat of the wind park to the nesting pair of Lesser Spotted Eagles found by the author, the author recommends to abandon the three WPPs closer to the forest edge - 92, 67, and 66. 49.

Mednis *Tetrao urogallus*

The woodcock is a species of passerine bird considered to be critically sensitive to disturbance from WPP and is considered to be excluded from the installation of WPP for the purposes of this opinion. The 2004 Species Conservation Plan²⁶¹ does not mention this factor, and there are no subsequent national publications on the impact of WPP on capercaillie in Latvia.

Given the ecology and breeding system of the capercaillie, rookeries are considered to be the core of the population and their conservation should be the main focus of conservation efforts²⁶². If the protection of the rookeries is assured, the population can tolerate even relatively intense anthropogenic disturbance outside the rookeries²⁶³. This has even been demonstrated in the study area, where both relatively intensive logging and at least 8 rookeries can coexist.

²⁶¹ Hofmanis H., Strazds M., 2004. Conservation plan for the capercaillie *Tetrao urogallus* L. in Latvia.

²⁶² Hofmanis H., Strazds M., 2004. Conservation plan for the capercaillie *Tetrao urogallus* L. in Latvia.

²⁶³ Rydell J., et.al. 2017. The effects of wind power on birds and bats. Swedish Environmental Protection Agency, Sweden.

All breeding sites in the study area were known already in 2022, except for breeding site 1, which was found by the bird expert at the beginning of 2023. At the beginning of 2023, the location of the WPP was adjusted in accordance with the bird expert's recommendations to relocate the WPP outside of the honeybee micro-reserves and the 1 km protection zones around the known LVM rookeries. The final expert opinion recommends further adjustments to the location of the WPP by creating a WPP-free zone to protect Sink 1 (Figure 7.6.4), which was found in 2023, and recommending the suspension of the 62. planning of the WPP until the potential sink identified in the vicinity of the WPP is located.

Figure contains limited access information

Figure 7.6.4. *LVM's observations of black grouse collected during the monitoring of black grouse*

In Estonia²⁶⁴, telemetry data show that roosters move within 1-3 kilometres around the roost during the year, while hens move within 1.5-7 kilometres. Latvia²⁶⁵ Two roosters equipped with satellite transmitters moved as far as 4-5 kilometres in a forest massif during a 9-month experimental study. These studies actually explain the dispersal of all other recorded signs of the presence of hounds in the study area, beyond the rut. As the network of known and potential breeding sites in the study area is so dense, the bird expert believes that it is possible to observe the woodcock anywhere within the study area. It should be stressed that not every sighting of a hart, even far from a rut, immediately means a rut, but at the same time, the possibility that there is another, unknown rut in the array, in addition to the indicated possible roosts, cannot be completely ruled out. However, at the current survey intensity, this possibility is already rather remote.

²⁶⁴ Kalamees A., Ojaste I., Pass E., Oja R., Sellis U. 2017. Tetrao urogallus in Estonia. Estonian Ornithological Society, University of Tartu.

²⁶⁵ Ozoliņš J. (leader) 2019. Investigation of environmental factors important for the conservation of the capercaillie. Final report. Latvian State Forest Research Institute "Silava", Salaspils.

As researchers in Sweden point out²⁶⁶, in the case of the capercaillie, in addition to maintaining a WPP-free zone around the roost, it is also important to ensure that the roost and the surrounding woodland habitat are managed appropriately. In the case of the study area, the forest stands are managed by JSC Latvijas Valsts meži. The company manages and monitors the rookeries. Due to the increased risk of anthropogenic disturbance when a wind farm is developed in a forest massif, the author recommends that, in cooperation with the forest manager, increased attention should be paid to the management of nesting sites. It should be carried out regularly, as a matter of priority, in accordance with guidelines developed by the operator and possibly financed as a mitigation measure from the wind farm construction and lifetime monitoring budget.

In communication with LVM game specialists, there was also an opinion about the inflexibility of the current legislation regulating the protection and management of game nests. The bureaucratic process is identified as being disproportionately complex in order to allow conservation and management measures to flexibly follow the actual situation on the ground. As described in the last description of a possible rut, this and possibly other rutting centres, contrary to the prevailing stereotype, actually tend to move much shorter distances and times in nature than the default assumption. One of the main reasons for this situation is probably intensive logging, but it would be objectively more rational to react at the legislative level to the actual situation, appreciating LVM's efforts to protect the species and simplifying the regulation of nest protection and management, rather than to oppose intensive logging on its merits in a situation where it is already taking place and the nest centres have actually already moved.

As identified during the site investigation, the study area is subject to significant disturbance from motorcyclists riding on off-road tracks, mostly on light, dry, easy to pass. Unfortunately, these forests mostly coincide with forests that are very suitable for hunting. The bird expert considers that a solution to limit this disturbance should be found in order to reduce the cumulative anthropogenic pressure on the population in the study area.

Black Stork *Ciconia nigra*

The Black Stork is a large passerine bird assessed as being at high risk of mortality in collisions with WPP²⁶⁷ or medium risk (a voluntary Europe-wide data collection on bird collisions with WPP, regularly updated, lists only 10 known cases of Black Stork mortality²⁶⁸. In the Bird Expert Opinion, the Black Stork was considered to be a species that would be excluded from the installation of WPP due to its avoidance behaviour.

8 records of Black Storks have been recorded in the study area since 1 January 2020 (Figure 7.6.5).

In accordance with current practice in Latvia and guidance in the literature, a WPP -free zone should be planned within a radius of 3 kilometres around the nest. The 3 kilometre zone also represents a compromise between the 2 kilometres used in Lithuania²⁶⁹ and the 4.8 kilometres used in Estonia, with the Estonian authors criticising their Lithuanian counterparts for using a distance that is not based on data and that is too small for the expected NPS impact. Some

²⁶⁶ Rydell J., et.al. 2017. The effects of wind power on birds and bats. Swedish Environmental Protection Agency, Sweden

²⁶⁷ Morkūnė R., Marčiukaitis, M., Jurkin, V., Gecevičius, G., Morkūnas, J., Raudonikis, L., et al. 2020. Wind energy development and wildlife conservation in Lithuania: A mapping tool for conflict assessment.

²⁶⁸ Dürr T.2023. Bird fatalities at wind turbines in Europe. 09.August 2023.

²⁶⁹ Morkūnė R., Marčiukaitis, M., Jurkin, V., Gecevičius, G., Morkūnas, J., Raudonikis, L., et al. 2020. Wind energy development and wildlife conservation in Lithuania: A mapping tool for conflict assessment.

literature sources and expert opinions allow even smaller WPP-free zones around nests, but the bird expert recommends the most conservative distance used so far in Latvia.

According to an additional assessment and cumulative assessment by M. Strazda (attached as Annex 6), black storks are potentially much less at risk of being injured at the generator than other soaring large birds - white storks (which are much heavier, poorer fliers) and birds of prey, in particular vultures, sea eagles, kites and coots, to a lesser extent kittiwakes and other eagles. The reason is that storks only fly in the air, not move around, looking down for prey and not seeing/watching what is in front of them. Most of the stork's flights take place during the day, when the wind turbines are clearly visible.

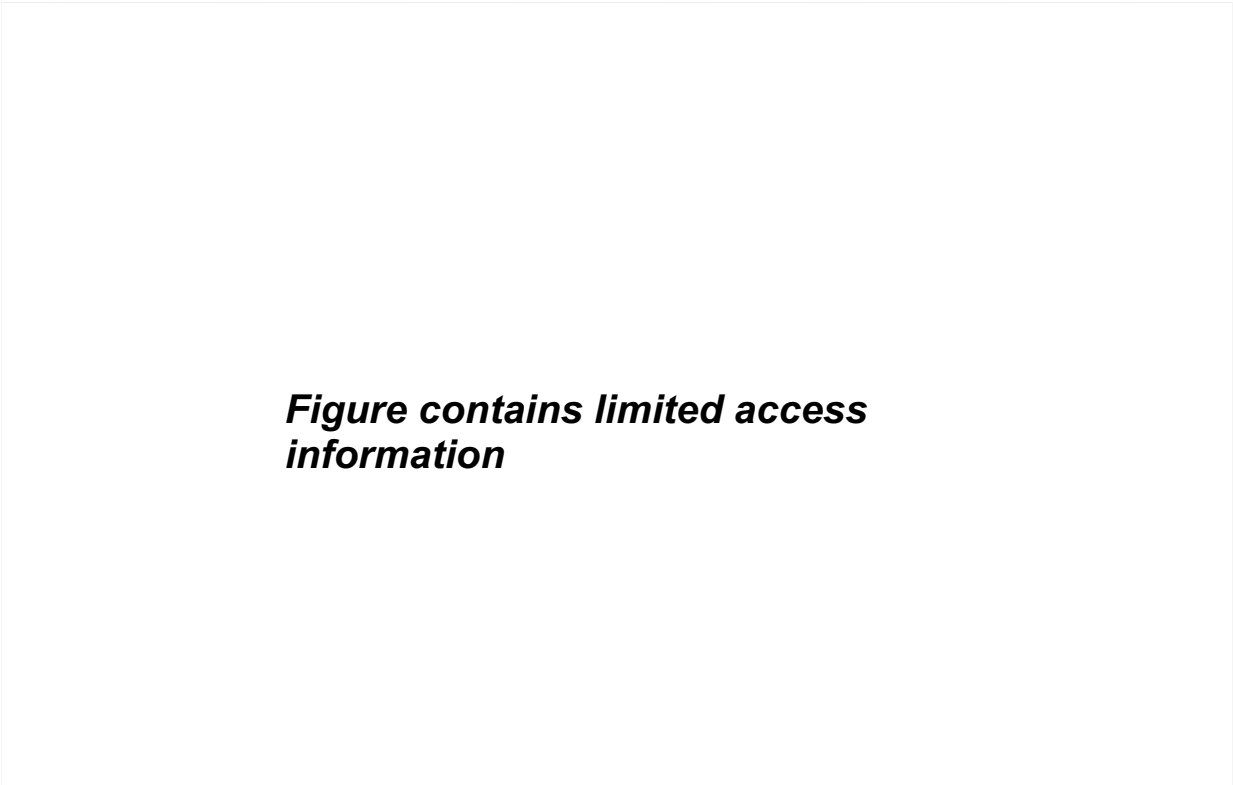


Figure 7.6.5. Observations of Black Storks in the study area

Overall, taking into account the observations, their nature and historical information on nests in the study area, bird expert E. Dzenis estimates that 2-3 pairs of Black Storks nest in the study area in the long term. All currently proposed WPP are located outside the 3 km zones around known recently occupied nests, and outside the 1 km zones around the most likely Black Stork feeding sites in the SW and SE parts of the study area.

According to M. Strazds' opinion on Black Storks, 3-4 pairs of Black Storks have nested in the territory of WPP Park in the study area of the Proposed Action. Knowing that the stork population in Latvia has been declining, 1-2 pairs could live here at present. of which one permanently occupied nest is known for certain

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If a nest can be found in this area, then this nesting site qualifies as a long-term area of conservation importance, where wind turbines should be avoided (~3 km) in the area between the nest and the main feeding grounds. As in undisturbed

nesting areas the displacements between nests do not exceed 100 m²⁷⁰, the location of the

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A 100 m wide zone should be maintained along the tributaries of the Sedas and the Gauja rivers Purgaili, Stakļupīte and Kokšu. When planning the location of turbines, a clear corridor as wide as possible should also be left from ***Limited access information*** (towards the old rivers of the Gauja), but a turbine-free zone of at least 500 m should definitely be maintained along the old rivers of the Gauja²⁷¹.

Small forest streams can also be considered as likely feeding sites for Black Stork, and a 1 km buffer zone has been constructed around these streams, where the author recommends against the installation of WPP (Figure 7.6.6).

Figure contains limited access information

Figure 7.6.6. *Constructed proposed 1 km WPP-free zone in the vicinity of Purgaili - Stakļupīte*

Hen hawk *Accipiter gentilis*

The hen hawk is a large nesting bird of prey in forests, for which micro-reserves are established to protect nesting sites (Cabinet Regulation No 940). For this reason, the chicken hawk is considered to be a species that would be excluded from the installation of WPP for the purposes of this opinion.

²⁷⁰ Strazds, M. 2011a. Conservation Ecology of the Black Stork in Latvia. Dissertation. Faculty of Biology, University of Latvia, Riga.

²⁷¹ According to the current location of the landfills, all the old rivers of the Gauja are located further than 500 m from them. The width of this required buffer zone is only mentioned in case of a change of layout.

The literature on the effects of WPP on the goshawk is scarce²⁷². It is widely believed that the ferruginous hawk is rarely the victim of collisions with WPP. 18 known mortalities²⁷³, but on a much smaller scale than for other raptor and passerine species.

Figure contains limited access information

Figure 7.6.7. Hen Hawk nests and observations in the study area

WPP - 52, 69 and 71. The bird expert recommends not installing WPP as a precaution.

Osprey *Pandion haliaetus*

The osprey is a specially protected species of birds of prey that breeds in large nests in forests (Annex 1 or 2 to Cabinet Regulation No 396), and micro-reserves are established to protect its breeding sites (Cabinet Regulation No 940). For these reasons, the osprey is considered to be an excluded species for the purposes of this opinion.

The literature²⁷⁴ recommends a WPP -free zone of 1 km around osprey nests. It is also noted that the species does not exhibit obvious avoidance behaviour of WPP, while within a 5 km radius around the nest it is recommended to maintain 1 km wide WPP -free corridors between the nest and the main feeding areas.

The bird expert recommends 54. WPP installation in connection with a plausible but so far undiscovered nest.

²⁷² Wang et. al. 2015, Rydell et.al. 2017, LAG VSW 2014, Morkünè et. al. 2020, u.c.

²⁷³ Dürr T.2023. Bird fatalities at windturbines in Europe. 09.August 2023.

²⁷⁴ Rydell et.al. 2017, LAG VSW 2014, Morkünè et. al. 2020

Figure contains limited access information

Figure 7.6.8. *Osprey nests and observations in the study area*

Risk of collisions

The risk of collisions is mainly a threat to the soaring bird species group. The essence of the threat is the failure of these birds to avoid the rotor blades of the WPP as they turn - for reasons the birds cannot understand, they are unable to predict and avoid them. Although the blades seem to turn slowly (depending on the manufacturer and design), a single blade, operating at the rated power of the WPP, makes a full revolution in a widely variable time interval (depending on the model and wind speed), but these are seconds, so the tip linear speed of a 100 m long wing can be as high as 300 km/h. The sweptarea of the 200 m diameter rotor is 3.14 ha. Birds crossing this broad plane of rotation may be unaware that it is a space periodically crossed at high speed by the now distant wing, so they mostly do not actively try to avoid it, nor can they do so when the wing is already in imminent collision distance. This often results in a fatal collision.

A number of the originally planned WPPs are located in very high collision risk areas close to the nests of large species of specially protected soaring birds. A species-by-species analysis recommends phasing them out. Some WPP have been recommended to be abandoned in order to reduce the impact of other impact components, but this has undoubtedly also reduced the risk of collisions of raptor species with WPP in the proposed wind farm.

Noise pollution

Priority protected areas for a range of protected owl species have been modelled within the planned wind farm area²⁷⁵. Some of the Priority Areas identified in the Conservation Plan for the Barn Owl *Glaucidium passerinum*, the Short-eared Owl *Aegolius funereus*, the Barn Owl

²⁷⁵ Avotiņš jun. A. 2019. Conservation plan for the Barn Owl *Glaucidium passerinum*, the Short-eared Owl *Aegolius funereus*, the Barn Owl *Strix aluco*, the Barn Owl *Strix uralensis*, the Long-eared Owl *Asio otus* and the Barn Owl *Bubo bubo*. Latvijas Ornitoloģijas biedrība, Rīga.

Strix aluco, the Barn Owl *Strix uralensis*, the Long-eared Owl *Asio otus* and the Barn Owl *Bubo bubo* also contain these owl species and the plan for these areas recommends that the additional noise pollution from the WPP be limited.

Given that scientific studies on the effects of noise from WPP on barn owls (*Strix uralensis*) are controversial, in many countries (Finland, Poland, etc.) have no restrictions on noise impact and the approved Owl Conservation Plan states that "...noise pollution levels should be below 35 dB anywhere within the micro-reserve (including the boundary) for the frequency range 0.1 to 20 kHz", pre-construction monitoring of this species should be undertaken to assess the potential noise disturbance from WPPs. This includes studying the behaviour of the birds and adjusting the operation of the WPP according to the observed data.

The published study *Anthropogenic Noise Effects on the Hunting Ability of Owls*²⁷⁶ provides information on the ability of owls to identify prey in the presence of increased noise pollution (Figure 7.6.9).

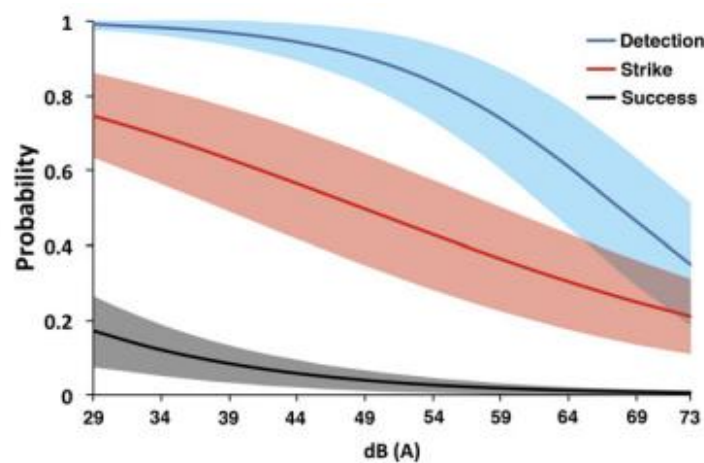


Figure 7.6.9. The graph shows the owl's ability to detect, attack and successfully capture a mouse at different noise levels (dB(A)). The graph shows three different factors influencing owl hunting: detection (blue curve), attack (red curve) and successful capture (grey curve).

35-40 dB range:

- Detection (blue curve): At noise levels between 35 and 40 dB, the owl's ability to detect prey is quite high, around 0.7 to 0.8. This suggests that this level of noise, which is similar to natural forest noises such as wind, does not significantly interfere with the owl's ability to hear its prey.
- Attack (red curve): The owl's ability to launch an attack at a noise level of 35-40 dB is slightly lower, around 0.5 to 0.7. This means that, although prey is identified, launching an attack in noise is somewhat more difficult.
- Success (grey curve): The probability of successfully capturing prey at this noise level is approximately 0.3 to 0.4, indicating that a noise level of 35-40 dB has a moderate effect on the overall hunting efficiency of the owl.

So, from the results of this study, it can be concluded that when noise levels reach 35-40 dB, which is typical for natural forest noises such as wind, the owl's ability to detect prey and launch an attack is still high, although overall hunting success is slightly reduced due to noise.

²⁷⁶ Mason, J. T., McClure, C. J. W., & Barber, J. R. (2016). Anthropogenic noise impairs owl hunting behavior. *Biological Conservation*, 199, 29-38. <https://doi.org/10.1016/j.biocon.2016.04.009>

This level of noise therefore creates some obstacles, but does not significantly prevent owls from hunting effectively.

Taking into account the Latvian Owl Conservation Plan, where the noise threshold is set at 35 dB, and based on various studies on natural noise in forest environments, where 30-40 dB is considered typical background noise, it can be concluded that a level of 40 dB, which corresponds to natural conditions, is unlikely to be harmful to owls. It can therefore be assumed that noise levels up to 40 dB will not have a significant impact on the owls' lifestyle and hunting efficiency. If it is possible to operate WPP in this range at night, this does not affect the ability of owls to hunt.

There are other studies^{277, 278} which show that owls are highly adaptable predators that have survived and hunted even in noisy environments. Although noise levels above 40-50 dB can affect their hunting efficiency, natural background noises such as wind, rain and tree whistling do not usually exceed this threshold very often, so owls have learned to cope with short-term noises that can make hunting difficult.

Visual disturbance

The negative effects of visual disturbance from WPP are the most difficult to assess objectively. For the bird expert, the problem is the "fact" of the WPP itself, and whether its rotor blades are turning or not is of secondary importance. It is not possible to objectively and directly ascertain the birds' "opinion" on the visual changes in the landscape when structures comparable to the height of a television tower appear. This can only be analysed indirectly by looking at changes in bird presence. In addition, the risk of physical collisions and the additional noise pollution generated make it impossible to separate the visual change component from the overall impact of the WPP. In recommending adjustments to the location of WPP, the author took into account the available recommendations of other researchers, which are mostly based on judgements about the overall effect of WPP location on bird distribution. The barrier effect of a continuous "wall" of installed WPPs is analysed in the section above. The result of the considerations is a recommendation to abandon a number of WPP, creating broad corridors within the previously visually continuous "walls" of the WPP, which cross both the usual spring and autumn bird migration routes towards the NE-SW, as well as the low flyway in the vicinity of Luksti meadows. Maintain a fairly dense group of WPP in Part D of the planned wind farm, an area where large areas of habitat are concentrated with little suitable nesting habitat for specially protected bird species. This solution was chosen as a compromise to avoid installing WPPs in other, ornithologically more valuable areas of the territory. To reduce this nuisance component even further, the alternative would be not to install the WPP, as there is no other way to reduce its visual impact.

²⁷⁷ Rheindt, F. E. (2003) – "The impact of roads on birds: Does song frequency play a role in determining susceptibility to noise pollution?"

This study looks at background noise levels in forests and how different environmental noises, including wind, can affect the audibility and behaviour of birds. It states that winds of 3-5 m/s can produce noise levels of 30-50 dB, which interfere with communication.

Source: *Journal of Applied Ecology*, 40(5), 744-753. <https://doi.org/10.1046/j.1365-2664.2003.00856.x>

²⁷⁸ Deichmann, J. L., et al. (2017) – "Sensitivity of tropical bats to anthropogenic noise"

This study looks at natural background noise levels in forests and explains how wind can generate noise levels of 30-50 dB by interacting with plants and habitat elements.

Source: *Biological Conservation*, 207, 9-15. <https://doi.org/10.1016/j.biocon.2017.05.012>

Barrier effect

Most of the descriptive literature on the effects of WPPs on birds²⁷⁹ refers to the "barrier effect" of a row of adjacent WPPs perpendicular to the direction of flight of birds in the case of wind farms. This gives birds the impression of a "wall", which they mostly fly around rather than over. As this manoeuvre inevitably increases energy consumption and can even change migration routes, this consideration must be taken into account when planning the location of wind farms.

In the study area, during both spring and autumn migration periods, the main direction of migration across the territory, as elsewhere in Latvia, is NE-SW. This is the main direction perpendicular to which continuous rows of WPPs should be avoided, creating a "barrier effect". Looking at the remaining WPP configuration, a dense group of WPP can be seen in the NE-SW direction in its SW part, with the widest part at 16-82. on the WPP line, forming a 5 km wide "barrier". Consequently, 2 NW-SE direction lines are formed in the N part of the park - between 7. and 63. WPP (3 km), and between 51 and 70. WPP (3,2 km).

Further assessment of EIA location alternatives

In assessing the impact of the Proposed Action on bird species, the updated WPP layout has been analysed, based on discussions between the bird expert, the Proposed Action proponent and other stakeholders.

The additional assessment adds to the expert opinion, see Annex 6, only those NPSs that were not recommended in the original version of the opinion are analysed in detail. A summary of the assessment of the individual WPPs is given in Table 7.6.4. The location of the wind farm is analysed, focusing on the differences in its location, comparing the initial version of the location of the wind farm, and comparing the two location alternatives "A" and "B".

Table 7.6.4. Additional assessments by the bird expert on individual WPP

Name of the WPP site	Addenda to the opinion of the bird expert (E. Dzeņa)
VV1	One of the two scenarios VV1, VV82/VV42 , VV36 should be chosen, the expert recommends to abandon VV1 and VV82, unless there are some technological reasons that it would be better to abandon VV42 and VV36. Monitoring should be carried out before construction and then a decision made
VV28	Location to be clarified later as it is too close to the planned micro-reserve for the apodice, currently the location is maintained
VV36	choose one of the two scenarios VV1, VV82/VV42 , VV36
VV42	choose one of the two scenarios VV1, VV82/VV42 , VV36
VV44	Potential impact on golden eagle - not recommended
VV45	Potential impact on golden eagle - not recommended
VV49	Further information should be awaited following investigations in adjacent areas. Implementation of WPP may be affected by the establishment of a micro-reserve for the Lesser Spotted Eagle
VV50	Further information should be awaited following investigations in adjacent areas. Implementation of WPP may be affected by the establishment of a micro-reserve for the Lesser Spotted Eagle

²⁷⁹ Rydell et.al. 2017, LAG VSW 2014, Morkūnē et. al. 2020

VV51	Further information should be awaited following investigations in adjacent areas. Implementation of WPP may be affected by the establishment of a micro-reserve for the Lesser Spotted Eagle
VV61	This turbine is recommended instead of the VV62
VV62	Effects on the grouse nest - not recommended
VV64	Further information should be awaited following investigations in adjacent areas. Implementation of WPP may be affected by the establishment of a micro-reserve for the Lesser Spotted Eagle
VV66	Further information should be awaited following investigations in adjacent areas. Implementation of WPP may be affected by the establishment of a micro-reserve for the Lesser Spotted Eagle
VV67	Further information should be awaited following investigations in adjacent areas. Implementation of WPP may be affected by the establishment of a micro-reserve for the Lesser Spotted Eagle
VV82	choose one of the two scenarios VV1, VV82/VV42 , VV36
VV92	Located in the Black Stork Conservation Area - 300 m of the River Seda - not recommended

When assessing the impact of location alternatives A and B on ornithological values in the area of the proposed wind farm, the two alternatives do not differ significantly.

The part of Alternative B ZA, which is the divergent part between Alternatives A and B, is located in poor habitats, in a region that is not crossed by regular local migratory flights of migratory species, and is located in the sequentially dominant direction of spring and autumn migrations of birds, the difference between the predicted impacts on ornithofauna of the two proposed alternatives is expected to be similar - the WPP group of Alternative B ZA does not pose significant additional risks. From the point of view of the potential threat to ornithofauna, the two proposed siting alternatives are similar.

7.6.3. Measures to mitigate impacts on birds

Of the 84 WPP originally planned and assessed in the EIA, the bird expert recommends 38 WPP sites be rejected for various reasons. For all other WPP sites, a number of operational restrictions are recommended, including. A number of restrictions, including the installation of camera systems to stop the WPPs, stopping the WPPs around sunrise and sunset, and adjusting the operation of the WPPs for the additional noise pollution they cause.

Proposed restrictions on the operation of WPP

It is recommended that all WPPs install shutdown camera systems, and from 1 April to 1 October, it is recommended that all WPPs shut down one hour before to one hour after local sunrise and sunset. The recommendation to suspend WPP for both soaring birds (1 April to 1 October) and flocking migrants (15 February to 15 May and 1 September to 15 November) is valid unless the effectiveness of the suspension systems can be demonstrated to be unabated during these periods.

WPP suspension chamber systems

Creating WPP-free zones around the nests of soaring birds eliminates the highest collision risks. The use of WPP stop camera systems is recommended to address collision risks outside the highest risk areas, which in the expert's view are already so low that there is no need to abandon the installation of WPP altogether. Given the distribution of soaring birds in and

around the planned wind farm, it is recommended that systems are installed for all WPP to be installed.

Stopping WPP around sunrise and sunset

All WPP stop camera systems, without exception, are likely to be less effective in low visibility conditions. As visibility deteriorates, the amount of light contrast available to camera systems decreases, making it impossible to analyse visual information as well as in good light. As Black Storks, and other large soaring birds, tend to fly to their feeding grounds before sunrise and return to their nests after sunset during the breeding season - mostly in low visibility conditions - it is necessary to address the threat posed by WPP to these birds at a time when the effectiveness of WPP camera systems is reduced. If a solution cannot be found in cooperation with the system manufacturer to eliminate the threat to raptors from the reduced camera efficiency before sunrise and after sunset, the WPP should be shut down completely during periods of reduced system efficiency. The expert recommends that all planned WPPs should be completely shut down one hour before to one hour after local sunrise and sunset during the entire Black Stork season, from 1 April to 1 October. The hour after sunrise and the hour before sunset also include the more frequent periods of fog, low clouds and similar meteorological conditions causing reduced visibility. This period also includes a time when the Sun is low on the horizon and the shadows cast by the WPP will be particularly long, and their motion as the WPP rotates may have a markedly disturbing effect over long distances. The disruptive effect will be significantly less if the WPP does not turn. However, if the manufacturers of the WPP suspension camera systems can offer a solution to compensate for the reduced efficiency of the system before sunrise and after sunset, or if there are definable weather parameters (amount of ambient light, meteorological visibility, etc.), for example, at which the efficiency of the system is not reduced, these solutions can be evaluated and the operation of the WPP is possible if the above risks are eliminated. The definition of meteorological threshold parameters would allow the definition of parameters at which the operation of the WPP is also possible during the critical period before sunrise and after sunset, assuming that the efficiency of the shutdown system is not reduced. To our knowledge, the use of infrared and/or thermosensitive technologies, which have not been used so far, is also seen as a possible future solution to compensate for the reduced efficiency of camera systems in conditions of reduced visibility.

Deforestation

Restrictions on deforestation necessary for the siting of WPP infrastructure. By default, WPPs and the infrastructure they require at local level are concentrated in areas with the lowest possible ornithological value, both initially and - increasingly - with each adjustment of the WPP location. As already indicated, clearings and young stands are the least ornithologically valuable, with the value of stands increasing with their age. The area of the planned wind park is home to several specially protected bird species for which clearings and young stands are important for breeding, but these are considered to be temporary habitats in intensively managed forest stands, and there is no reason to make special efforts to protect the species that inhabit these habitats. Even taking into account the presence of protected species, clearings and coppices, as temporary, highly dynamic and at the same time widespread habitats, are the best places to install WPP in the forest massif, of course taking into account a range of other, more global, factors.

Table 7.6.5. Bird species found in the 3 km zone around the assessed WPP and proposed mitigation measures

No.	Species in Latvian/ Species in Latin	Suggested mitigation measures applicable to the species
1	the octopus <i>Glaucidium passerinum</i>	Adjustments to the siting of WPPs, restrictions on additional noise pollution, restrictions on logging and disturbance, creation of micro-reserves, restrictions on the design and construction of WPP infrastructure
2	Great Egret <i>Ardea alba</i>	WPP position adjustments, WPP suspension camera systems and WPP suspension around sunrise/sunset
3	White Stork <i>Ciconia ciconia</i>	VES position adjustments, WPP suspension camera systems and WPP suspension around sunrise/sunset
4	White-backed <i>Dendrocopos leucotos</i>	Adjustments to WPP siting, restrictions on logging and design and construction of infrastructure, restrictions on disturbance
5	Bare-tailed hawk <i>Aegolius funereus</i>	Adjustments to the siting of WPPs, restrictions on additional noise pollution, restrictions on logging and disturbance, restrictions on the design and construction of WPP infrastructure
6	Brown Chiffchaff <i>Lanius collurio</i>	restrictions on logging and disturbance, restrictions on the design and construction of WPP infrastructure
7	Yellow Plover <i>Pluvialis apricaria</i>	Adjustments to the siting of WPPs, restrictions on additional noise pollution, restrictions on logging and disturbance, restrictions on the design and construction of WPP infrastructure
8	Crane <i>Grus grus</i>	WPP siting adjustments, WPP suspension camera systems and WPP suspension around sunrise/sunset, logging and disturbance restrictions, WPP infrastructure design and construction restrictions
9	gaigala <i>Bucephala clangula</i>	Adjustments to the siting of WPPs, limiting additional noise pollution
10	cut <i>Crex crex</i>	Adjustments to the siting of WPPs, limiting additional noise pollution
11	Sea eagle <i>Haliaeetus albicilla</i>	WPP siting adjustments, WPP suspension camera systems and WPP suspension around sunrise/sunset, logging and disturbance restrictions, WPP infrastructure design and construction restrictions
12	Cormorant <i>Phalacrocorax carbo</i>	WPP position adjustments, WPP suspension camera systems and WPP suspension around sunrise/sunset
13	The Wedge <i>Pernis apivorus</i>	WPP siting adjustments, WPP suspension camera systems and WPP suspension around sunrise/sunset, logging and disturbance restrictions, WPP infrastructure design and construction restrictions
14	golden eagle <i>Aquila chrysaetos</i>	WPP siting adjustments, WPP suspension camera systems and WPP suspension around sunrise/sunset, logging and disturbance restrictions, WPP infrastructure design and construction restrictions
15	kuitala <i>Numenius arquata</i>	Adjustments to WPP siting, WPP suspension camera systems and WPP shutdown around sunrise/sunset, limiting additional noise pollution, logging and disturbance restrictions, WPP infrastructure design and construction restrictions
16	welcome to <i>Perdix perdix</i>	Adjustments to the siting of WPPs, limiting additional noise pollution
17	rural drizzle <i>Circus cyaneus</i>	WPP position adjustments, WPP suspension camera systems and WPP suspension around sunrise/sunset
18	Peregrine Falcon <i>Falco tinnunculus</i>	WPP position adjustments, WPP shutdown around sunrise/sunset
19	Great Crested Grebe <i>Lanius</i>	Adjustments to the siting of WPPs, limiting additional noise pollution

No.	Species in Latvian/ Species in Latin	Suggested mitigation measures applicable to the species
	<i>excubitor</i>	
20	Great Eider <i>Mergus merganser</i>	WPP position adjustments, WPP shutdown around sunrise/sunset
21	Great Bumblebee <i>Botaurus stellaris</i>	Adjustments to the siting of WPPs, limiting additional noise pollution
22	the great gull <i>Larus ridibundus</i>	WPP position adjustments, WPP shutdown around sunrise/sunset
23	Lesser Spotted Eagle <i>Clanga pomarina</i>	Adjustments to WPP siting, WPP suspension camera systems and WPP suspension around sunrise/sunset, logging and disturbance restrictions, microreserve creation, WPP infrastructure design and construction restrictions
24	Lesser Spotted Flycatcher <i>Ficedula parva</i>	Adjustments to WPP siting, WPP shutdown around sunrise/sunset, limitation of additional noise pollution, restrictions on logging and disturbance, restrictions on design and construction of WPP infrastructure
25	tree <i>Tetrao urogallus</i>	Adjustments to WPP siting, stopping WPP around sunrise/sunset, limiting additional noise pollution, limiting logging and disturbance, promoting roost management, limiting design and construction of WPP infrastructure
26	Black Woodpecker <i>Dryocopus martius</i>	Adjustments to WPP siting, WPP shutdown around sunrise/sunset, limitation of additional noise pollution, restrictions on logging and disturbance, restrictions on design and construction of WPP infrastructure
27	Black Kite <i>Milvus migrans</i>	WPP position adjustments, WPP suspension camera systems and WPP suspension around sunrise/sunset
28	Black Stork <i>Ciconia nigra</i>	Adjustments to WPP siting, WPP suspension camera systems and WPP suspension around sunrise/sunset, logging and disturbance restrictions, microreserve creation, WPP infrastructure design and construction restrictions
29	Wood pigeon <i>Columba oenas</i>	Adjustments to WPP siting, WPP shutdown around sunrise/sunset, limitation of additional noise pollution, restrictions on logging and disturbance, restrictions on design and construction of WPP infrastructure
30	logging <i>Bonasa bonasia</i>	Adjustments to WPP siting, WPP shutdown around sunrise/sunset, limitation of additional noise pollution, restrictions on logging and disturbance, restrictions on design and construction of WPP infrastructure
31	the cane <i>Circus aeruginosus</i>	WPP position adjustments, WPP suspension camera systems and WPP suspension around sunrise/sunset
32	Osprey <i>Porzana porzana</i>	Adjustments to WPP siting, stopping WPPs around sunrise/sunset, limiting additional noise pollution
33	Humpback swan <i>Cygnus olor</i>	WPP position adjustments, WPP suspension camera systems and WPP suspension around sunrise/sunset
34	Grey Woodpecker <i>Picus canus</i>	Adjustments to WPP siting, WPP shutdown around sunrise/sunset, limitation of additional noise pollution, restrictions on logging and disturbance, restrictions on design and construction of WPP infrastructure

No.	Species in Latvian/ Species in Latin	Suggested mitigation measures applicable to the species
35	Meadow Pipit <i>Tringa totanus</i>	Adjustments to WPP siting, stopping WPPs around sunrise/sunset, limiting additional noise pollution
36	bean <i>Upupa epops</i>	Adjustments to WPP siting, stopping WPPs around sunrise/sunset, limiting additional noise pollution, limiting logging and disturbance
37	barn owl <i>Asio flammeus</i>	WPP siting adjustments, WPP suspension camera systems, WPP suspension around sunrise/sunset, additional noise pollution limitations, logging and disturbance limitations
38	Marsh Tern <i>Tringa glareola</i>	Adjustments to WPP siting, stopping WPPs around sunrise/sunset, limiting additional noise pollution, restrictions on design and construction of WPP infrastructure
39	grouse <i>Lyrurus tetrix</i>	Adjustments to WPP siting, WPP shutdown around sunrise/sunset, limitation of additional noise pollution, restrictions on logging and disturbance, restrictions on design and construction of WPP infrastructure
40	Seivi kauķis <i>Locustella luscinioides</i>	No impact from WPPs expected
41	Sila Chirulis <i>Lullula arborea</i>	restrictions on logging and disturbance, restrictions on the design and construction of WPP infrastructure
42	Somzīlīte <i>Remiz pendulinus</i>	No impact from WPPs expected
43	stepes čipste <i>Anthus campestris</i>	restrictions on logging and disturbance, restrictions on the design and construction of WPP infrastructure
44	Striped Warbler <i>Sylvia nisoria</i>	restrictions on logging and disturbance, restrictions on the design and construction of WPP infrastructure
45	tītiņš <i>Jynx torquilla</i>	Adjustments to WPP siting, WPP shutdown around sunrise/sunset, limitation of additional noise pollution, restrictions on logging and disturbance, restrictions on design and construction of WPP infrastructure
46	Three-toed Woodpecker <i>Picoides tridactylus</i>	Adjustments to WPP siting, stopping WPP around sunrise/sunset, limiting additional noise pollution, creating micro-reserves, restrictions on logging and disturbance, restrictions on design and construction of WPP infrastructure
47	River tern <i>Sterna hirundo</i>	WPP position adjustments, WPP shutdown around sunrise/sunset
48	The Barn Owl <i>Strix uralensis</i>	Adjustments to WPP siting, WPP shutdown around sunrise/sunset, limitation of additional noise pollution, restrictions on logging and disturbance, restrictions on design and construction of WPP infrastructure
49	European nightjar <i>Caprimulgus europaeus</i>	Stopping WPPs around sunrise/sunset, limiting additional noise pollution, restrictions on logging and disturbance, restrictions on design and construction of WPP infrastructure
50	Middle spotted woodpecker <i>Leiopicus medius</i>	Adjustments to WPP siting, WPP shutdown around sunrise/sunset, limitation of additional noise pollution, restrictions on logging and disturbance, restrictions on design and construction of WPP infrastructure
51	hen hawk <i>Accipiter gentilis</i>	Adjustments to WPP siting, WPP suspension camera systems and WPP suspension around sunrise/sunset, logging and disturbance restrictions, microreserve creation, WPP infrastructure design and construction restrictions

No.	Species in Latvian/ Species in Latin	Suggested mitigation measures applicable to the species
52	Northern swan <i>Cygnus cygnus</i>	VPP siting adjustments, VPP suspension chamber systems and VPP suspension around sunrise/sunset, VPP infrastructure design and construction constraints
53	Osprey <i>Pandion haliaetus</i>	WPP siting adjustments, WPP suspension camera systems and WPP suspension around sunrise/sunset, logging and disturbance restrictions, WPP infrastructure design and construction restrictions
54	Fish Stingray <i>Alcedo atthis</i>	No impact from WPPs expected
55	goose <i>Anser sp.</i>	WPP position adjustments, WPP suspension camera systems and WPP suspension around sunrise/sunset

Summary of proposed mitigation measures

- VV2, VV3, VV4, VV5, VV6, VV8, VV10, VV11, VV12, VV13, VV14, VV15 are recommended to be dropped from a number of originally planned WPP, VV18, VV19, VV23, VV25, VV27, VV29, VV35, VV43, VV44, VV45, VV52, VV54, VV62, VV69, VV71, VV83, VV87, VV90, VV92, VV93;
- for all remaining WPPs, it is recommended to install WPP stop camera systems;
- it is recommended that all remaining WPP during the Black Stork breeding season be stopped around sunrise and sunset if the effectiveness of the WPP camera systems is reduced at dusk;
- VV26, VV30, VV31, VV33, VV81, VV86 un VV89. It is also recommended to stop WPP around sunrise in spring and autumn if the effectiveness of WPP camera systems is reduced at dusk;
- it is recommended to limit additional noise pollution from the WPP throughout the lifetime of the wind farm in accordance with the results of the pre-construction monitoring (regarding the impact of noise from the WPP on owls);
- deforestation for the wind farm is recommended outside the bird breeding season;
- It is recommended that infrastructure is planned as far as possible outside habitats of importance for birds and constructed outside the bird breeding season;
- It is recommended that wind farm construction processes, which are associated with increased noise and light pollution emissions, should be planned outside the bird nesting season, preferably in the middle of the day;
- it is recommended to limit the intensity of logging in the study area;
- it is recommended to prevent off-road driving in the study area;
- it is recommended to improve the protection regime of the SPAs adjacent to the study area;
- In the context of the planned wind farm, it is recommended to monitor nesting birds and the remains of birds killed by collisions with WPP, based on the methodology used in the original study;
- the need for Natura 2000 monitoring in the adjacent SPAs - "Sedas purva" and "Ziemeļgauja" - has been updated;
- It is recommended to keep the feedback to the mitigation measures of the wind farm, with the possibility to adjust them based on the results of the monitoring.

7.6.4. Effects on bats

The overall bat activity in the study area is considered high compared to 14 other wind farm sites where similar surveys were carried out. The highest bat activity is recorded in July and August - the time when young bats gain flight capacity and start feeding independently, as well as during migration. The Pygmy Bat has only been recorded during migration. Bats have been recorded almost throughout the night, with high activity from the first to the ninth hour after sunset.

The highest risk of bat mortality in the planned wind park area is observed in July-August. In May 2022 and especially in September, the area does not show high bat activity, but it should be noted that during these months migration takes place and activity is strongly influenced by the weather conditions, especially temperature, on certain nights. This means that nights with high bat activity are also possible in May and September.

Bat activity in the study area is high almost throughout the night, so it is not possible to distinguish night-time hours when bat mortality risks are lower, except for the last 2-3 morning hours in late autumn (from 10 pm after sunset in the second half of September, October and November).

Overall, the site is not considered to be exceptionally suitable for bats, but there is significant activity of at least one species, the northern long-eared bat. In the context of wind energy extraction, this species is one of the species at particularly high risk of extinction in our region.

There are a number of important bat foraging sites near water in the vicinity of the proposed wind farm, so it would not be desirable to install turbines where they would block potential bat commuting routes from colonies to foraging sites. In this context, the proposed location of the turbines does not constitute a significant obstacle, as the turbines are more likely to affect the bat roost habitats themselves (for forest-dwelling species) rather than obstructing transit routes.

A growing number of studies and publications²⁸⁰ suggest that bat activity in wind farms may increase significantly after turbines are built, and that bats may appear en masse in places where they were not found during the feasibility study, including in theoretically unsuitable or poorly suitable open agricultural landscapes. Bats are strongly attracted to wind turbines, although the reasons for this have not yet been established²⁸¹. It is therefore imperative to carry out at least two years of monitoring after the turbines are built and the wind farm is operational, see Chapter 12 for bat monitoring.

7.6.5. Measures to mitigate impacts on bats

The establishment of a wind park in the area "Valmiera-Valka" is allowed only under the following restrictions and conditions:

1. During the period from 1 May to 30 September, automatic shutdown or non-start-up of wind turbines shall be provided during the night from sunset to sunrise if:
 - (1) wind speed at turbine rotor height is 6 m/s or less,
 - 2) rainfall does not exceed 1 mm/h,
 - 3) air temperature above 6°C.

²⁸⁰ Solick D., Pham D., Nasman K. & Bay K. 2020. Bat activity rates do not predict bat fatality rates at wind energy facilities. *Acta Chiropterologica*, 22(1): 135–146.

²⁸¹ Rodrigues et al. 2015. Guidelines for Consideration of Bats in Wind Farm Projects - Revision 2014. EUROBATs Publication Series No. 6. Bonn, Germany.

2. Bat monitoring is provided in the first and second years after the wind turbines are operational. The monitoring methodology is developed and implemented by a bat expert certified by the Nature Conservation Agency with experience in processing ultrasound recordings. A description of the monitoring is given in Chapter 12.

Depending on the results of the monitoring, which may or may not confirm increased bat activity and/or mortality at the constructed turbines, the **restrictions on wind turbine operation** after the first and second years of post-construction monitoring **could be revised or lifted altogether, relaxed or tightened**, in particular: the period of restriction on turbine operation could be extended or reduced or the wind speed threshold at which turbine operation is allowed could be changed.

7.6.6. Invertebrates

In order to conserve specially protected species and other important species, the Proposed Action will:

1. WPP (VV7, VV16, VV20, VV22, VV27, VV31, VV32, VV34, VV36, VV38, VV43, VV45, VV46, VV48, VV70, VV82, VV85, VV88, VV91, VV93) and substation (ST1, ST2, ST3, ST4) locations, where adult or new emergence of large stink beetles is detected, all fallen trees, snags, stems should be removed from the development site and relocated to the nearest coppice or woodland, preferably to the nearest coppice or woodland. The insect larvae in the dead wood can then complete their development. They may also be able to continue breeding. Dead wood that does not decompose when moved should be removed.
2. No measures are needed to protect the Humped and Yellow Stump Fly. They will fly to a place that is favourable to them.
3. In the event that the new access road to be constructed passes through a stand of fallen or standing ecological trees, these trees shall be relocated outside the development area.
4. Recommendation throughout the study area, if there has been a forest fire, pine trees that have been burnt but are still alive should be preserved.
5. Recommendation throughout the study area, if the stand to be felled contains pine saplings with black trunks (presence of the fungus *Aurobasidion* sp.), the trees should be moved out of the managed stand.

The main protection measures for SPA species are the removal of dead wood (fallen trees, stumps, snags) from the development area. This gives the larvae in the wood a chance to complete their development. The population sizes of the species found in the area of the proposed activity, the Great Humped Beetle and the Humped Stump-fly, have not been assessed in Latvia. Given the relatively wide distribution of species in the area of the Proposed Action and in Latvia as a whole, the establishment of the WPP Park will not affect the populations of the species.

Preserving burnt forest stands without clearing them is important. Schneider's and striped hooded warbler have not been recorded in the WPP area. It is not possible to judge the impact of the Proposed Action on these species in Latvia as a whole.

7.6.7. Effects on mammals

The construction of the WPP parks (both "Limbaži" and "Valmiera-Valka") will not significantly change the status of specially protected species at national level. Local and wider indirect and cumulative impacts on wild mammals (up to 10 km away from the study area of the Proposed Action) are expected, the consequences and spatial limits of which are currently unknown and unpredictable.

Continuity of green corridors in a transboundary context will not be affected - the construction of the WPP is not planned in the Gauja valley, which is an important corridor for the movement of game, including large carnivores.

The available information suggests that, in terms of spatial and temporal dimensions, it is wild large mammals that will have the most widespread and, from a human perspective, the most difficult to manage impacts. Large mammals have relatively high intelligence and good mobility. Their response and speed of adaptation to a new disturbance is completely unpredictable, as are the resulting impacts on areas outside wind farms and the myriad other species affected. Their future behaviour will be determined by the new element in their environment, and they will actively seek places and times to make up for lost resources, or exploit new resources created by the wind turbines. It should also be borne in mind that today, there is already a high level of conflict of interests, opinions and values in society regarding large mammals. This includes conflict areas such as ungulate damage to forestry and agriculture, predator attacks on domestic animals, otter and mink damage in aquaculture, animal-caused traffic accidents, synanthropisation in cities and human settlements, human fear and safety, epizootics, hunting, food safety and health, so-called animal rights issues, etc. Many of these aspects are also poorly regulated and lack a well-established legal platform for conflict resolution.

7.6.8. Measures to mitigate impacts on mammals

The installation and operation of the WPP is likely to have an impact on wild species in the vicinity, including specially protected species, but it is currently not possible to assess the magnitude and significance of the impact in terms of maintaining a favourable conservation status for these species, and in the case of economically exploited species, changes in the overall population value and the impact on the national economy. The interactions between species in the ecosystem must also be taken into account, as wind turbines can affect one species and indirectly affect others. Moreover, in this context, it is not about the direct destruction of species or habitats, but about the impact on the behaviour of highly organised living organisms - mammals - which determine other biological parameters at the level of individuals and populations²⁸² and which are very limited to manage and manipulate in the wild.

In order to clarify the potential impacts of the WPP parks on wild non-flying mammal communities, the consequences and spatial limits of which are currently unknown and unpredictable, the following measures should be implemented:

- To leave unchanged (and under no circumstances increase) the intensity and seasonal cycle of other existing economic activities in the area of the wind turbine parks and

²⁸² Zorenko T. 2001. Animal behaviour: foundations of ethology, zoopsychology and comparative psychology. Riga, SIA "STRIG", 286 pp.

their immediate surroundings, this applies to the following activities: logging (if not directly related to the installation of turbines), reforestation, all types of stand maintenance, restoration of drainage systems, hunting pressure, game feeding, nature tourism pressure and agriculture on agricultural land adjacent to the forest. This does not apply to fighting forest fires, wind storms and damage caused by forest pests. Actions are needed to avoid cumulative disturbance effects and to separate the potential impacts of wind turbines from the background effects of other economic activities.

- Given that there are no assessments of the impact of wind turbines on non-flying mammals in Latvia based on wildlife studies or monitoring data to date, the expert does not propose mandatory monitoring requirements for a specific wind park. The expert recommends that the controlling national authorities should require the developers of the North Latvian and Estonian border wind farms (Figure 3.2.5) to jointly initiate specialised monitoring of wild mammals in cooperation with the controlling national authorities and scientific institutions. This need is emphasised by all authors of the scientific publications used in the report. The monitoring is carried out in accordance with a monitoring programme developed and agreed with a certified expert.
- In case of negative impacts, provide mitigation measures to protect mammals.

In addition to the measures listed above, it is desirable to preserve the beaver forests, which serve as an important refuge and feeding ground for all mammal species, when constructing the wind farm.

7.7. Landscape and heritage impact assessment

7.7.1. Impact on the landscape

In terms of landscape, the entire study area of the Proposed Action falls within the Gaujaszeme landscape area, which is described in the Latvian Landscape Atlas as woodland and plain, while the landscape impact study area (10 km zone around the maximum possible outer boundary of the wind farm) is also located in the Gaujaszeme part, which is defined as open country and upland, and to some extent in the Northern Vidzeme (woodland/upland)²⁸³.

According to the Landscape Atlas, the entire area of the Proposed Action and most of the landscape study area fall within two areas of undulating forest landscape: Seda forest landscape and Pūpolu - Mežmuiža forest landscape. The forest landscape of Seda is described as "woodland, marshes, dunes, undulations", while the key elements of the Pūpolu-Mežmuiža forest landscape are woodland, dunes, lakes, undulations and marshes. The landscape study area also includes the Seda landscape area and the Strenči landscape area, which belong to the urban landscape, the Seda marsh landscape, the Trikata agrarian mosaic landscape (lowland agrarian mosaic landscape), Ergeme mosaic landscape (hill forest mosaic landscape), Rencēni mosaic landscape (undulating relief agrarian mosaic landscape), Valka landscape and Gauja river landscape from Strenči to the Estonian border.

²⁸³ <https://experience.arcgis.com/experience/32051c63871a47f1a6446a04f8ade1c2/page/Ainavas-kart%C4%93s/?views=Ainavapvidi>

The earlier landscape ecological plan of the NWBR (2007)²⁸⁴, which covers the area adjacent to the foreseeable development area in the north, has a different landscape mapping in the north-west. The Sēda Marsh and the forest (the landscape of the Sēda biocentre) around it is defined as a forest and marsh biocentre space of international importance. Its nuclear area is adjacent to the area of the Proposed Action. This status is defined as the forest massif to the NW of Valka, or Valka Biocentre, which is located further from the study area of the Proposed Action. Both of these biocentres are connected to the Valka-Sēda forest and wetland corridor of international importance. Between these areas lies the Valka undulating plain landscape, described as a landscape space with a predominant landscape type with no special land use requirements. To the E of the Proposed Development study area is the Ēvele Cultural Landscape, which consists of a landscape of cultural, historical and aesthetic value.

The Landscape Impact Assessment is for the potential WPPs to be built, corresponding to the Valmiera-Valka Park site Alternative A with 29 WPPs and site Alternative B with 43 WPPs. For these alternatives for the location of the WPP, an assessment of physical impacts (flicker, landscape impact), a calculation of climate change impacts and a calculation of socio-economic benefits were carried out for the public consultation version of the EIA report. It is envisaged that the EIA report may be updated during the public consultation process for the WPPs that are currently recommended for construction, taking into account the proposals submitted by the public and other institutions and the results of the public consultation. In the updated version of the EIA report, which will be submitted to the NEB for its opinion, the landscape impact assessment will be updated according to the number of proposed WPPs, but it can already be said that the updated results will have a lower potential impact.

Landscape values

The "Treasures of Landscapes" project²⁸⁵ mentions two landscapes in the landscape study area: Sēda town and marsh landscape (no closer than 1 km from the nearest WPP) and Gauja landscape near Strenči (no closer than 3.95 km from the nearest WPP; the boundary of this treasure is not precisely defined in the Landscape Atlas). The impact on the landscape of the town of Sēda is described in more detail in the subsections "Landscape of the town of Sēda" and "Other cultural heritage" below, and the Sēda marsh in the subsection "Landscape of the Sēda marsh". The impacts on the Gauja landscape and the Strenči landscape are described below.

The existing municipal plans identify the following as the most significant landscapes or landscape elements within the study area and/or landscape study area of the Proposed Action:

- The North Gauja valley with its mosaic landscape, with a remarkable diversity of habitats and species, and the entire North Gauja AAP; flood landscapes in the Gauja valley with its old rivers;
- The River Sēda and its floodplain meadows;
- Sēda Bog (moor);
- Jērcēņi parish cultural landscape: around the national road V232 in the direction of Kaņepju oak and Zaļmeži house;

²⁸⁴ <https://www.daba.gov.lv/en/media/6869/download>

²⁸⁵ <https://ainavudargumi.lv/>

- Plantations (groups of trees) around farmsteads, ancient avenues, rubble stone buildings, winding country roads adjacent to the terrain, manor houses in Vijciems parish;
- Seda-Ergeme and Seda landscape protection zones of the North Vidzeme Biosphere Reserve;
- park-like meadows in Valka and Zvārtava parishes (part of the AAA "Ziemeļgauja");
- inland dune massif in the vicinity of Cīrgali (partly included in the Northern Gauja AAC);
- Gauja coastal outcrops (part of the Northern Gauja AAC);
- Landscape of Seda town centre;
- Landscape of Strenči town centre;
- Pukšu swamp (part of the AAC "Ziemeļgauja").

There is no very prominent topography in the study area that would affect the visibility of the turbines. The dominant landscape is woodland, with only a few relatively large areas of open countryside: Lukstu meadows, Laiviņi bog, Lauži bog. Wind turbines will be visible from these open areas, but the presence of cleared areas (clearings, roads, stiges, overhead power lines) will be the most important factor for visibility. The rest of the Landscape Study Area, meanwhile, is much more diverse. The study area for the proposed action covers the Gauja River, the Pukši Swamp, but beyond this there are agricultural landscapes at the edges of the site, the large Seda Swamp, and a settlement landscape (see subsection on settlement intensity).

Forest landscape

Inland dune masses are a characteristic and important element of the landscape in this area: Strenči Massif on the right bank of the Gauja and Cīrgali Massif on the left bank. A small part of the Cīrgali dunes, the largest inland dune massif in Latvia, which are characterised as being of high scenic value, fall within the study area of the Proposed Action, while the majority fall within the landscape study area. The dunes of the Strenči massif are scattered over a much wider area. A large part of them fall within the study area of the Proposed Action. The most compact dune area with the largest absolute height range (at least 20 metres) is around the Birch House in Plani parish, between the A3 road and the Rīga-Valga railway. In order to avoid the loss of value of the dune massifs, including in accordance with the NRDP IAS, the dune relief should be preserved:

- do not place turbines on (behind) dune ridges;
- construction of access roads, cable excavation; installation and construction of turbines; no significant alteration of dune topography, including ensuring continuity of dune ridges;
- make the turbine access roads parallel to the dunes, not perpendicular.

These aspects are most relevant for turbines VV17, VV20, VV31, VV34, VV37, VV44, VV61, VV89, VV93 (all in the Strenči massif), which are located in close proximity to the dune ridges, but the dunes could also be affected by the construction of other turbines.

According to the NRP strategy, in ecologically and landscape-valuable areas of forest land, forestry activities can be located in accordance with environmental and nature protection requirements, and wood processing and production enterprises should be located without reducing the value of the surrounding landscape and close to existing regional infrastructure.

As deforestation for the purposes of the Proposed Action can certainly be considered as forestry and turbines as production facilities, the landscape value of these forest areas (Strenči and Cīrgali) can be considered to be diminished.

Gauja landscape

As such, outside the forested areas, the most significant landscape element is the Gauja River and its relatively forested valley with alluvial forests, floodplain (including parkland) grasslands and oxbow lakes that cross the landscape study area. The proposed activity will not directly affect the Northern Gauja AAP and will not cause visual impacts for the most part, but it will in some areas. Wind turbines could be seen in the floodplain grasslands at Rūte-Raudai, Ieviņi, between Mežvidi and Gaujaskalni, between Zīle and Vekši in Valka municipality, near Bebrini and Jauntropiņi in Vijciems municipality, as well as certain sections of the River Gauja, in particular from Ieviņi to Zīle Plantation, the bend before Spicu Bridge to the bend after Jauntropiņi in Vijciems parish, and from Kalna Starki in Vijciems parish to Pulki in Plāni parish. The grassland area around Vekšiai is particularly valuable, where a nature trail has been created and 16 hectares of park-like meadows have been restored within the Latvian Fund for Nature project GrassLIFE²⁸⁶, as well as other habitat maintenance measures. Therefore, turbines VV71, VV69, VV65, VV49 and VV68 should have a height limit of 250 metres.

Bridges are important viewpoints of the Gauja Valley: Anņu Bridge, Spicrāmja Bridge and Strenči Bridge. The location of turbine VV11 is planned to the west (2.4 km) of the Spitscrum Bridge and will be clearly visible. In order to preserve the scenic view, the VV11 turbine is not proposed.

Other high-quality viewpoints are along the steep banks of the Gauja River. The best view is provided by the opening at Canary Rock. It has two viewpoints (see Annex 9). (see Annex 8 to the Landscape Expert's Report), to the NNW towards Kankarišiai houses with views of the River Vijas and its new estuary into the Gauja, as well as the Gauja before the meander, from which the turbines would not be visible; however, at the highest vantage point above the mouth of the River Vijas, to the NNW, several turbines would be visible. The turbines VV39 and VV1, which are not recommended, would be very visible. A height limit of 250 metres should be imposed on the partially visible turbines VV48, VV82, VV83, VV36. The viewpoints at the Rāmnieku outcrop and at the Klauči recreation site are not oriented in the direction of the Proposed Action.

There is only one lookout tower in the area - Cīrgali Lookout Tower, located in Zvārtava municipality, near the P23 road (near Estonia). The nearest turbine would be VV60, which would be located westwards at a distance of 8.89 km. Unlike the lookout towers of the Seda marsh (see below), this lookout tower provides a full panoramic view: although it is primarily intended to view the landscapes of the Middle (North) Curonian Spit, it also offers a view of the forests of the Cīrgali dune massif, which would be located between the nearest turbine and the tower (see Annex 9). See Annex 10 to the Landscape Expert's Opinion). However, the turbines will be more of a background feature and will not affect views towards the Gauja valley (NW, N, A, SE, S).

The Gauja landscape also has cultural and historical significance, and is world-renowned: On 1 December 2022, the craft skills of the Gauja rafters were included in the UNESCO Representative List of the Intangible Cultural Heritage of Humanity. In 2018, these skills were

²⁸⁶ <https://grasslife.lv/>

included in the Latvian National List of Intangible Cultural Heritage. Strenči is traditionally known as the rafting capital of Latvia, and the town hosts the Gauja rafting parade and welcome ceremony. Although the Proposed Action could have a visual impact on the landscape of the River Gauja (depending on the location of the turbine terminals), it cannot be considered to have any impact on the status and appreciation of this ancient practice. However, it should be stressed that tradition plays an important role in shaping the cultural landscape of the landscape study area.

Seda townscape

Among the valuable urban landscapes in the immediate vicinity of the activity is the landscape of the town centre of Seda, which is described in the Strenči municipality plan as follows: "Seda's Central Square with its interconnected street layout, wide avenues of birch and lime trees and yellow Stalinist houses in such a clean and concentrated form are found nowhere else in Latvia and have a special cultural, historical and town-planning value." The mature and relatively undisturbed (at least in the planning process) forest to the south and east of the town has been identified as an important backdrop. The proposed development would include four turbines, however the attractiveness of the existing landscape would not be adversely affected; turbines VV25, VV24, VV30 are not proposed, turbine VV80 is proposed to be reduced to a maximum overall design height of 250 metres. Retain uncut tree belt (in state forest with cadastral designation: 94760010055) at least 100 m around the city in the direction of the Proposed Action.

Strenči town centre landscape

The landscape of Strenči town centre, defined as valuable by the SNTP, consists of the historic buildings around Rīgas Street (approximately from the 27th house) and between Rīgas Street and the railway (including the Lutheran church and the fire station buildings). This boundary is not documented. The visibility model indicates that the highest visibility would be along the railway, in the Strenči Centre Park area, in the courtyards between Rīgas, Pulkveža Brieža and Gaujas streets. The turbines will also be visible from the central buffer zone near the market square, which is the closest point to the turbines. The nearest turbine (VV24) would be 4.4 km away but would not be visible. The top of turbine VV81 and the wings above (4.5 km) and the wings of turbine VV33 (directly behind VV81; 5.6 km) would be visible. The impact on this view from the market area can be considered to be medium. However, this view is not valuable in itself.

The Strenči townscape is also formed by the Strenči Psychoneurological Hospital complex, the impact of which is described separately in the section "Impact on cultural heritage".

Oliņi Big Forest

Oliņi Lielais mežs is a cultural and historical forest area, connected with the history and traditions of hunting, recreation, approximately between Strenče to the east, the Gauja River to the south, at least the Pukši Bog to the west and the A3 motorway or the Riga-Valga railway to the north. In the 19th century, it was considered to be the area with the richest variety of wild game in the whole of the Baltics. The specific nature of the forest is also reflected in the corresponding place names given: Mežkaķis, Veckāķis, Ūdenskaķis, Vārnu vēris, Ķēves sils, Dzērvju meadows, Medņu riesta sils, Gaiļu gārša, Lāčsprākle sils and many others. 19th century. In the 2nd half of the year, hunting was organised here by the owner of Valmiermuiža,

von Leuvenstern, who hosted noble guests. After staying for several days, the guests were also keen to go on a further excursion to the Oliņi Great Forest. Overnight in Oliņi half-manor. Within a few years, the fame of the Oliņi forests has spread beyond the Baltic and Russian borders. Crown Prince Frederick Charles of Prussia participated in two hunting seasons (1875 and 1876), and Grand Duke Vladimir, son of Tsar Alexander II of Russia, visited in 1882, when monuments were erected to commemorate their visit.

The site has not been fully explored from a cultural history perspective, but a number of monuments have been identified, as well as other types of cultural heritage (such as ancient farming practices, tar production) (see subsection "Other cultural heritage"). The area is crossed by the Mežtaka, the Gauja Cultural and Historical Trail and the Mushroom Route.

The cultural heritage values identified and theoretically to be rediscovered in this area should be preserved, and the routes should not be altered to the maximum extent possible. For example, do not turn a natural carriageway into a wide "typical LVM road" with gravel and ditches along it.

Landscape of the Seda marsh

The Seda Bog is a scenically valuable open area, as well as a nature reserve. Two birdwatching towers have been created to revise it - one is closer to the town of Seda, the other is closer to Jērceni. The nearest turbines would be located 4.7 to 5.2 km (VV87, VV29, VV14, VV15) from the nearest lookout tower to Seda, but would not be visible as the view from the tower is only to the west and north. The nearest turbines to the nearest lookout tower from Jērceni would be located between 7.98 and 8.6 km away (VV25, VV30, VV26, VV87). Again, the view from the SE is blocked by a row of trees, so the turbines from both towers have virtually no effect on the view.

However, the view will be from the causeways in the marsh area. For example, at least 21 turbines will be clearly visible from the road to the observation tower nearest Seda (see Annex 9. See Annex 10 to the Landscape Expert's Opinion).

Open farmland (arable) landscapes

Although no outdoor landscapes are actually present in the immediate vicinity of the Proposed Action, the proposed wind turbines will be directly visible from these relatively distant areas. On the NE side of the Ergem hills, a distant vista could potentially overlook dozens of turbines. Although the VMSP does not define scenic road sections and the most valuable viewpoints, a high scenic value articulated relief landscape with the Strenči-Cirgaliai forest massif in the background is visible from several locations (see Annex 9). Annex 12 of the Landscape Expert's Report), including:

- from the P24 between the P23 and the houses "Vēverzemnieki";
- from the P23 road between Seleni and the Rugāji house;
- from Valka Raina Street between Tīruma Street and Indrānu Street;
- from the A3 between the houses "Vēžukrogs" and "Kalnstaloti".

It should be noted that this area (the villages of Sēļi and Lugažai, the outskirts of the town of Valka) is densely populated compared to the rest of the territory.

The closest turbines to these road sections are VV92, VV67, VV66, which are located up to 820 metres away and right on the edge of the forest (up to 80 m from the edge of the forest). If we

assume an average forest height of 25 m, the entire wind farm will exert a strong and dominant influence on these views. Turbines VV92, VV67 and VV66 are not recommended.

To the R of the study area of the Proposed Action is the Ēvele cultural landscape, which consists of culturally and aesthetically valuable landscape. The turbines will be at least 4.9 km from the DA, but will be visible. One of the most important cultural sites is the Cannabis Oak - both the view of it and the view from the oak will be affected by the turbines in the distance. However, NPSs will be characterised as subdominant objects.

On the other side of the Proposed Action study area is the Vijciems open landscape space, from which the turbines would be clearly visible. The Vijciems-Cirgali forest massif is particularly well viewed from the P24 motorway near the Vijciems bus stop, as well as from the V240 motorway between Vijciems and the Vijciems Cone Hill (Mežmuiža). From it, several turbines will be visible in the N direction (see Annex 9. (see Annex 13 of the Landscape Expert's Report), however the nearest visible turbine (VV53) would be 6.5 km away.

7.7.2. Impact on cultural heritage

The state protected cultural monuments in the area of the Proposed Action and in the landscape study area are listed in Chapter 6.6.2, and a summary of the expected impacts of the Proposed Action is provided below, assessing the impact of all the assessed WPP turbines on each of the cultural monuments.

The cultural heritage impact assessment is for the potential WPPs to be built, which correspond to the Valmiera-Valka park location alternative A with 29 WPPs and location alternative B with 43 WPPs. For these alternatives for the location of the WPP, an assessment of physical impacts (flicker, landscape impact), a calculation of climate change impacts and a calculation of socio-economic benefits were carried out for the public consultation version of the EIA report. It is envisaged that the EIA report may be updated during the public consultation process for the WPPs that are currently recommended for construction, taking into account the proposals submitted by the public and other institutions and the results of the public consultation. In the updated version of the EIA report that will be submitted to the NEB for its opinion, the assessment of impacts on cultural heritage will be updated according to the number of proposed WPPs, but it can already be said that the updated results will have a lower potential impact.

7.7.1 Group of tables. Information on cultural monuments, impacts and mitigation recommendations

Ethnographic farm "Ielīcas"

Short description	The Vidzeme farmstead "Ielīcas" represents the buildings of the second half of the 18th-19th centuries and reflects traditional architecture. A unique farmstead, which includes a complex of buildings characteristic of the Northern Vidzeme region: a dwelling house, a bathhouse with a whaling room, 3 barns, a pigsty, a stable with fodder rooms, a stable, a coach house, a cellar. The buildings are arranged in a courtyard system typical of northern Vidzeme. In addition to its architectural significance, the farm is also a place in Latvian film history, as the film "Pūt, vējiņi" (1973) was shot here. Since 2006, the farm has been restored.
Location	Vijciema parish, Ielīcas, Valka municipality. ~9,1 km from Vijciems, ~15,4 km from Valka.

	Coordinates in the WGS-84 coordinate system: 57.657815, 26.001540.
Status	<ul style="list-style-type: none"> Cultural monument of national importance (group: architecture) Farmstead (aiz aizs. No 6884). It was included in the List of Cultural Monuments when it was adopted in 1998. An individual protection zone has been designated.²⁸⁷ Appears in AAA "Ziemeļgauja"
Landscape characteristics	<p>Located between the national road P24 and LVM "Ielīcu cesta". On the edge of the main bank of the Gauja (which cannot be felt in nature) and on the left bank of the tributary Ielīca. The homestead area is like an island in a spruce forest. In addition to the ancient buildings, there is also a boat (possibly related to the film). There are several deciduous trees in the yard.</p> <p>The people of Vijciems consider it one of the most important elements of the landscape.</p>
Availability	Growing. Next to a national road, signposted ("brown sign"), theoretically also accessible by bus as it is next to a bus stop. (At the time of the survey, it was not accessible by car on a cleared road - you had to drive 200 metres).
Ownership	Property of a natural person.
Tourism	<p>An important tourist attraction. It can be viewed from the outside all year round. Included in Latvian (including foreign) and Valka municipality tourism material, etc. The venue for ethnographic, but also other types of events (e.g., Ielīce celebrations, summer solstice celebrations, etc.), which bring together several hundred people. Also a wedding venue.</p> <p>Included in Latvian tour operators' itineraries, international German cycling route, school excursions. It is also visited by specific interest groups (e.g. employees of the Ethnographic Open-Air Museum of Latvia) The owner estimates that a few thousand (up to 8,000) tourists visit the museum annually.</p>
Nearest VES	1,41 km (from residential building), 1,23 km from the boundary of the cultural monument to the SE (VV59)
Expected impact	<p>Medium. As the site is complex and there are not only a few viewpoints, the farmstead was viewed from different positions. It has been established that the wings of turbine VV56 will be visible from the edge of 'Ielīcu' in the DRR direction and the upper part of the tower and wings of turbine VV59 in the D direction.</p> <p>Physical impacts on building structures may also result from the movement of machinery on a nearby road or from the reconstruction of this road to accommodate the movement of WPP structures.</p>
Recommendations	<p>WPP turbine VV59 is not recommended, set turbine VV56 to a maximum height of 250 metres.</p> <p>Preserve the forest (no logging) in the existing state forest (cad. designations: 94920010035, 94920010038) in a strip at least 70 m wide around the farm (land</p>

²⁸⁷ <https://mantojums.lv/cultural-objects/6884>

	<p>unit with the cad. 94920010025), which according to the forest transparency model (developed by Estonian researchers²⁸⁸) should limit the view of other turbines.</p> <p>When installing turbines and related works, assess the impact of machinery movement on building structures, do not plan its movement along the LVM road "Road of the road".</p>
Notes	<p>Included in the terms of reference from the NCMP. Surveyed in the field.</p> <p>The WPP that could potentially affect the ethnographic homestead "Ielīcas" are not included in any of the recommended alternatives, so there will be no impacts described as "foreseeable impacts".</p>

Pauklis medieval cemetery

Short description	Medieval cemetery ²⁸⁹ at the back of the dune.
Location	<p>Vijciema parish, Valka municipality, near Paukulite on the old Smiltene-Valka highway. ~4,7 km from Vijciems, ~19,9 km from Valka.</p> <p>Coordinates in the WGS-84 coordinate system: 57,61663, 25,967386.</p>
Status	<ul style="list-style-type: none"> Cultural monument of regional importance (group: archaeology) Pauklīši medieval cemetery (Miklāva, Baznīcas kalns) (aiz aizs. No 2400). It was included in the List of Cultural Monuments when it was adopted in 1998. A standard protection zone of 500 m in rural settlements.²⁹⁰ Located in the protected landscape area "Ziemeļgauja"
Landscape characteristics	It is located in the forest, at the back of a dune, right next to the old Smiltene-Valka highway.
Availability	Medium. 300 m from the national road P24, in close proximity to a natural carriageway.
Ownership	State property.
Tourism	Not a tourist attraction. No potential as a tourist site.
Nearest WPP	3,29 km NW (VV82)
Expected impact	None. Wind turbines will not be visible.
Recommendations	—
Notes	Not included in the terms of reference from the NCMP. Not surveyed in the field.

Strenči Psychoneurological Hospital Complex

Short description	The hospital complex forms an authentic ensemble of typologically rare buildings of high scenic, architectural and cultural-historical value. The complex is a well-preserved, important testimony to the development of the Vidzeme region of the Latvian state, reflecting a very progressive approach to the development of
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²⁸⁸ Lang, M., Kuusk, A., Vennik, K., Liibus, A., Türk, K., Sims, A. 2021. Horizontal Visibility in Forests. Remote Sens. 13, 4455

²⁸⁹ <https://mantojums.lv/cultural-objects/2400>

²⁹⁰ <https://mantojums.lv/cultural-objects/2400>

	<p>hospital areas of this type at the time. The Director's House of Strenči Hospital (1904-1906), which is on the list of cultural monuments, has fully preserved its original building volume, architectural and artistic composition of the facades, decorative decoration and other details; it is considered to be an original work of a prominent architect of its time, a high-quality example of architecture of the era in the characteristic so-called "brick eclecticism" style.²⁹¹</p> <p>The buildings are still used for hospital purposes.</p>
Location	<p>Valmiera Municipality Strenči, Valkas iela 11A.</p> <p>Coordinates in the WGS-84 coordinate system: 57,629135, 25,696858.</p>
Status	<p>One of the buildings: cultural monument of regional importance (group: architecture) The Headmaster's House (no. No 9198). Listed as a cultural monument in 2020. A standard protection zone of 100 m in urban areas.²⁹²</p> <p>The whole complex and the water tower separately are designated as cultural and historical objects of municipal significance (according to the Strenči municipality spatial plan).</p>
Landscape characteristics	<p>A high quality, typologically unique landscape of care architecture, consisting of a peculiar ensemble of early 20th century buildings with a park and woodland. The ensemble has an important landmark - the architecturally interesting water tower, which provides an important perspective from the hospital entrance and from other places in the hospital complex.</p>
Availability	<p>Growing. Located on the A2 national motorway, several parking spaces. Open to the public, regardless of hospital status.</p>
Ownership	<p>State property.</p>
Tourism	<p>Tourist attraction.</p>
Nearest WPP	<p>4,38 km to the S (VV2)</p>
Expected impact	<p>None. The wind turbines will not be visible from the director's house, the hospital complex or from looking at the complex.</p>
Recommendations	<p>To preserve the cadastral units of the forest hospital (cad. app. 94170010085) on the eastern side or in the adjacent Latvian State Forest (Cad. app. 94170013127) within a 100 metre strip to the west of the site, adjacent to the hospital complex.</p>
Notes	<p>Not included in the terms of reference from the NCMP. Surveyed in the field.</p>

Silbitari Antiquities

Short description	<p>Monuments dating back to the Late Iron Age - the Middle Ages.²⁹³ Also known as Bitarin Hill, it is known as an ancient Latvian cult observatory.²⁹⁴ The site has been</p>
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²⁹¹ <https://mantojums.lv/cultural-objects/9191>

²⁹² <https://mantojums.lv/cultural-objects/9191>

²⁹³ <https://mantojums.lv/cultural-objects/9191>

²⁹⁴ <http://visit.valka.lv/lv/iepazisti-mus/apskates-vietas-valkas-apkartne/bitarinkalns>

	compared to the Pokaini Forest, discussed in fiction and historical literature, but has not gained the same popularity. ²⁹⁵
Location	In the forest near Silbitari, Vijciema parish, Valka municipality. ~2 km from Vijciems. Coordinates in the WGS-84 coordinate system: 57,597692, 25,945712.
Status	<ul style="list-style-type: none"> Cultural monument of national importance (group: archaeology) Silbitaru Ancient Monuments (aiz aizs. No 2401). It was included in the List of Cultural Monuments when it was adopted in 1998. A standard protection zone of 500 m in rural settlements.²⁹⁶ Located in the protected landscape area "Ziemeļgauja"
Landscape characteristics	It is located on a forested hill between a municipal road and farmland. There are several stones on the hill. Natural carriageway in the northern part.
Availability	Medium. Next to a municipal road. There is no infrastructure.
Ownership	In two properties (properties owned by two legal entities).
Tourism	Tourist attraction. Included in local tourism material, hiking routes. A tourist sign leads from Vijciems to it.
Nearest WPP	4.17 km to the N (VV82)
Expected impact	Unlikely. If the forest in the area of the ancient burial site is preserved, the turbines will not be visible.
Recommendations	<i>Preserve the forest in the area of the ancient burial site.</i>
Notes	Not included in the terms of reference from the NCMP. Not surveyed in the field.

Lugazi Medieval Castle

Short description	Former fortification of the Livonian Order (14th-15th centuries). Only the earth rampart on the eastern side of the former castle has survived. ²⁹⁷
Location	Valkas municipality, Lugaži, Rogas. ~4,1 km from Valka. Coordinates in the WGS-84 coordinate system: 57,763265, 25,954230.
Status	Cultural monument of regional importance (group: archaeology) Lugazi medieval castle (aiz aizs. No 2395). It was included in the List of Cultural Monuments when it was adopted in 1998. A standard protection zone of 500 m in rural settlements. ²⁹⁸
Landscape characteristics	It is part of the Lugazi Manor Park complex. Pedestrian walkways. To the west is a pond. A gravel carriageway crosses the site in the NE-SW direction. On the eastern side is a tree-covered rampart. The site contains buildings or ruins of the manor complex.
Availability	Growing. Parking lot in front of the manor (parish) building, 100 m from the

²⁹⁵ Misāne, A. 2012. Latvian heterotopia - the newly created sanctuary in Pokaiņi: Bela, B., Zepa, B. (zin. ed.). *Identities, communities, discourses. Collection of articles*. Rīga, LU Akadēmiskais apgāds, 77.—90.

²⁹⁶ <https://mantojums.lv/cultural-objects/2401>

²⁹⁷ https://lv.wikipedia.org/wiki/Luga%C5%BEu_pils

²⁹⁸ <https://mantojums.lv/cultural-objects/2395>

	manor.
Ownership	Municipal and private property.
Tourism	The site is not a tourist attraction in itself, but as it is part of the Lugazi Manor Park, it can attract visitors.
Nearest WPP	4,38 km to the S (VV2)
Expected impact	None. The wind turbines will not be visible from the site or from the monument.
Recommendations	<i>Not proposed.</i>
Notes	Not included in the terms of reference from the NCMP. Not surveyed in the field.

Planči hillfort

Short description	A hillfort dating back to the Iron Age.
Location	In the town of Vijciems, Planči, Valka district. ~2,75 m from the centre of Valka. Coordinates in the WGS-84 coordinate system: 57,766000, 26,037765.
Status	Cultural monument of local importance (group: archaeology) Vijciema Celītkalns - castle mound (aiz aizs. No 2394). It was included in the List of Cultural Monuments when it was adopted in 1998. A standard protection zone of 100 m in the city. ²⁹⁹
Landscape characteristics	A hill covered with deciduous trees, north of Planči homestead. There is a difficult dirt road leading from the house to it. There is forest (clusters of trees) to the north and south-west, marshy grassland to the east and farmland to the south-west and east. From the southern foot of the hillfort, as well as from the slope in more prominent places, there is a wide view to the south-south-west.
Availability	Growing.
Ownership	It falls into two ownerships: natural persons and municipalities.
Tourism	Tourist attraction. Included in local tourism material. No signposts from the road.
Nearest WPP	4,55 km to the S (VV66)
Expected impact	Medium. Dozens of turbines will be visible nearer or further away (see Annex 9), creating a cumulative effect on the panoramic view to the south. The closest ones - VV66 and VV92 - are the best (almost full height), depending on the vantage point also VV67.
Recommendations	The nearest turbines VV66, VV92 and VV67 are not recommended.
Notes	Not included in the terms of reference from the NCMP. Not surveyed in the field.

Vijciema cone

Short description	Built in 1895. A unique object in the world - the oldest cone forge in Latvia and the only cone forge of its kind in the world. It was listed as a site of interest in the European Heritage Days (2002) and the Extraordinary European Heritage Days (2008). ³⁰⁰
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²⁹⁹ <https://mantojums.lv/cultural-objects/2394>

³⁰⁰ <https://www.mammadaba.lv/galamerki/lvm-vijciema-ciekurkalte>

Location	Mežmuiža, Čiekuru forge, Vijciema parish, Valka municipality. ~5,5 km from Vijciems. Coordinates in the WGS-84 coordinate system: 57,592407, 26,039865.
Status	Cultural monument of national importance (group: industrial) Vijciems (Mežmuižas) Cone Mine (aiz aizs. No 9280). Listed as a cultural monument in 2020. Individual protection zone ³⁰¹ (along the territory of the land unit).
Landscape characteristics	Located on the V240, after a scenic stretch of road with an oak avenue. The red-brown brick building, whose shapes suggest an industrial role, is architecturally interesting and unusual. Mežmuiža or Vijmeži - a small (unofficial) village - is located in a small open space among the forest. Behind the drying kiln is an open lawn, bordered by a row of spruce trees and crossed by a ditch.
Availability	Growing. Next to the V240 national road. Parking, seating.
Ownership	Property of a legal entity (LVM).
Tourism	A tourist attraction of national importance. Defined as one of the most important attractions of the Valka region. A tourist sign leads from Vijciems to it.
Nearest WPP	4,96 km to the NW (VV53)
Expected impact	None. The wind turbines will not be visible from the site or from the monument.
Recommendations	<i>Not proposed.</i>
Notes	Not included in the terms of reference from the NCMP. Surveyed in the field.

Vijciems Mound

Short description	Vijciems Celītkalns is a former castle hill, more precisely a temporary fortification in case of enemy attacks.
Location	Vijciema parish, Celīši, Valka municipality. ~650 m from Vijciems. Coordinates in the WGS-84 coordinate system: 57,592125, 25,956176.
Status	<ul style="list-style-type: none"> Cultural monument of national importance (group: archaeology) Vijciema Celītkalns - castle mound (aiz aizs. No 2398). It was included in the List of Cultural Monuments when it was adopted in 1998. A standard protection zone of 500 m in rural settlements.³⁰² Located in the protected landscape area "Ziemeļgauja".
Landscape characteristics	A mound on the left bank of the River Vija, covered with mixed forests. To the north-west of it is the farmstead Celīši. There are many trails on the hill. Unfortunately, even though the potential for views is high, there are hardly any good vantage points due to overgrowth. A small stile provides a view to the NW.
Availability	Growing.
Ownership	State property.
Tourism	Tourist attraction. Included in local tourism material. Extensive network of paths, indicating that it is used for walking. Regular clean-ups of the mound

³⁰¹ <https://mantojums.lv/cultural-objects/9264>

³⁰² <https://mantojums.lv/cultural-objects/2398>

	infrastructure.
Nearest WPP	4,96 km to the S (VV53)
Expected impact	None. If the existing vegetation is retained, the wind turbines will not be visible from the site or from the view of the monument.
Recommendations	Preserve the existing forest on the north-west-north slope of the mound.
Notes	Not included in the terms of reference from the NCMP. Surveyed in the field.

Stone obelisk

Short description	In December 1882, a stone obelisk was erected with the text: 'His Imperial Highness Grand Duke Vladimir Alexandrovich had the pleasure of hunting here on 16 and 17 December 1882'. Describes the significance of the Oliņi Lielā Forest as a cultural and historical site, including hunting-related sites. Located on the LVM "Monument Road".
Location	Valmiera municipality, Plani parish. LVM "Monuments Road", ~ 11,1 km from Strenči. Coordinates in the WGS-84 coordinate system: 57,635434, 25,840290.
Status	Cultural and historical object of municipal significance (according to the Strenči municipality spatial plan).
Landscape characteristics	Located directly on the LVM road, on the other side of a small ditch, just before a pine forest with fir trees on the second floor. On the other side of the road is a clearing, with individual pines or groups of pines.
Availability	Growing. LVM on the side of the "Monument Road", accessible from the road. Parking is possible.
Ownership	State property.
Tourism	Tourist attraction. Included in various local tourism materials. One of the Gauja Cultural and Historical Trail sights. Also included in the Mežtakas attractions. Near the R. Veide monument. The two sites share a stand (on the other side of the ditch).
Nearest WPP	0,19 km to the NW (VV21)
Expected impact	Growing. Wind turbines will be highly dominant if the original intention is realised. The nearest turbine, VV21, will be visible at full height from the monument and from the Monument Road. Half of turbine VV86 will be visible (see Annex). The route of the Gauja Cultural and Historical Trail runs along the monument. The monument may be endangered during construction works and during the movement of machinery.
Recommendations	As it is not possible to ensure that turbine VV21 is not visible, it should be moved further away from Monument Road (possible location coordinates: 57.635288, 25.837657 or 57.635615, 25.837217). Preserve the semi-circular forest around the obelisk within a radius of 100 m on the obelisk side of Monument Road. On the other side of the road, plant Norway spruce covering the base of the turbine, preferably in two parallel rows. When planting rows, use planting material at least 1.5 metres high. To protect the monument during construction works and machinery movements,

	and to maintain or renew the information board about it.
Notes	Included in the terms of reference from the NCMP. Surveyed in the field.

Monument to the Crown Prince of Prussia

Short description	Monument (sometimes thought to be just the base) to Crown Prince Frederick Carl of Prussia, who hunted here in 1875. The site was buried in the 20th century. in the 1960s, during the construction of what is now the V260. It is not known whether it survives or in what condition.
Location	Plani municipality, Valmiera region, on the side of the V260 road. ~13,7 km from Strenči. Coordinates in the WGS-84 coordinate system: 57.635542, 25.860731
Status	—
Landscape characteristics	Located in a forest, close to the V260 national road. There is no evidence of its existence in nature
Availability	Medium (on the side of a public road, but no possibility to stop).
Ownership	State property.
Tourism	Not a tourist attraction in itself. Theoretically, the information that the object was located here could be used.
Nearest WPP	0,23 km to the A (VV38)
Expected impact	Medium (if the site exists) Located on the roadside, virtually no visual impact, however the site may be threatened by machinery movements and the creation of an access road to turbine VV38.
Recommendations	Clarify the actual location in nature. With this in mind, try to uncover and protect the site during construction work and machinery movements. Inform museum professionals.
Notes	Information about the object has been provided by the Valka Museum and Iveta Ence. Not included in the terms of reference from the NCMP. Not surveyed in the field.

Monument to Rihards Veide

Short description	Monument to Latvian opera singer Rihards Veide, who died here in February 1964 while hunting.
Location	Valmiera municipality, Plani parish. LVM road "Monument Road", ~11,3 km from Strenči. Coordinates in the WGS-84 coordinate system: 57,634823, 25,842647.
Status	—
Landscape characteristics	Located in a pine-fir forest, on the edge of a natural carriageway, 70 metres from Monument Road.
Availability	Medium. Not far (100 m) from the LVM road "Monument Road", an obscure sign leads to the site, located on the other side of the ditch. Also included in the

	Mežtakas attractions.
Ownership	State property.
Tourism	A little-known tourist attraction. One of the Gauja Cultural and Historical Trail sights. Also included in the Mežtakas attractions. Near the Stone Obelisk. The two sites share a stand (on the other side of the ditch).
Nearest WPP	0,34 km to the NW (VV21)
Expected impact	Medium. As the site is located in the middle of a forest, the activity would have no visual impact on the monument, preserving the forest. However, in theory, the monument could be damaged or destroyed, so its location during construction and machinery movements must be taken into account.
Recommendations	To protect the monument during construction works and machinery movements, and to maintain or renew the information board about it. Preserve the forest in a 100 m zone around it.
Notes	Included in the terms of reference from the NCMP. Surveyed in the field.

Chimney of the former Saules sawmill

Short description	The chimney of the former Saules sawmill was not found in the field and, according to local residents, was demolished in spring 2023.
Location	Saule 3, Valkas pag., Valkas novads. 12,9 km from Valka. Coordinates in the WGS-84 coordinate system: 57,692887, 25,896454.
Notes	Included in the terms of reference from the NCMP. Surveyed in the field.

Oliņi half-manor house (Mežmuiža)

Short description	Built at the end of the 19th century. It belonged to the owners of Valmiermuiža, the von Loewensterns. Culturally and historically significant as a sleeping place of the noble hunters who hunted in the Oliņi Lielais Forest. ³⁰³
Location	Oliņas, Plani municipality, Valmiera region. ~10.1 km from Strenči. Coordinates in the WGS-84 coordinate system: 57.623319, 25.852390
Status	Located in the protected landscape area "Ziemeļgauja"
Landscape characteristics	Enclosed courtyard farmstead on the right bank of the Gauja between the road and the river. Inhabited. The semi-detached house is a relatively large log building. The outbuildings have also been preserved. On the other side of the road is a new deciduous forest (overgrown farmland).
Availability	Medium (public roadside, but no tourist information, no possibility to stop).
Ownership	Property of a natural person.
Tourism	A little-known tourist attraction. Visible from the outside (road). One of the Gauja

³⁰³ <http://valmiera.zurbu.net/document/1081>

	Cultural and Historical Trail sights.
Nearest WPP	1,09 km to the S (VV47)
Expected impact	Unlikely. Most of the VV47 turbine wing will be visible from the courtyard of the building. They will not be visible from the building, even when viewed from the road.
Recommendations	Plan a maximum height of 250 metres for turbine VV47. Maintain the existing forest strip of at least 70 m on the other side of the road.
Notes	Implicit in the terms of reference from the NCMP. Part of the Gauja Cultural and Historical Trail. Surveyed in the field.

Monument to Captain Anton Irv

Short description	Monument to the fallen Estonian army captain Anton Irv, who was a participant of the Latvian (and Estonian) War of Independence and fell in battle with the Bolsheviks on 27 April 1919 near Strenči near Egle pub. The foundation stone of the monument was laid in 1939, but due to the Soviet occupation, the monument was not erected until after independence and was unveiled in 1994. ³⁰⁴ The monument is made in classical regular forms, as a granite memorial stone with an inscription.
Location	Plani municipality, Valmiera county, near the A3 motorway, ~3.5 km from Strenči. Coordinates in the WGS-84 coordinate system: 57,626484, 25,74396.
Status	Cultural and historical object of municipal significance (according to the Strenči municipality spatial plan). Located in the protected landscape area "Ziemeļgauja"
Landscape characteristics	Located on the side of the A3 national road, in a coniferous forest. A special gravel path, not directly connected to the A3 motorway, leads about 50 m from the road towards the monument. Located 150 m from the Gauja River (connected by a trail), 160 m from an asphalted parking area on the side of the highway. On the other side of the highway is a large clearing.
Availability	Medium. Although it is on the motorway, it is not safely accessible from the motorway. Reachable from the car park either by forest roads or by following the motorway.
Ownership	State property.
Tourism	A little-known tourist attraction. There is no indication of this.
Nearest WPP	1,35 km to the NE (VV24).
Expected impact	Unlikely. The view of the monument is not compromised, however, as there is a clearing on the other side of the road towards the turbines, turbine VV24 will be clearly visible from the monument and the wings of turbine VV30 will also be visible.
Recommendations	Although turbine VV24 will be clearly visible from the monument site, given the site's role and primary vantage point, the relocation or non-provision of VV24 would only be a suggestion, but it would be preferable not to provide for it higher

³⁰⁴ <https://latvijaspeminekli.lv/piemineklis-kritusajam-igaunijas-armijas-kapteinim-antonam-irvam/>

	than 250 metres. Although the forest has already been cleared on the other side of the road, preserve the uncut forest strip along it opposite the monument.
Notes	Included in the terms of reference from the NCMP. Surveyed in the field.

Vijciems hunting castle

Short description	Originally built in 1899 for the hunting of local lords and barons. After the burning in 1907, the present stone building was built in the National Romantic style (assumed to be the work of the architect Eugen Laube). After 1918 it was at the disposal of the forestry, later the VEF company established a hunters' recreation base. It has stood unused for some time The Bergervilla guest house is now open.
Location	Vijmeži 4, Vijciema municipality, Valkas region. ~8,5 km from Vijciems, 22 km from Valka. Coordinates in the WGS-84 coordinate system: 57,628886, 26,033338.
Status	Located in the protected landscape area "Ziemeļgauja"
Landscape characteristics	Located in the middle of a forest massif - at the crossroads of former forest stigs, now LVM roads. Coming from the P24 motorway, a major axial object at the end of the road. Planting of large Western avenues in front of the building. A striking building, an important element of the local landscape, which enhances the monotonous landscape of the forest massif. To the north of the castle is a large clearing.
Availability	Growing. LVM road "Medīb mājas ceļš", parking lot.
Ownership	Property of a natural person.
Tourism	Tourist and recreational facility (accommodation).
Nearest WPP	1,16 km to the NW (VV53)
Expected impact	Growing. From the castle car park you will be able to see about 2/5 of the height of wind turbine VV53, so it will dominate the landscape. From the north of the castle, you will also be able to see the top and wings of turbine VV54 (see Annex).
Recommendations	No turbine VV53 is proposed, reduce the maximum overall design height of turbine VV54 to 250 metres. Retain the currently unlogged forest strip (Block 290, Section 5) to the N of the Hunting Lodge, 70 metres wide.
Notes	Not included in the terms of reference from the NCMP. Surveyed in the field.

Seda buildings

Short description	In fact, the entire town of Seda is a 20th century... A monument of 1950s town-building - an ensemble of historical buildings. Key assets: public and residential buildings, layout of buildings and streets, layout of residential courtyards, greenery - avenues of street and courtyard trees.
Location	Valmiera region, Seda. Coordinates in the WGS-84 coordinate system: 57,650323, 25,751009.
Status	Cultural and historical object of municipal significance (according to the Strenči

	municipality spatial plan).
Landscape characteristics	The core of the city - the most valuable part (between Meža, Dārza, Sporta and Parka Streets) - is formed by almost symmetrical residential and public buildings of the Stalin era (mostly 2-storey buildings). The main anchor points are the School Square with the school building, Uzvaras Street with its dominant building, the House of Culture. The central access road (Miera iela) also offers a scenic view.
Availability	Growing. Accessible via the national regional road P26.
Ownership	Part of several estates; mostly municipal.
Tourism	The buildings of Seda are a tourist attraction of national importance (although mostly a complex of permanently inhabited buildings). The brown information sign leads to the House of Culture. Also included in the Mežtakas attractions.
Nearest WPP	1 km from the Stalin-era built-up area boundary to the SE (VV30)
Expected impact	Growing. From the open areas of the city, the nearest turbines VV24, VV25, VV30 and turbine VV80 will be very visible at street level (at least 2/3 of the structure) (see Annex 5). Many more turbines will be visible from the second-floor windows facing east and south-east.
Recommendations	No turbine VV25, VV24, VV30 recommended, reduce maximum overall design height of turbine VV80 to 250 metres. Retain uncut tree belt (in state forest with cadastral designation: 94760010055) at least 100 m around the city in the direction of the proposed development.
Notes	Not included in the terms of reference from the NCMP. Surveyed in the field.

7.8. Impact on tourism and recreation

Attitudes towards WPP parks, in the context of their impact on tourism and recreation, vary from negative to positive.

Worldwide studies indicate³⁰⁵ that wind energy development has a negative impact on the aesthetic values of landscapes, thus reducing the tourism industry. Tourism in this assessment refers to trips away from the permanent place of residence for various purposes (e.g. business trips, excursions, attending or participating in sports and cultural events, etc.), while recreation refers to various (primarily) outdoor activities close to the place of residence (e.g. walking, playing sports, mushroom picking, fishing, sunbathing, etc.). Sometimes, however, these lines can be blurred.

Tourists (visitors) often look for less modified and artificial landscapes³⁰⁶. Wind farms, as opposed to stand-alone (isolated) wind turbines, have a particularly negative impact on landscape attractiveness³⁰⁷. Although there are tourists who would prefer to see wind farms directly, a study in the Czech Republic, for example, suggests that tourists would be most attracted to these sites if special tourist (visitor) centres were set up^{308 309} or even if special

³⁰⁵ Broekel, T. & Alfken, C. 2015. Gone with the wind? The impact of wind turbines on tourism demand. *Energy Policy*. 86, 506—519.

³⁰⁶ Hoppe-Klipper, M., Steinhäuser, U., 2002. Wind Landscapes in the German milieu. In: *Windpower in View: Energy Landscapes in a Crowded World*. Academic Press, New York, 83—99.

³⁰⁷ Ladenburg, J., Dahlgaard, J.-O. 2012. Attitudes, threshold levels and cumulative effects of the daily wind-turbine encounters. *Applied Energy*, 98, 40—46.

³⁰⁸ Broekel, T. & Alfken, C. 2015.

viewing platforms were created that were accessible to tourists (these have been set up in countries around the world, e.g. UK, Austria, Germany, the Netherlands).

A Czech study found that **siting wind turbines in suitable locations has little or no negative impact** on tourists' perception of the landscape and their choice of destination. They also found that turbine development, combined with good marketing, can develop new forms of tourism. In general, tourists have a more negative view of other industrial or infrastructure sites such as factories, quarries (mines), telecommunication towers or electricity pylons. While the vast majority of tourists consider the attractiveness of nature and landscape as the most important consideration when choosing destinations and recognise the sensitivity to unwanted intrusions into the landscape, only 6% said they would not go on a trip because of wind turbines³¹⁰.

While tourism could be described as having a less negative impact overall, studies shows that the more negative impact is on the recreation of local people. This is particularly important in areas where there is less wilderness or limited access to it. A study in Norway on the impact of wind turbines near recreational areas concluded that the impact of wind turbines is negative. The study uses *therevealed preference-travel cost method (RP-TCM)* and the *stated preference-contingent behaviour method (SP-CB)* to estimate potential demand under conditions that are outside the range of variation in observed cost or resource characteristics and to predict what study subjects would do in a hypothetical situation. The study was carried out in three recreational areas popular with local people: a mountainous region (assessing the impact of an inland wind farm) with an extensive network of trails and two popular beaches (a backcountry wind farm) with good tourism infrastructure, located up to 35 km from major cities. It concluded that the presence of wind turbines would significantly reduce the number of recreational trips, both inland and coastal, and affect the well-being of holidaymakers. The negative impact of wind turbines on an area with 200 000 visitors per year is estimated at €10.5 million or 20% loss of indirect value, without taking into account downstream impacts (e.g. on neighbouring areas).³¹¹

The assessment of impacts on tourism and recreation is for the potential WPPs to be built, corresponding to the Valmiera-Valka park location alternative A with 29 WPPs and location alternative B with 43 WPPs. For these alternatives for the location of the WPP-Park, the public consultation version of the EIA report was subject to a physical impact assessment (flicker, landscape impact assessment (including impacts on tourism and recreation)), a climate change impact assessment and a socio-economic benefits assessment. It is envisaged that the EIA report may be updated during the public consultation process for the WPPs that are currently recommended for construction, taking into account the proposals submitted by the public and other institutions and the results of the public consultation. In the updated version of the EIA report, which will be submitted to the NEB for its opinion, the assessment of impacts on tourism and recreation will be updated according to the number of proposed WPPs, but it can already be said that the updated results will have a lower potential impact.

³⁰⁹ Frantál, B., Kunc, J. 2011. Wind turbines in tourism landscapes. *Annals of Tourism Research*. 38 (2), 499—519.

³¹⁰ Frantál, B., Kunc, J. 2011. Wind turbines in tourism landscapes. *Annals of Tourism Research*. 38 (2), 499—519.

³¹¹ [Gorm](#) et.al. The impact of wind turbines on local recreation: Evidence from two travel cost method - contingent behaviour studies, *Journal of Outdoor Recreation and Tourism*, Volume 25, 2019, Pages 66-75.

Nature trail

Several nature trails have been created in the area: Kokši Lakes Nature Trail maintained by DAP, Zīle Biotope Trail maintained by LVM (currently closed), Seda Nature Trail, Strenči Nature Trail maintained by LVM together with Valmiera County Municipality, and Vekši Nature Trail maintained by private individuals. Trails for both recreation and information on the protection of specific natural values. The planned activity will have a visual impact or the turbines will be visible in the Vekši nature trail and the end of the Seda nature trail. As the Vekši nature trail is closer to the planned turbines (2.1 km to VV70), we recommend reducing the distance around the turbine (see Landscape Characterisation subsection). The turbines will not be visible from the Kokši Lakes Nature Trail and the Strenči Nature Trail, and tourists or recreationists will not be affected by the Proposed Action.

Water tourism

The most important - nationwide - water tourism route within the Study Area is along the entire length of the Gauja River. The Valka Regional Spatial Plan names it as one of the "special places for tourism development" of Valka Region, while the VPR IAS - as a niche product of the region. LVM maintains several recreation areas on the banks of the Gauja River. The landscape of the Gauja River and the impact of the Proposed Action on it is described in the section "Landscape brief and recommendations", where sections from which the turbines would be clearly visible are mentioned. New elements in the landscape could be expected to reduce the quality of the view, so a maximum height (250 m) should be set for some turbines or not at all.

The Vija and Seda are also used for water tourism, but their importance and popularity are much lower. Although the Seda River flows close to the nearest turbines in the northern part of the wind park, this section is not used for water tourism (the most suitable section of the Seda for boating (from Dakstie to Burtņieks) is outside the Study Area). The Vija is boated from Raudiņu Bridge (near P24) to the mouth of the Gauja. According to the visibility model, the turbines would not be visible at any point while boating on the Vija.

Hiking and cycling routes

International, national and local tourist routes cross the area. The most important of these is the Mežtaka section of the European Long Distance Hiking Route E11, which crosses a large part of the territory, 57.8 kilometres long, from the Dedums River in Brenguli parish to Būdai in Zvārtava parish. Most of the trail route leads close to the Gauja Valley, but at Kokši Lakes it turns further - deeper into the Cīrgali dune massif. The Study Area partly includes the Valmiera-Strenči section, where the Proposed Action will have no impact. The situation is different for the next section "Strenči-Spicu tilts", whose route literally adjoins the territory of the OP. The nearest turbine would be VV33, which would be approximately 490 metres away, but would hardly be visible in its vicinity (except for a short stretch at the junction of the A3 and V260) and the audibility of the turbines (around 40-45 dB) would compete with the noise from the A3. There will be visibility splays along the straight stretch of the clearings between the Regiment Road and up to the A3 turn-off. Here we recommend spruce plantations along the route to screen the view towards the turbines if they are built. The second section, where the turbines will be highly visible, is along the V260 just before Cekulīai to the Oliņi Finnish bath. Here a maximum height (250 m) should be set for turbines VV88 and VV47. It should be noted that the description of the Mežtakas route also includes sites that are not in the immediate vicinity of the trail, but whose visit would be affected by the Proposed Action (e.g. the Stone Obelisk). The last stage of this section of the trail with turbine visibility would be

where the trail enters the LVM road "Black Road". Here we recommend spruce plantations along the Black Road in the direction of the high voltage power line to screen the view towards turbines VV62 and VV13 (if these turbines are built). Other potential impacts could be related to noise, which would have the greatest impact on the section of the path between the high voltage line Valka-Vireši and Vecmājām. This could reach 40-45 dB, affecting the perception of wilderness. The closest turbines would be VV82 (565 m) and VV1 (695 m). Due to the view from the Kankariši Rock, it is already proposed not to plan turbine VV1 and to set a maximum height (250 m) for VV82. Given that the section between Vecmāji Road and Vecmāji houses follows a natural carriageway, the construction of the access roads required for the turbines should not lead to the reconstruction of this section, preserving the authentic appearance of the 'trail'. In the next section "Spicu tilts-Zaķi" the route moves further away from the Gauja River, but crossing it on the Spicrāmja Bridge, it gets closer to the left bank of the Gauja River. However, the only place where the turbines would be clearly visible is the Spitscrae Bridge, from which turbine VV11 would be visible, which has already been asked not to be planned.

Another route of international importance is the Camino de Santiago, which overlaps with the Mežtakas route for a short stretch between Ūdriņi and Strenči Bridge, and then leads to Valka via Seda Bog, Jērceni and Turna. The turbines will be most visible in the Seda marsh, walking towards Seda (see details in the Seda marsh landscape description). The second area on the route affected by the proposal would be around Lugazi, where the nearest turbine (VV92) would be 4.98 km away. Not recommended for VV92 (see description of open farmland landscapes).

The Green Railways are a network of hiking and cycling routes of national significance, mostly along former railway embankments and in some places along dykes. So is the Valka/Valga-Ape green railway. The main route from Valka follows the P24 and P23 roads, and the turbines would be clearly visible in many places (see description of open farmland landscapes). The nearest turbine would be VV66 2.4 km away, which is also discouraged, as are VV67 and VV92.

The Gauja Cultural and Historical Trail, which starts in the village of Oliņi near Cekuliai and ends in Tsirgumāe (Estonia), is a route of regional importance. The first part of the route up to the Spitzmuseum Bridge overlaps with Meztaku (this section is not analysed again), but it has a branch to the Stone Obelisk and the Rihards Weide Monument. Taking into account this route and the impact of turbine VV21 on these sites already described, it is recommended that the turbine be orientated away from Monument Road and that planting of Norway spruce covering the base of the turbine, preferably in two parallel rows, be established across Monument Road" (opposite the Stone Obelisk). When planting rows, use planting material at least 1.5 metres high. Information boards along the route, at the attractions, must not be destroyed. One of the attractions included is the "pits with stone edges" (coordinates: 57.629561, 25.929861): an ancient cultural monument of economic character, which has not been preserved elsewhere in Latvia. The site must not be destroyed during construction works, including the construction of access roads. From the Spitscraum Bridge, the turbines would only be visible for a short distance in the village of Zīle. The nearest turbine would be VV70 (668 m away but visible from 1 km). This turbine has already been recommended for reduction due to its impact on the landscape of the North Gauja.

A new route is the Mushroom Path between Oliņi and Vecmājām, which forms a loop, partly coinciding with the Mežtaku and Gauja Cultural and Historical Trail. It was created with the aim of "creating an international network of business initiatives for the "Mushroom Route", a network of collected NTFPs and products made from them, aimed at diversifying activities, creating favourable conditions for the creation of new businesses and jobs in rural areas, the

development of new products and services; developing thematic tourism on mushrooms and other NTFPs in rural areas as an innovative and attractive niche for the tourism market and as a tool for diversifying the local economy". One of the sights included is the Cat's Den Pine (57.627762, 25.887085), which is an ancient dore tree, although it has been lying in the ground for several years. It must not be destroyed during construction and/or operation. This tree will not be affected by the Proposed Action as access to the VES recommended for construction is not planned via the "Vecmāju Road", see Figure 4.1.3 for information on planned vehicle access routes and Figure 6.5.2 for a road map of the Proposed Action area.

Impact on recreation in state forest lands managed by JSC Latvia's State Forests

It should be noted that the Norwegian study described above cannot be fully applied to the area of the Proposed Action and the study area, as the existing recreation areas are mostly forested, thus not offering wide panoramic views (in the future: also of wind turbines), i.e., Such views are not the most likely reason for recreation in these forests, but it cannot be denied that also in these recreation areas of Strenči-Vijciems there could be a potential decrease in people's willingness to use them for various recreational purposes, which, among other negative side-effects, could increase recreational expenditure (e.g. transport costs). In addition to the impact on views and noise, the Proposed Action will also physically reduce forest areas (taking into account that an average of 2.3 ha per turbine requires preparation (deforestation, clearing)) and fragment them, including through the construction of forest roads or cable routes. At the same time, on the positive side, the new road network created for the wind farm could theoretically increase accessibility to natural areas. However, the overall effect on recreation will be negative.

Bearing in mind that in the Study Area there are also municipal recreation areas and other areas managed by LVM and other landowners suitable for various types of recreation, it should be considered that in this area LVM does not provide enough forest area in the state forests specifically for recreation, e.g. reducing logging volumes, selective logging, walking trails, landscaping. Taking into account that the Planned Action would reduce the areas available for recreation and deteriorate the quality of the landscape, its impact should be compensated for by creating a new individual planned area for local residents in cooperation with the municipalities of Valmiera and Valka, where logging would be reduced, recreation areas and well-maintained routes would be created. According to the authors, a suitable site could be the area near the homestead "Bērzi" in Plani parish (state road A3 and LVM roads "Melleņu ceļš" and "Armijas ceļš"), where the orthophoto shows a relatively uncut forest, a remarkable dune massif with a protected habitat of EU importance "Lichen-rich pine forests" (91T0).

As the planned activity is located in the vicinity of the Northern Gauja Protected Landscape Area, we recommend to consider the possibility of creating an observation deck for one of the wind turbines overlooking the Middle Gauja and the surrounding landscape or building a separate observation tower, developing the site as a region-wide nature tourist visitor centre, providing information on both wind energy and nature conservation.

Due to the inland dune massifs (where the EU biotope "Lichen-rich forests" is located), mushroom picking is an important form of recreation in this area, which is included in the list of intangible cultural heritage of Latvia in 2023.

A special route "Mushroom Route" has even been created for this activity, and the entire Strenči massif between Strenči and Spicu Bridge has been named "the beautiful mushroom

and berry forest of Vidzeme". The planned activity, which also involves deforestation, is likely to have a short-term impact on the collection of traditional mushroom species characteristic of this biotope, reducing the mushroom assemblage.

Impact on other activities

In the context of recreation, we should also definitely talk about outdoor grassroots sport. One of the most popular modern folk sports is orienteering.³¹² One of the criteria for selecting a site for orientation is complex and challenging terrain (including topography), diverse landforms, uninhabited and natural areas.³¹³ The British *Orienteering* Federation's guide to orienteering also states that the best terrain is woodland or woodland with varied topography, moorland and other open areas, but the availability of such areas is increasingly under threat, both for recreation and for economic development. Such schemes threaten the best and often most beautiful places for orienteering, which is why the protection of natural and cultural heritage is a priority when organising orienteering competitions.³¹⁴ Orienteering takes place outdoors, so the creation of wind turbines in orienteering areas would reduce the areas available and undermine their attractiveness. At the International Orienteering Coaches Conference in Austria (August 2023), a French report identifies the installation of wind turbines (as well as solar panels) as one of the future challenges for the sport, reducing access to orienteering terrain.³¹⁵

The Valmiera Orienteering Club "Valmiera-ZVOC" organises its own competition in the Study and Action Area - the "Valmiera Magnēts" series. The area of the Action is the area of the single-phase ("Bērzi") development - around the house "Bērzi", Plani municipality (between the national road A3 and the LVM roads "Melleņu ceļš" and "Armijas ceļš"), see Figure 7.8.1.



Figure 7.8.1. Strava users' running routes in the "Birch" orienteering area

In 2023, for example, 101 participants took part.³¹⁶

³¹² <https://enciklopedija.lv/skirklis/5170-tautas-sports-Latvija>

³¹³ Tutić, D., Štanfel, M., Horvat, M.T. 2018. Multi-Criteria Land Evaluation of Suitability for the Sport of Foot Orienteering: A Case Study of Croatia and Slovenia. ISPRS Int. J. Geo-Inf. 7, 227.

³¹⁴ https://www.britishorienteering.org.uk/images/uploaded/downloads/officials_handbook_landaccess_environmental_goodpractice.pdf

³¹⁵ https://www.oefol.at/wp-content/uploads/2023/08/CC_Report_FRA.pdf

³¹⁶ https://lof.lv/seriali_rez/valmieras_magnets

The area is located in a distinct dune massif with several successive dune ridges, in a pine forest, making it possible to train in such an area. Three wind turbines are planned to be located here, with another turbine (VV15) on the other side of Blueberry Road. In order to preserve this area for orienteering, we recommend that VV93, VV16 and VV17 are not planned to be installed in this area, see Figure 7.8.2.

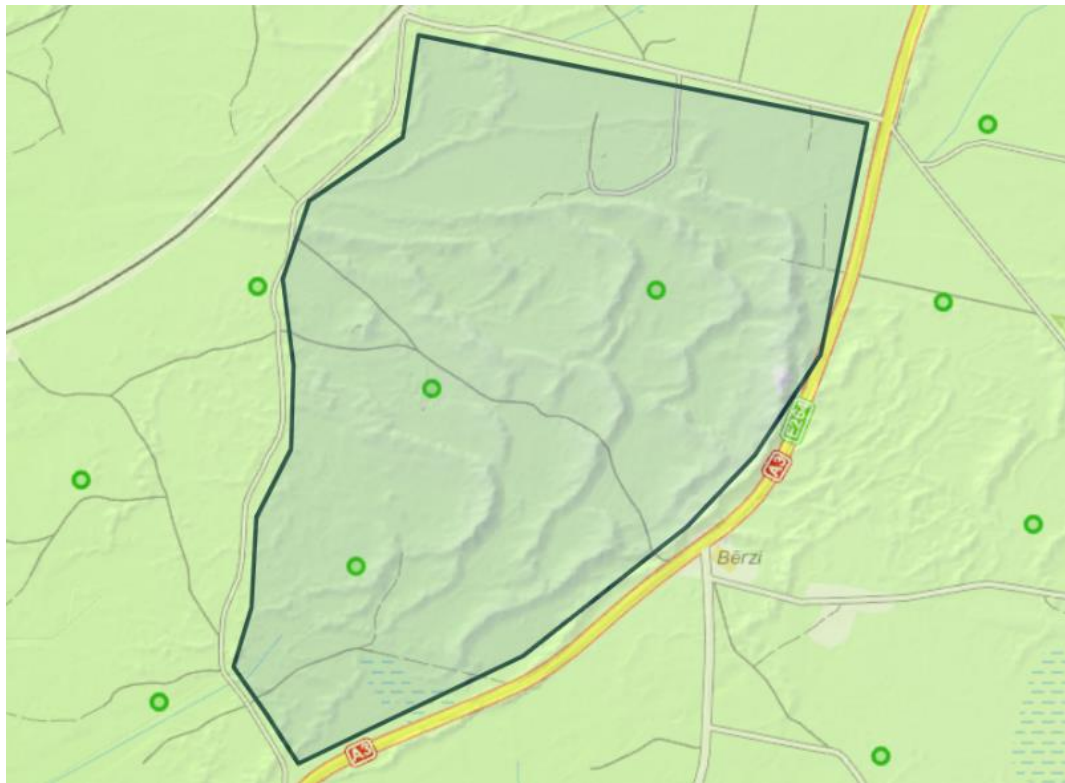


Figure 7.8.2. *Relief model and location of turbines in the Birch orienteering area*

Other orienteering areas are located on the other side of the Gauja River in Trikata municipality: Slāži (near Tower Hill), Dūkas (to the R from Ūdrīņi), Pūpoli A (to the E from the garden village "Pūpoli"). These areas will not be affected directly or indirectly (visually) by the Proposed Action. The layering area is within 4 kilometres of the nearest WPP, the others further away.

During the preparation of the Opinion, information was received from Armands Broks of Valmiera-ZVOC that new maps are currently being drawn for the area of the Proposed Action and the area immediately adjacent to it (on the other side of the railway; see Figure 7.8.3).

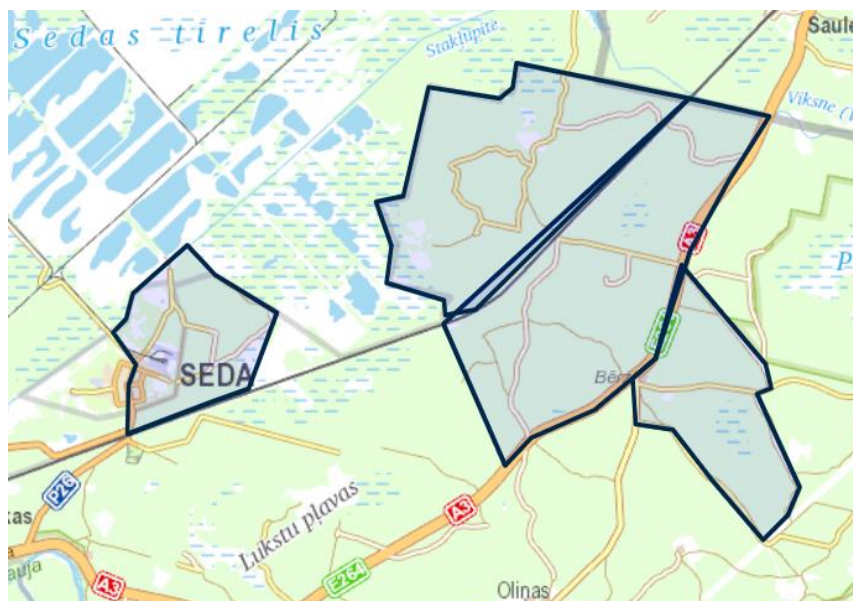


Figure 7.8.3. Developed "Valmiera-ZVOC" orienteering areas

Thus, 12 turbines (VV14, VV15, VV16, VV17, VV18, VV19, VV35, VV37, VV40, VV46, VV84, VV93) would be located in the orientation areas. Of these, six are not recommended for construction - VV14, VV15, VV17, VV19, VV35, VV93 (see Figure 1 in the introduction to the EIA report).

If preservation of the site or not planning for turbines is not possible, it would be desirable to compensate for their loss by supporting the orienteering club in updating the orienteering map or offering another area for competitions/training series.

Rogaining competitions have also taken place in the study area (e.g. the Hare Rogaining on 18 March 2023), but they cannot be considered as regular activities, and the specific nature of the sport and the size of the terrain (several times larger than an orienteering race) make certain changes in nature less important.

7.9. Impacts on Natura 2000 sites in the vicinity of the WPP Park

The opinions of the habitat expert and the bird expert assess the impact of the proposed wind farms, access roads, transmission lines and transformer substations on protected natural values within or adjacent to Natura 2000 sites (see Table 7.9.1).

A summary of the objectives for the establishment and protection of Natura 2000 sites adjacent to the area of the Proposed Action and the factors that adversely affect them prior to implementation of the Proposed Action is provided in Table 6.4.2 in Chapter 6.4.1.

Table 7.9.1. Special Protection Areas (SPAs) within or adjacent to the assessment area

Name	Status	Location in relation to the study area	Establishment criteria
DL "Sedas purvs"	Nature reserve, <i>Natura 2000</i>	NW of the study area, beyond the Riga-Valga railway line	Protection of high and transitional marshes, boreal and swamp forests, river flood meadows and old rivers
DL "Burgas"	Nature reserve,	NW of the study area, beyond	For the protection of river

Name	Status	Location in relation to the study area	Establishment criteria
meadows"	<i>Natura 2000</i>	the A3 Inčukalns-Valmiera-Valka motorway, 3 km from the nearest turbine VV2	flood meadows and birds
AAZ "Ziemeļgauja"	Landscape Conservation Area, <i>Natura 2000</i>	Partially overlapping with the study area	For the protection of river floodplain meadows, forests and aquatic habitats and species
ML "Boulevard barking"	Microreserve, <i>Natura 2000</i>	In the Z part of the study area	For the protection of specially protected species and forest habitats
ML "Estonian bark"	Microreserve, <i>Natura 2000</i>	In the NE part of the study area, 8 km from the nearest turbine VV68	For the protection of specially protected species and forest habitats
DL "Purgaile River forests"	Nature reserve	To the NW of the study area, upstream of the Riga-Valga railway line, the nearest turbine to be assessed is VV5, located approximately 450 m away	For the protection of birds and alluvial forests

Article 4.1 (3) of the Law on Environmental Impact Assessment (13 November 1998) states that "...if an impact assessment is carried out for a proposed activity and the implementation of this activity may significantly affect a protected nature area of European importance (*Natura 2000*), an assessment of the impact on the protected nature area of European importance (*Natura 2000*) shall be carried out and the assessment report shall be included in the environmental impact assessment report in accordance with the procedure established by the normative acts on impact assessment".

As mentioned in Section 6.4.1 of the EIA Report and summarised in Table 7.9.1, there are 5 SSSIs in the vicinity of the proposed wind farm that are included in the single European network of SSSIs *Natura 2000* (see Figure 6.4.2 of the EIA Report):

- Sedas purvs Nature Reserve. The nearest WPPs are planned within 0.9 km of the nature reserve boundary.
- Burgas Meadows Nature Reserve. The nearest WPPs are planned within 4 km of the nature reserve boundary.
- Northern Gauja Protected Landscape Area. The nearest WPPs are planned within 0.3 km of the protected landscape area boundary.
- Micro-reserve "Bulvāra riests". The nearest WPPs are planned within 0.8 km of the micro-reserve boundary.
- Estonian Sage Grouse Micro-reserve. The nearest WPPs are planned within 8 km of the micro-reserve boundary.

On 21 November 2023, the Cabinet of Ministers approved the "Regulations on Nature Reserves", and a new nature reserve was established - the Purgaile River Forests. The nearest WPP turbine, VV7, is planned 1.3 km to the east of the nature reserve.

This assessment includes an assessment of the impacts of the five Natura 2000 sites as identified in the Programme No 5-03/9/2023 issued by the NRW on 12 September 2023.

The objectives for the establishment and protection of the Natura 2000 sites listed above (habitats and species); the patterns and interactions that determine the existence of natural values in these sites; and the factors affecting natural values prior to implementation of the Proposed Action are summarised and presented in Table 6.4.2 of Chapter 6.4.1.

The following is an assessment of the opinions of the experts involved in the EIA on the impacts on habitats and plant species in the nearby Natura 2000 sites and on bird species in the nearby Natura 2000 sites.

Impact on habitats and plant species in nearby Natura 2000 sites

In case of construction of all 84 assessed VPP sites, part of the Proposed Action (construction of cable lines along roads, road reconstruction) would affect Natura 2000 sites - protected landscape area "Ziemeļgauja" and microreserve "Bulvāra riests", as well as nature reserve "Purgailes rives meži", which is not a Natura 2000 site.

The impact on the SPA has been significantly reduced by avoiding the sites on the left bank of the Gauja and the possible reconstruction of several road sections on the right bank.

By building a WPP park, Alternative A or A' locations Natura 2000 sites would not be directly affected.

The potential area of direct effects in Natura 2000 sites B and B' at the locations of the alternatives in the two Natura 2000 sites may affect the following types of protected habitats of EU importance:

- 6270* Species-rich pastures and grazed meadows, 0.12 ha (AAA "Ziemeļgauja", cable route along Pukšu swamp);
- 9010* Old or natural boreal forest, 0,12 ha ("Boulevard's grove" along Boulevard Road);
- 91D0* Swamp forests, 0.1 ha (AAA "Ziemeļgauja", cable route along Pukšu swamp).

Potential effects of dewatering in the SSSI include:

- 9080* Coniferous forests 0,3 ha ("Purgaile River forests");
- 91E0* Alluvial forests 1.5 ha ("Purgaile River forests").

The remaining **impacts on protected habitats and species sites in the SSSI** can be fully avoided by choosing to **locate the cable routes on the opposite side of the road from the habitats and species sites**, and by avoiding dewatering impacts on habitats in the DL "Purgaile river forests". The implementation of the Proposed Action does not pose a threat to the conservation objectives of protected areas in terms of ensuring a favourable level of protection for protected habitats of EU importance or to the integrity of protected areas at either a local or regional level.

The proposed action is not planned and is not expected to have any direct or indirect adverse effects on micro-reserves established for the protection of freshwater, grassland, forest or wetland habitats.

The proposed activity is not planned in any potential Special Protection Areas, and the implementation of the proposed activity will not have any foreseeable adverse effects on

these areas, either directly or indirectly, as far as the protection of the habitats and associated plant species included in the areas is concerned.

Impact on bird species in nearby Natura 2000 sites

No Natura 2000 site within 3 km around the proposed WPP study area is evenly populated by birds. From this point of view, the concept of Natura 2000 site becomes essentially secondary in the case of off-site impacts. In the case of bird species, the impact of the WPP-Park as a relatively large, multi-source element affecting a relatively large area is, in the opinion of the bird expert, only relevant for the smallest logical units of the populations of the species concerned, but in any case not for formally established areas of any kind. For dispersing species, the smallest logical population unit is a breeding pair, for colonial breeding birds - a colony, and for species with polygamous breeding systems - in the case of Latvia - a nest. In all three cases, the territories occupied by these population units will never, even in the case of micro-reserves, coincide with the boundaries of the SPA. Conservation measures should be taken for the species and pairs concerned, irrespective of the protected area boundaries, especially in the vicinity of the planned wind farm, where the established SSSIs fit organically into the landscape and are ecologically inseparable from it. From this perspective, **the potential impacts of the proposed WPP are discussed in the relevant species profiles, see Chapter 7.6.2.**

Two groups of bird species may be affected in relation to impacts on bird species in nearby Natura 2000 sites, both of which are characterised by long-distance flights: the ***soaring bird group***, which is characterised by long-distance foraging flights, and the flocking ***migratory waterbird group***, which is characterised by long-distance flights between feeding and roosting sites.

For both groups of species, there is reason to speak of a barrier effect created by the wind farm, which may alter flight routes, hypothetically making regions of the site "inaccessible" to the species in extreme cases, without even physically threatening the birds themselves. In the case of soaring birds, there is also a risk of physical danger to birds, which is assessed as high for some species, while the risk of physical collisions is assessed as low for the flocking migratory waterbird group, mainly due to their avoidance behaviour.

Monitoring of bird species to identify indirect impacts on Natura 2000 sites, see Chapter 12.

Tables 7.9.2 to 7.9.5 summarise the assessment of impacts **on ornithofauna** in accordance with Cabinet Regulation No 300 "Procedures for assessing impacts on Specially Protected Nature Areas of European Importance (Natura 2000)", taking into account the list of birds included in the Natura 2000 sites "Sedas bog", "Burgas meadows", "Northern Gauja", "Boulevard's Roost" and "Estonian Roost" data forms.

Table 7.9.2. Impact assessment on ornithofauna in accordance with Cabinet Regulation No 300 "Procedure for assessing the impact on specially protected nature areas of European importance (Natura 2000)" AAA "Ziemeļgauja"

Bird species	Habitat area of the species	Population density of the species	Fragmentation of the species' habitat	Disturbance to specially protected species	Isolation (separation) of a species' habitat from other species of the same kind	Changes in habitat quality of the species	Changes in the patterns and interactions that determine the structure and function of an area
Lesser Spotted Hawk <i>Accipiter gentilis</i>	no change	no change	increasing	increasing	increases insignificantly	getting worse	theoretically insignificant deterioration of feeding and social conditions in the adjacent area, insignificant risk of collisions, given the absolute inefficiency of camera systems
Suspension bird <i>Aegolius funereus</i>	decreasing	no change	increasing	increasing	increases insignificantly	getting worse	theoretically insignificant deterioration of feeding and social conditions in the adjacent area
Common tern <i>Alcedo atthis</i>	no change	no change	no change	no change	no change	no change	no change
Lesser Spotted Eagle <i>Aquila pomarina</i>	no change	no change	no change	increases insignificantly	no change	not significantly worsening	theoretically insignificant deterioration of feeding and social conditions in the adjacent area, insignificant risk of collisions, given the absolute inefficiency of camera systems
Barn Owl <i>Asio flammeus</i>	no change	no change	no change	no change	no change	no change	no change
Eel <i>Bubo bubo</i>	decreasing	no change	increases insignificantly	increases insignificantly	increases insignificantly	getting worse	theoretically insignificant deterioration of feeding and social conditions in the adjacent area
Gaigala <i>Bucephala clangula</i>	decreasing	no change	no change	increasing	increases insignificantly	no change	theoretical risk of collisions with WPP during off-site flights

Bird species	Habitat area of the species	Population density of the species	Fragmentation of the species' habitat	Disturbance to specially protected species	Isolation (separation) of a species' habitat from other species of the same kind	Changes in habitat quality of the species	Changes in the patterns and interactions that determine the structure and function of an area
European nightjar <i>Caprimulgus europaeus</i>	no change	no change	no change	increasing	no change	getting worse	theoretical risk of collisions with WPP during off-site flights, altered feeding conditions around WPP
White Stork <i>Ciconia ciconia</i>	no change	no change	no change	increasing	increases insignificantly	not significantly worsening	theoretically negligible impact on off-site flights, negligible risk of collisions given the absolute inefficiency of camera systems
Black Stork <i>Ciconia nigra</i>	no change	no change	increases insignificantly	increasing	increasing	getting worse	theoretically impaired access to feeding points due to avoidance, negligible risk of collisions given the absolute inefficiency of camera systems
Reed Bunting <i>Circus aeruginosus</i>	no change	no change	no change	no change	increases insignificantly	no change	negligible risk of collisions, given the absolute inefficiency of camera systems
Wood pigeon <i>Columba oenas</i>	decreasing	no change	increases insignificantly	increasing	no change	not significantly worsening	theoretical risk of collisions with WPP during off-site flights
Common quail <i>Coturnix coturnix</i>	no change	no change	no change	no change	no change	no change	no change
Grieze <i>Crex crex</i>	no change	no change	no change	no change	no change	no change	no change
White-backed <i>Dendrocopos leucotos</i>	decreasing	no change	increasing	no change	no change	no change	no change
Common Woodpecker <i>Dendrocoptes</i>	decreasing	no change	no change	no change	no change	no change	no change

Bird species	Habitat area of the species	Population density of the species	Fragmentation of the species' habitat	Disturbance to specially protected species	Isolation (separation) of a species' habitat from other species of the same kind	Changes in habitat quality of the species	Changes in the patterns and interactions that determine the structure and function of an area
<i>medius</i>							
Black Woodpecker <i>Dryocopus martius</i>	decreasing	no change	increasing	no change	no change	not significantly worsening	nesting territories of some pairs close to the site boundary will inevitably also be submitted in the vicinity of the WPP
Peregrine Falcon <i>Falco columbarius</i>	decreasing	no change	increases insignificantly	increasing	increases insignificantly	not significantly worsening	theoretically, the presence of WPP will not significantly alter foraging areas in adjacent areas
Little Flycatcher <i>Ficedula parva</i>	decreasing	no change	increasing	no change	no change	no change	no change
Common <i>Gallinago media</i>	decreasing	no change	no change	no change	no change	no change	no change
The underwing net <i>Glaucidium passerinum</i>	decreasing	no change	increasing	increases insignificantly	increases insignificantly	not significantly worsening	theoretically insignificant deterioration of feeding and social conditions in the adjacent area
Crane <i>Grus grus</i>	decreasing	no change	increasing	increases insignificantly	increases insignificantly	not significantly worsening	theoretically insignificant deterioration of feeding and social conditions in the adjacent area, insignificant risk of collisions, given the absolute inefficiency of camera systems
Sea eagle <i>Haliaeetus albicilla</i>	decreasing	no change	increasing	increasing	increasing	getting worse	theoretically impaired access to feeding points due to avoidance, negligible risk of collisions given the absolute inefficiency of camera systems
Brown Chiffchaff <i>Lanius collurio</i>	no change	no change	no change	no change	no change	no change	no change

Bird species	Habitat area of the species	Population density of the species	Fragmentation of the species' habitat	Disturbance to specially protected species	Isolation (separation) of a species' habitat from other species of the same kind	Changes in habitat quality of the species	Changes in the patterns and interactions that determine the structure and function of an area
Sila chickadee <i>Lullula arborea</i>	possible increase	possible increase	decreasing	increasing	decreasing	getting worse	risk of ecological trapping, as the WPP sites are highly likely to attract this species
Black grouse <i>Lyrurus tetrix</i> <i>tetrix</i>	possible increase	possible increase	decreasing	no change	decreasing	improving	The WPP construction sites are potentially attractive landscapes, as the species inhabits forest clumps. Due to the infrequent and high flights, the risk of collisions with wings is assessed as low, but there are concerns about collisions with towers. The effect of disturbance on the location of roosts has not been demonstrated.
Osprey <i>Pandion haliaetus</i>	decreasing	no change	increasing	increasing	increases insignificantly	getting worse	foraging flights in the vicinity of the WPP most likely to be affected, negligible risk of collisions given the absolute inefficiency of the camera systems
Gull <i>Pernis apivorus</i>	decreasing	no change	increasing	increasing	increases insignificantly	getting worse	theoretically insignificant deterioration of feeding and social conditions in the adjacent area, insignificant risk of collisions, given the absolute inefficiency of camera systems
Three-toed woodpecker <i>Picoides tridactylus</i>	decreasing	no change	increasing	no change	increases insignificantly	no change	no change
Grey Woodpecker <i>Picus canus</i>	decreasing	no change	increasing	no change	no change	getting worse	no change

Bird species	Habitat area of the species	Population density of the species	Fragmentation of the species' habitat	Disturbance to specially protected species	Isolation (separation) of a species' habitat from other species of the same kind	Changes in habitat quality of the species	Changes in the patterns and interactions that determine the structure and function of an area
Yellow Plover <i>Pluvialis apricaria</i>	no change	no change	no change	no change	no change	no change	no change
Osprey <i>Porzana porzana</i>	no change	no change	no change	no change	no change	no change	no change
Barn Owl <i>Strix uralensis</i>	decreasing	no change	increasing	increasing	increases insignificantly	getting worse	theoretically insignificant deterioration of feeding and social conditions in the adjacent area
Striped Warbler <i>Sylvia nisoria</i>	no change	no change	no change	no change	no change	no change	no change
Black grouse <i>Tetrao tetrix tetrix</i>	no change	no change	no change	no change	no change	no change	no change
Woodcock <i>Tetrao urogallus</i>	decreasing	no change	increasing	increasing	increases insignificantly	getting worse	theoretically insignificant deterioration of feeding and social conditions in the adjacent area
Blackcap <i>Tetrastes bonasia</i>	no change	no change	no change	no change	no change	no change	no change
Marsh Harrier <i>Tringa glareola</i>	no change	no change	no change	no change	no change	no change	no change
Çikuts <i>Gallinago media</i>	no change	no change	no change	no change	no change	no change	no change

Table 7.9.3. Impact assessment on ornithofauna in accordance with Cabinet Regulation No 300 "Procedures for assessing impacts on specially protected nature areas of European importance (Natura 2000)" DL Sedas bog

Bird species	Habitat area of the species	Population density of the species	Fragmentation of the species' habitat	Disturbance to specially protected species	Isolation (separation) of a species' habitat from other species of the same kind	Changes in habitat quality of the species	Changes in the patterns and interactions that determine the structure and function of an area
Suspension bird <i>Aegolius funereus</i>	decreasing	no change	increasing	increasing	increases insignificantly	getting worse	theoretically insignificant deterioration of feeding and social conditions in the adjacent area
Common tern <i>Alcedo atthis</i>	no change	no change	no change	no change	no change	no change	no change
Eurasian White-bellied <i>Anas penelope</i>	no change	no change	no change	no change	no change	no change	Theoretical, negligible risk of collisions during migration to Seda. The species is not characterised by local overflights, but collisions are possible during long-distance migrations, given that Seda is an attractive area
White-fronted goose <i>Anser albifrons</i>	no change	no change	no change	increasing	increases insignificantly	getting worse	local overflight tracks affected in sector D, negligible risk of collisions given the non-absolute efficiency of the camera systems
White-fronted goose <i>Anser fabalis</i>	no change	no change	no change	increasing	increases insignificantly	getting worse	local overflight tracks affected in sector D, negligible risk of collisions given the absolute inefficiency of the camera systems
Golden eagle <i>Aquila chrysaetos</i>	decreasing	no change	increasing	increasing	increases insignificantly	getting worse	theoretically insignificant deterioration of feeding and social conditions in the adjacent area. It should be stressed that the golden eagle in Seda is listed in very old

Bird species	Habitat area of the species	Population density of the species	Fragmentation of the species' habitat	Disturbance to specially protected species	Isolation (separation) of a species' habitat from other species of the same kind	Changes in habitat quality of the species	Changes in the patterns and interactions that determine the structure and function of an area
							sources, unlike the Northern Goshawk which is not listed, there is a negligible risk of collisions given the absolute inefficiency of camera systems
Lesser Spotted Eagle <i>Aquila pomarina</i>	no change	no change	no change	no change	no change	no change	negligible risk of collisions, given the absolute inefficiency of camera systems
Least Tern <i>Bonasa bonasia</i>	decreasing	no change	increasing	increasing	increases insignificantly	getting worse	theoretically, feeding and social conditions in the adjacent area are not significantly impaired
Lielais dumpis <i>Botaurus stellaris</i>	no change	no change	no change	increases insignificantly	no change	not significantly worsening	theoretically worsened social conditions due to noise pollution. Species migrates at night at WPP blade height, theoretical risk of collisions.
White-fronted goose <i>Branta leucopsis</i>	no change	no change	no change	increasing	increases insignificantly	getting worse	local overflight tracks affected in sector D, negligible risk of collisions given the absolute inefficiency of the camera systems
Eel <i>Bubo bubo</i>	decreasing	no change	increases insignificantly	increases insignificantly	increases insignificantly	getting worse	theoretically, feeding and social conditions in the adjacent area are not significantly impaired
European nightjar <i>Caprimulgus</i>	no change	no change	no change	increasing	no change	getting worse	theoretical risk of collisions with WPP during off-site flights, altered feeding

Bird species	Habitat area of the species	Population density of the species	Fragmentation of the species' habitat	Disturbance to specially protected species	Isolation (separation) of a species' habitat from other species of the same kind	Changes in habitat quality of the species	Changes in the patterns and interactions that determine the structure and function of an area
europaeus							conditions around WPP
Black tern <i>Chlidonias niger</i>	no change	no change	no change	no change	no change	no change	theoretical risk of collisions with WPP during off-site flights
White Stork <i>Ciconia ciconia</i>	no change	no change	no change	increasing	increases insignificantly	not significantly worsening	theoretically negligible impact on off-site flights, negligible risk of collisions given the absolute inefficiency of camera systems
Black Stork <i>Ciconia nigra</i>	no change	no change	increases insignificantly	increasing	increasing	getting worse	theoretically impaired access to feeding points due to avoidance, negligible risk of collisions given the absolute inefficiency of camera systems
Reed Bunting <i>Circus aeruginosus</i>	no change	no change	no change	increases insignificantly	no change	not significantly worsening	theoretically insignificant deterioration of feeding and social conditions in the adjacent area, insignificant risk of collisions, given the absolute inefficiency of camera systems
Corncrake <i>Crex crex</i>	no change	no change	no change	no change	no change	no change	no change
Mazais gulbis <i>Cyngus columbianus bewickii</i>	no change	no change	no change	increasing	increases insignificantly	getting worse	local overflight tracks affected in sector D, negligible risk of collisions given the absolute inefficiency of the camera systems

Bird species	Habitat area of the species	Population density of the species	Fragmentation of the species' habitat	Disturbance to specially protected species	Isolation (separation) of a species' habitat from other species of the same kind	Changes in habitat quality of the species	Changes in the patterns and interactions that determine the structure and function of an area
Northern swan <i>Cygnus cygnus</i>	no change	no change	no change	increasing	increases insignificantly	getting worse	local overflight tracks affected in sector D, negligible risk of collisions given the absolute inefficiency of the camera systems
White-backed <i>Dendrocopos leucotos</i>	decreasing	no change	increasing	no change	no change	no change	no change
Black Woodpecker <i>Dryocopus martius</i>	decreasing	no change	increasing	no change	no change	not significantly worsening	nesting territories of some pairs close to the site boundary will inevitably also be submitted in the vicinity of the VES
Common <i>Gallinago media</i>	decreasing	no change	no change	no change	no change	no change	no change
Crane <i>Grus grus</i>	decreasing	no change	increasing	increasing	increasing	getting worse	theoretically insignificant deterioration of feeding and social conditions in the adjacent area during breeding, local flyways in sector D will be affected during migration, insignificant risk of collisions given the absolute inefficiency of camera systems
Sea eagle <i>Haliaeetus albicilla</i>	decreasing	no change	increasing	increasing	increases insignificantly	getting worse	theoretically insignificant deterioration of feeding and social conditions in the adjacent area, insignificant risk of

Bird species	Habitat area of the species	Population density of the species	Fragmentation of the species' habitat	Disturbance to specially protected species	Isolation (separation) of a species' habitat from other species of the same kind	Changes in habitat quality of the species	Changes in the patterns and interactions that determine the structure and function of an area
							collisions, given the absolute inefficiency of camera systems
Little gull <i>Hydrocoloeus minutus</i>	no change	no change	no change	no change	no change	no change	theoretical risk of collisions with WPP during off-site flights
Brown Chiffchaff <i>Lanius collurio</i>	no change	no change	no change	no change	no change	no change	no change
Sila chickadee <i>Lullula arborea</i>	possible increase	possible increase	decreasing	increasing	decreasing	getting worse	risk of ecological trapping, as the WPP sites are highly likely to attract this species
Black grouse <i>Lyrurus tetrix</i>	possible increase	possible increase	decreasing	no change	decreasing	improving	The WPP construction sites are potentially attractive landscapes, as the species inhabits forest clumps. Due to the infrequent and high flights, the risk of collisions with wings is assessed as low, but there are concerns about collisions with towers. The effect of disturbance on the location of roosts has not been demonstrated.

Bird species	Habitat area of the species	Population density of the species	Fragmentation of the species' habitat	Disturbance to specially protected species	Isolation (separation) of a species' habitat from other species of the same kind	Changes in habitat quality of the species	Changes in the patterns and interactions that determine the structure and function of an area
Lesser Black-backed Gull <i>Mergellus albellus</i>	no change	no change	no change	no change	no change	no change	theoretical, negligible risk of collisions during migration to Seda. The species is not characterised by local overflights, but collisions are possible during long-distance migrations, given that Seda is an attractive area
Osprey <i>Pandion haliaetus</i>	decreasing	no change	increasing	increasing	increases insignificantly	getting worse	foraging flights in the vicinity of the WPP most likely to be affected, negligible risk of collisions given the absolute inefficiency of the camera systems
Gull <i>Pernis apivorus</i>	decreasing	no change	increasing	increasing	increases insignificantly	getting worse	theoretically insignificant deterioration of feeding and social conditions in the adjacent area, insignificant risk of collisions, given the absolute inefficiency of camera systems
Gugatnis <i>Philomachus pugnax</i>	no change	no change	no change	no change	no change	no change	theoretical, negligible risk of collisions during migration to Seda. The species is not characterised by local overflights, but collisions are possible during long-distance migrations, given that Seda is an attractive area
Three-toed woodpecker <i>Picoides</i>	no change	no change	no change	no change	no change	no change	no change

Bird species	Habitat area of the species	Population density of the species	Fragmentation of the species' habitat	Disturbance to specially protected species	Isolation (separation) of a species' habitat from other species of the same kind	Changes in habitat quality of the species	Changes in the patterns and interactions that determine the structure and function of an area
<i>tridactylus</i>							
Lesser Spotted Owl <i>Porzana parva</i>	no change	no change	no change	no change	no change	no change	no change
Osprey <i>Porzana porzana</i>	no change	no change	no change	no change	no change	no change	no change
River tern <i>Sterna hirundo</i>	no change	no change	no change	no change	no change	no change	theoretical risk of collisions with WPP during off-site flights
Black grouse Tetrao tetrix tetrix	no change	no change	no change	no change	no change	no change	no change
Blackcap <i>Tetrastes bonasia</i>	no change	no change	no change	no change	no change	no change	no change
Marsh Harrier <i>Tringa glareola</i>	no change	no change	no change	no change	no change	no change	no change

Table 7.9.4. Impact assessment on ornithofauna in accordance with Cabinet Regulation No 300 "Procedure for assessing the impact on specially protected nature sites of European importance (Natura 2000)" DL Burgas meadows

Bird species	Habitat area of the species	Population density of the species	Fragmentation of the species' habitat	Disturbance to specially protected species	Isolation (separation) of a species' habitat from other species of the same kind	Changes in habitat quality of the species	Changes in the patterns and interactions that determine the structure and function of an area
Common tern <i>Alcedo atthis</i>	no change	no change	no change	no change	no change	no change	no change
Lesser Spotted Eagle <i>Aquila pomarina</i>	no change	no change	no change	increases insignificantly	no change	not significantly worsening	theoretically insignificant deterioration of feeding and social conditions in the adjacent area, insignificant risk of collisions, given the absolute inefficiency of camera systems
Barn Owl <i>Asio flammeus</i>	no change	no change	no change	no change	no change	no change	no change
European nightjar <i>Caprimulgus europaeus</i>	no change	no change	no change	no change	no change	no change	no change
White Stork <i>Ciconia ciconia</i>	no change	no change	no change	no change	no change	no change	Theoretical negligible risk of collisions during migrations due to the absolute inefficiency of camera systems
Reed Bunting <i>Circus aeruginosus</i>	no change	no change	no change	no change	no change	no change	no change
Corncrake <i>Crex crex</i>	no change	no change	no change	no change	no change	no change	no change
Great snipe <i>Gallinago media</i>	no change	no change	no change	no change	no change	no change	no change

Bird species	Habitat area of the species	Population density of the species	Fragmentation of the species' habitat	Disturbance to specially protected species	Isolation (separation) of a species' habitat from other species of the same kind	Changes in habitat quality of the species	Changes in the patterns and interactions that determine the structure and function of an area
Crane <i>Grus grus</i>	no change	no change	no change	no change	no change	no change	Theoretically, local overflight routes between feeding and roosting sites during migration are affected, but so far these routes have not been found to pass through the area of the planned wind farm
Brown Chiffchaff <i>Lanius collurio</i>	no change	no change	no change	no change	no change	no change	no change
Gull <i>Pernis apivorus</i>	no change	no change	no change	increases insignificantly	no change	not significantly worsening	theoretically insignificant deterioration of feeding and social conditions in the adjacent area, insignificant risk of collisions, given the absolute inefficiency of camera systems
Osprey <i>Porzana porzana</i>	no change	no change	no change	no change	no change	no change	no change
Black grouse Tetrao <i>tetrix tetrix</i>	no change	no change	no change	no change	no change	no change	no change
Marsh Harrier <i>Tringa glareola</i>	no change	no change	no change	no change	no change	no change	no change

Table 7.9.5. *Impact assessment on ornithofauna in accordance with Cabinet Regulation No 300 "Procedures for assessing the impact on specially protected nature areas of European importance (Natura 2000)" DL Bulvaras riests*

Bird species	Habitat area of the species	Population density of the species	Fragmentation of the species' habitat	Disturbance to specially protected species	Isolation (separation) of a species' habitat from other species of the same kind	Changes in habitat quality of the species	Changes in the patterns and interactions that determine the structure and function of an area
Woodcock <i>Tetrao urogallus</i>	decreasing	no change	increasing	increasing	increases insignificantly	getting worse	theoretically, feeding and social conditions in the adjacent area are not significantly impaired

Summary of the assessment of impacts on Natura 2000 sites

Tables 7.9.6 to 7.9.8 provide a summary assessment of the impacts on species (excluding birds) and habitats in Natura 2000 sites in accordance with Cabinet Regulation No 300 "Procedures for assessing the impact on Specially Protected Nature Areas of European Importance (Natura 2000)".

Separate assessments are provided for the Special Protection Areas "Ziemeļgauja" (Table 7.8.6) and "Bulvāra riests" (Table 7.8.7), while the assessments for the DL "Sedas purvs", DL "Burgas pļavas" and ML "Eston riests" are summarised in a single table, as the proposed action does not directly affect any of the three Special Protection Areas (Table 7.8.8).

Table 7.9.6. Impact assessment of the Northern Gauja SPA according to the Natura 2000 impact assessment criteria for species and protected habitats in the area

No. p.k.	Criteria	Indicator	Planned trend of the project
1.	Habitat area of the specially protected habitat or species	Change in habitat area (as a result of the Proposed Action) (ha) and ratio (%) vs:	The areas of habitats and species habitats remain unchanged if <u>the cable routes are selected in the case of Alternatives B or B', the AAA "Ziemeļgauja" along Gailīšu Road is planned on the side of the road where no habitats have been identified</u> ³¹⁷ - 6270* Species-rich grassland and grazed meadows and 91D0* Swamp forests and habitats of the SPA species Baltic Cuckoo <i>Dactylorhiza baltica</i> . In the case of alternatives A or A', the North Curonian Spit is not affected.
		1. the habitat area of the habitat or species in the Natura 2000 site	Plant species and habitats remain unchanged under all alternatives as they are not directly affected. For bird species, see Table 7.8.2 for changes in habitat area
		2) habitat areas of the habitat or species in Natura 2000 sites in Latvia as a whole	Plant species and habitats remain unchanged under all alternatives as they are not directly affected. For bird species, see Table 7.8.2 for changes in habitat area
		3) the total area of habitat of the habitat or species in the country	Plant species and habitats remain unchanged under all alternatives as they are not directly affected. For bird species, see Table 7.8.2 for

³¹⁷ According to the conclusions of the habitat expert (see species and habitat expert opinion in Annex 4), the construction of the cable route in the area of the Northern Gauja SPA is feasible without destroying the habitats and the site of the SPA species: "impacts on protected habitats and species sites in the SPA can be fully avoided by choosing to locate the cable route on the opposite side of the road from the habitats and species sites".

No. p.k.	Criteria	Indicator	Planned trend of the project
			changes in habitat area
		(4) the area of habitat of the habitat or species in the Natura 2000 network of sites in the European Union as a whole	Plant species and habitats remain unchanged under all alternatives as they are not directly affected. For bird species, see Table 7.8.2 for changes in habitat area
2.	Population density of the specially protected species	Changes in population density	No change, as plant species and habitats would not be affected under all alternatives. For bird species, see Table 7.8.2.
3.	Fragmentation of habitats of specially protected habitats or species	Fragmentation relative to the initial state.	The degree, continuity or permanence of habitat fragmentation relative to the baseline would remain unchanged under all alternatives, as no direct or indirect effects are expected as a result of the Proposed Action. The proposed action will not affect SPA habitat polygons in Natura 2000 sites, so no habitat fragmentation effects are expected. An assessment of habitat fragmentation for bird species is given in Table 7.8.2.
4.	Disturbance to specially protected species	Vascular plant species	No change. The proposed action will not affect the vascular plant species of the SPA in Natura 2000 sites under all alternatives. The disturbance to SPA bird species is assessed in Table 7.8.2.
5.	Isolation (separation) of the habitat or habitat of the specially protected species from other habitats or habitats of the same kind	The isolation of the most important habitats protected by Natura 2000 sites from other habitats of the same type is determined by the location of the corresponding ecosystems The isolation (remoteness) of habitats will not change as the isolation of the most important protected habitats of the Natura 2000 site from other habitats of the same type is determined by the location of appropriate ecosystems (e.g. active areas of raised bogs) which will not be affected by the implementation of the Proposed Action.	No change. The location of the ecosystems will not be affected by the implementation of the proposed action under all alternatives. An assessment of the habitat isolation (separation) of the bird species from other species of the same type is given in Table 7.8.2.
6.	Changes in the habitat quality (structures and	No changes in the quality of specially protected habitats are expected as a result of the implementation of the	No change. Under all alternatives, no changes in the quality of specially protected

No. p.k.	Criteria	Indicator	Planned trend of the project
	functions) of the specially protected habitat or species	Proposed Action, as the Proposed Action is not expected to affect the quality of habitats in Natura 2000 sites.	habitats are expected as a result of the implementation of the Proposed Action, as no impacts on the quality of habitats in nearby Natura 2000 sites are expected. In Natura 2000 sites in the vicinity of the Proposed Action, significant effects are due to localised conditions and factors within the SPA, such as historical use and management of the site or changes to the hydrological regime within these Natura 2000 sites.
7.	Changes in the patterns and interactions that determine the structure and function of an area	Degree of fragmentation, continuity or permanence relative to the initial state.	<p>No change.</p> <p>Under all alternatives, no changes in the patterns and interactions that determine the structure and function of the sites are expected, as the effects of the Proposed Action are not expected to alter the hydrological, geological or other conditions that characterise the site, nor are they expected to have a significant effect on potential migration corridors <i>orstepping stones</i> for species.</p> <p>An assessment of changes in the patterns and interactions that determine the structure and function of the site in the context of bird species is given in Table 7.8.2.</p>

Table 7.9.7. *Impact assessment on ML "Bulvāra riests" according to the criteria for Natura 2000 impact assessment on species and protected habitats in the area*

No. p.k.	Criteria	Indicator	Planned trend of the project
1.	Habitat area of the specially protected habitat or species	Change in habitat area (as a result of the Proposed Action) (ha) and ratio (%) vs:	<p>No change in habitats and species habitat areas if <u>under Alternatives B or B' the cable route along ML "Boulevard bundle" is selected, plan on the side of the Boulevard road where no habitat is found</u>³¹⁸ - 9010* Old or natural boreal forests.</p> <p>In the case of alternatives A or A', ML</p>

³¹⁸ According to the conclusions of the habitat expert (see species and habitat expert opinion in Annex 4), the construction of the cable route along the territory of ML "Bulvāra riests" is possible without destroying the habitat: "the impact on the protected habitats in the SPA can be fully avoided by choosing to locate the cable route on the opposite side of the road from the habitats".

No. p.k.	Criteria	Indicator	Planned trend of the project
			"Boulevard bay" is not affected.
		1. the habitat area of the habitat or species in the Natura 2000 site	Plant species and habitats remain unchanged under all alternatives as they are not directly affected. For bird species, see Table 7.8.5 for changes in habitat area
		2) habitat areas of the habitat or species in Natura 2000 sites in Latvia as a whole	Plant species and habitats remain unchanged under all alternatives as they are not directly affected. For bird species, see Table 7.8.5 for changes in habitat area
		3) the total area of habitat of the habitat or species in the country	Plant species and habitats remain unchanged under all alternatives as they are not directly affected. For bird species, see Table 7.8.5 for changes in habitat area
		(4) the area of habitat of the habitat or species in the Natura 2000 network of sites in the European Union as a whole	Plant species and habitats remain unchanged under all alternatives as they are not directly affected. For bird species, see Table 7.8.5 for changes in habitat area
2.	Population density of the specially protected species	Changes in population density	No change, as plant species and habitats would not be affected under all alternatives. For bird species, see Table 7.8.5 for changes in population density.
3.	Fragmentation of habitats of specially protected habitats or species	Fragmentation relative to the initial state.	The degree, continuity or permanence of habitat fragmentation relative to the baseline would remain unchanged under all alternatives, as no direct or indirect effects are expected as a result of the Proposed Action. The proposed action will not affect SPA habitat polygons in Natura 2000 sites, so no habitat fragmentation effects are expected. An assessment of habitat fragmentation for bird species is given in Table 7.8.5.
4.	Disturbance to specially protected species	Vascular plant species	No change. Under all alternatives, the proposed action will not affect vascular plant species of SPAs in Natura 2000 sites. Disturbance to SPA bird species is

No. p.k.	Criteria	Indicator	Planned trend of the project
			assessed in Table 7.8.5.
5.	Isolation (separation) of the habitat or habitat of the specially protected species from other habitats or habitats of the same kind	<p>The isolation of the most important habitats protected by Natura 2000 sites from other habitats of the same type is determined by the location of the corresponding ecosystems</p> <p>The isolation (remoteness) of habitats will not change as the isolation of the most important protected habitats of the Natura 2000 site from other habitats of the same type is determined by the location of appropriate ecosystems (e.g. active areas of raised bogs) which will not be affected by the implementation of the Proposed Action.</p>	<p>No change.</p> <p>The location of the ecosystems will not be affected by the implementation of the proposed action under all alternatives.</p> <p>An assessment of the habitat isolation (separation) of the bird species from other species of the same type is given in Table 7.8.5.</p>
6.	Changes in the habitat quality (structures and functions) of the specially protected habitat or species	No changes in the quality of specially protected habitats are expected as a result of the implementation of the Proposed Action, as the Proposed Action is not expected to affect the quality of habitats in Natura 2000 sites.	<p>No change.</p> <p>Under all alternatives, no changes in the quality of specially protected habitats are expected as a result of the implementation of the Proposed Action, as no impacts on the quality of habitats in nearby Natura 2000 sites are expected. In Natura 2000 sites in the vicinity of the Proposed Action, significant effects are due to localised conditions and factors within the SPA, such as historical use and management of the site or changes to the hydrological regime within these Natura 2000 sites.</p>
7.	Changes in the patterns and interactions that determine the structure and function of an area	Degree of fragmentation, continuity or permanence relative to the initial state.	<p>No change.</p> <p>Under all alternatives, no changes in the patterns and interactions that determine the structure and function of the sites are expected, as the effects of the Proposed Action are not expected to alter the hydrological, geological or other conditions that characterise the site, nor are they expected to have a significant effect on potential migration corridors <i>or stepping stones</i> for species.</p> <p>An assessment of changes in the patterns and interactions that determine the structure and function of the site in the context of bird species is given in Table 7.8.5.</p>

Table 7.9.8. *Impact assessment of the DL Sedas bogs, DL Burgas meadows and the micro-reserve Estonian grouse, according to the criteria for Natura 2000 impact assessment on species and protected biotopes in the area*

No.	Criteria	Indicator	Planned trend of the project
1.	Habitat area of the specially protected habitat or species	Change in habitat area (as a result of the Proposed Action) (ha) and ratio (%) vs:	The areas of habitats and species habitats in the nature reserves "Sedas purvs" and "Burgas pļavas" and the micro-reserve "Estonian riests" remain unchanged, as the proposed action does not directly affect any of the three SSSIs.
		1. the habitat area of the habitat or species in the Natura 2000 site	Plant species and habitats remain unchanged under all alternatives as they are not directly affected. For bird species, see Tables 7.8.3 and 7.8.4 for changes in habitat area
		2) habitat areas of the habitat or species in Natura 2000 sites in Latvia as a whole	Plant species and habitats remain unchanged under all alternatives as they are not directly affected. For bird species, see Tables 7.8.3 and 7.8.4 for changes in habitat area
		3) the total area of habitat of the habitat or species in the country	Plant species and habitats remain unchanged under all alternatives as they are not directly affected. For bird species, see Tables 7.8.3 and 7.8.4 for changes in habitat area
		(4) the area of habitat of the habitat or species in the Natura 2000 network of sites in the European Union as a whole	Plant species and habitats remain unchanged under all alternatives as they are not directly affected. For bird species, see Tables 7.8.3 and 7.8.4 for changes in habitat area
2.	Population density of the specially protected species	Changes in population density	No change, as plant species and habitats would not be affected under all alternatives. For bird species, see Tables 7.8.3 and 7.8.4 for changes in population density.
3.	Fragmentation of habitats of specially protected habitats or species	Fragmentation relative to the initial state.	The degree, continuity or permanence of habitat fragmentation relative to the baseline would remain unchanged under all alternatives, as no direct or indirect effects are expected as a result of the Proposed Action. The proposed action will not affect SPA habitat polygons in Natura 2000 sites, so no habitat fragmentation effects are expected. An assessment of habitat fragmentation for bird species is given in Tables 7.8.3 and 7.8.4.
4.	Disturbance to specially protected species	Vascular plant species	No change. Under all alternatives, the proposed action will not affect vascular plant species of SPAs in Natura 2000 sites. Disturbance to SPA bird species is

No.	Criteria	Indicator	Planned trend of the project
			assessed in Tables 7.8.3 and 7.8.4.
5.	Isolation (separation) of the habitat or habitat of the specially protected species from other habitats or habitats of the same kind	The isolation of the most important habitats protected by Natura 2000 sites from other habitats of the same type is determined by the location of the corresponding ecosystems The isolation (remoteness) of habitats will not change as the isolation of the most important protected habitats of the Natura 2000 site from other habitats of the same type is determined by the location of appropriate ecosystems (e.g. active areas of raised bogs) which will not be affected by the implementation of the Proposed Action.	No change. The location of the ecosystems will not be affected by the implementation of the proposed action under all alternatives. An assessment of the habitat isolation (separation) of bird species from other species of the same type is given in Tables 7.8.3 and 7.8.4.
6.	Changes in the habitat quality (structures and functions) of the specially protected habitat or species	No changes in the quality of specially protected habitats are expected as a result of the implementation of the Proposed Action, as the Proposed Action is not expected to affect the quality of habitats in Natura 2000 sites.	No change. Under all alternatives, no changes in the quality of specially protected habitats are expected as a result of the implementation of the Proposed Action, as no impacts on the quality of habitats in nearby Natura 2000 sites are expected. In Natura 2000 sites in the vicinity of the Proposed Action, significant effects are likely to arise from localised conditions and factors within the SPA, such as historical use and management of the site or changes to the hydrological regime within these Natura 2000 sites.
7.	Changes in the patterns and interactions that determine the structure and function of an area	Degree of fragmentation, continuity or permanence relative to the initial state.	No change. Under all alternatives, no changes in the patterns and interactions that determine the structure and function of the sites are expected, as the effects of the Proposed Action are not expected to alter the hydrological, geological or other conditions that characterise the site, nor are they expected to have a significant effect on potential migration corridors <i>orstepping stones</i> for species. An assessment of changes in the patterns and interactions that determine the structure and function of the site in the context of bird species is given in Tables 7.8.3 and 7.8.4.

Taking into account that the planned construction of the wind farm does not directly affect any Natura 2000 sites and that the planned construction of the WPP will not cause additional drainage effect, it can be concluded that the implementation of the action will not have direct or indirect negative impacts on adjacent areas, including on Latvian or EU specially protected habitats in specially protected nature areas - Natura 2000 sites. The implementation of the

proposed action is not expected to exacerbate the negative impacts identified for the Natura 2000 site, namely drainage and changes in species composition due to vegetation succession.

However, it can be concluded that several bird species are likely to decrease their habitat area (outside Natura 2000 sites), the population density of bird species in the assessed Natura 2000 sites will remain generally unchanged, and some species are likely to increase, e.g. Ruben and Sanderling. Habitat fragmentation will remain unchanged for most SPA bird species, but is expected to change for a number of species, with a marginal increase in fragmentation, e.g. for the Black Stork. In relation to changes in the patterns and interactions that determine the structure and function of the site, it is concluded that for several species, such as the Lesser Spotted Eagle, the Osprey, the theoretical deterioration of feeding and social conditions in the adjacent area is insignificant and, given the absolute inefficiency of the camera system, the risk of collisions is negligible. Species such as damselflies and shrews will experience a slight deterioration in feeding and social conditions in the adjacent area. Disturbance to bird species flying from the Northern Gauja AAP to the Seda Marsh Nature Reserve will increase, but this cannot be predicted at this time.

Overall, it can be concluded that, as no significant adverse effects are expected on the habitats and species protected by Natura 2000 sites, no significant effects are expected:

- to the objectives of establishing and protecting the Natura 2000 sites referred to above;
- factors that have already affected these areas prior to the implementation of the Proposed Action;
- the role of sites in the coherence of the Natura 2000 network nationally and in the biogeographical region.

There is a possibility that the proposed activity will cause disturbance to bird species in the "Ziemeļgauja" SPA, "Sedas purvs" DL and "Bulvāra riests" ML Ornithofauna. All three of these sites are designated for the protection of rare habitats and species, including birds, and therefore-

The current nature management plans available for the Natura 2000 sites adjacent to the area of the Proposed Action at³¹⁹³²⁰ do not assess the conservation objectives for the bird species of these sites. Conservation targets can be set at the existing level, but it should be noted that the bird species data for the Natura 2000 sites adjacent to the area of the Proposed Action are from 2005-2006, when the nature management plans currently in force were drawn up.

Identification and description of cumulative impacts

In terms of cumulative impacts, the following factors have been assessed:

- 1) Location of the proposed activity and expected cumulative impact with other wind farms in Latvia and the immediate surroundings in northern Latvia

The types of impacts that could overlap with other WPP parks could be related to noise, changes in the hydrological regime, landscape impacts, impacts on bird species.

In Latvia, there are 82 WPP parks with environmental impact assessments (EIAs) applied for/underway/ongoing/completed at various stages of development (see Figure 14.1, Chapter 14) with a total onshore capacity of ~12 GW (excluding those that have been discontinued). There are no wind farms built in the northern part of Latvia, but there are wind farms for

³¹⁹ <https://www.daba.gov.lv/lv/sedas-purvs>

³²⁰ <https://www.daba.gov.lv/lv/ziemelgauja>

which environmental impact assessments have been carried out or are in various stages of preparation; information on their location in relation to the Valmiera-Valka wind park is given in Figure 3.5 in Chapter 3.2. The assessment of the cumulative environmental impacts of wind farms is based on publicly available information on these wind farms. The closest wind park is the Valka Wind Park, which borders the area of the Proposed Action to the north, between the Valmiera-Valka Wind Park and the town of Valka. In June 2024, an EIA procedure was launched for the Valka WPP Park³²¹, where up to 15 WPPs are to be built, but it is currently not possible to predict how this project will develop.

In the context of bird protection, cumulative impacts may arise, especially if the Valka wind park is built. However, in the view of the EIA report's authors, it is not currently possible to carry out a full assessment of cumulative impacts on bird conservation, as it is not possible to establish unequivocally that such impacts will occur or that all or all of the construction plans will be implemented.

In the context of the implementation of the proposed activity and the planned surveys, according to anecdotal information, a certified expert is assessing the situation of the Lesser Spotted Eagle in the Valka Wind Park in the forest area near VV92 and VV67 during the 2024 breeding season as part of the micro-reserve application. An expert opinion on the proposed Lesser Spotted Eagle micro-reserve should be awaited in order to be able to judge the further recommended development of this part of the wind park from an ornithological point of view.

- 2) Location of the proposed activity and expected cumulative impact with solar parks in the immediate vicinity in the northern part of Latvia.

The types of impacts that could overlap with solar parks could be related to impacts on landscape and bird species.

At Valka, about 4 km from the nearest WPPs - VV51 and VV67 - Evecon Ltd has purchased land and plans to install a solar park with a capacity of up to 3 MW, which in terms of area could be about 5 ha with solar panels³²². *The Lugazi fields*, located in the immediate vicinity of the future solar park, are a permanent site for cranes and a relatively permanent site for geese/swans in spring/fall. The Sun Park reduces the area of this bird feeding site. Reed bunting, lapwing, fieldfare, peregrine falcon - all species that use open areas as feeding/nesting sites will be affected, but this will depend on the specific location and whether the project is implemented.

In the assessment of the EIA report preparers, there is currently no information available to carry out a full assessment of cumulative impacts in the context of impacts on landscape and bird populations, as it is not possible to state unequivocally that such impacts will occur or that all construction proposals will be implemented or fully implemented.

- 3) Location of the proposed activity and expected cumulative impacts with forestry activities.

Types of impacts that could overlap with forestry activities include site fragmentation (outside Natura 2000 sites), deforestation (reducing foraging areas).

³²¹ <https://www.vpvp.gov.lv/lv/ietekmes-uz-vidi-novertejumu-projekti/veja-parka-valka-un-ta-saistitas-infrastruktur-as-buvnieciba-valkas-novada-valkas-pagasta-sia-ewe-neue-energien-1>

³²² https://www.valka.lv/lv/jaunums/saules-panelu-parks-bus-ari-valkas-novada?utm_source=https%3A%2F%2Fwww.google.com%2F and <https://ziemellatvija.lv/elektribas-ieguve-ar-saules-paneliem-nakotne-ari-latvija-tostarp-valka/>

A comparison of data published on Globalforestwatch³²³ the land cover of the Valmiera-Valka WPP is divided into natural forests (7.14 thousand ha), planted forests (7.68 thousand ha) and other land uses (1.46 thousand ha) (Figure 7.9.1).

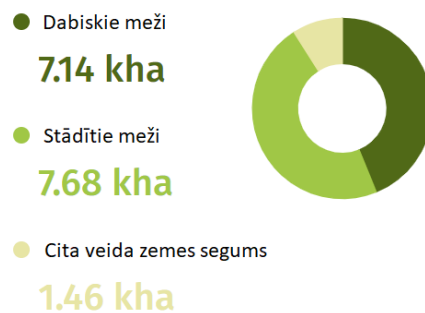


Figure 7.9.1. WPP "Valmiera-Valka" land cover according to Global forest watch data.

Comparing the data published on the portal, it can be concluded that in the period from 2001 to 2023, the LVM area of the Valmiera-Valka WPP decreased forest cover by 4190 ha or 28% of the total area (Figure 7.9.2).

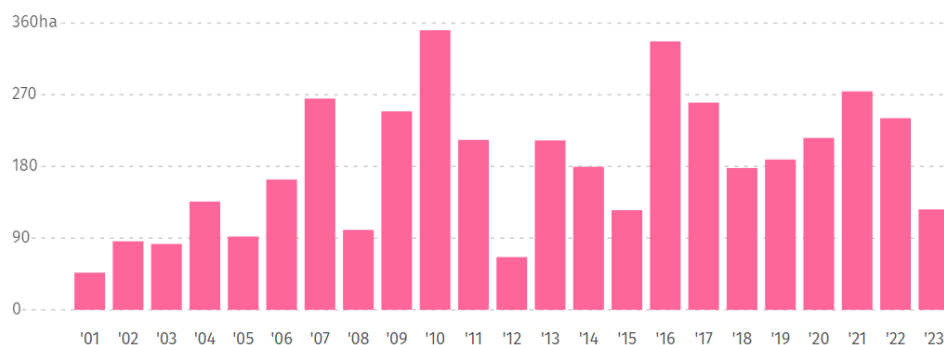


Figure 7.9.2. Reduction of forest cover in the area of LVM lands of the Valmiera-Valka WPP in the period 2001-2023

Figure 7.9.3 provides a visual representation of the changes in forest land in the Valmiera-Valka WPP in 2001, 2010, 2020 and 2023. The area of forest stands in the LVM area of VPP Valmiera-Valka increased by 5.8% or 949 ha between 2000 and 2020, the increase is shown in the map fragment for 2023.

³²³ <https://www.globalforestwatch.org/> an online platform that provides data on forest use around the world using modern remote sensing and analysis technologies, the portal allows anyone to get information on where and how forest cover is changing around the world

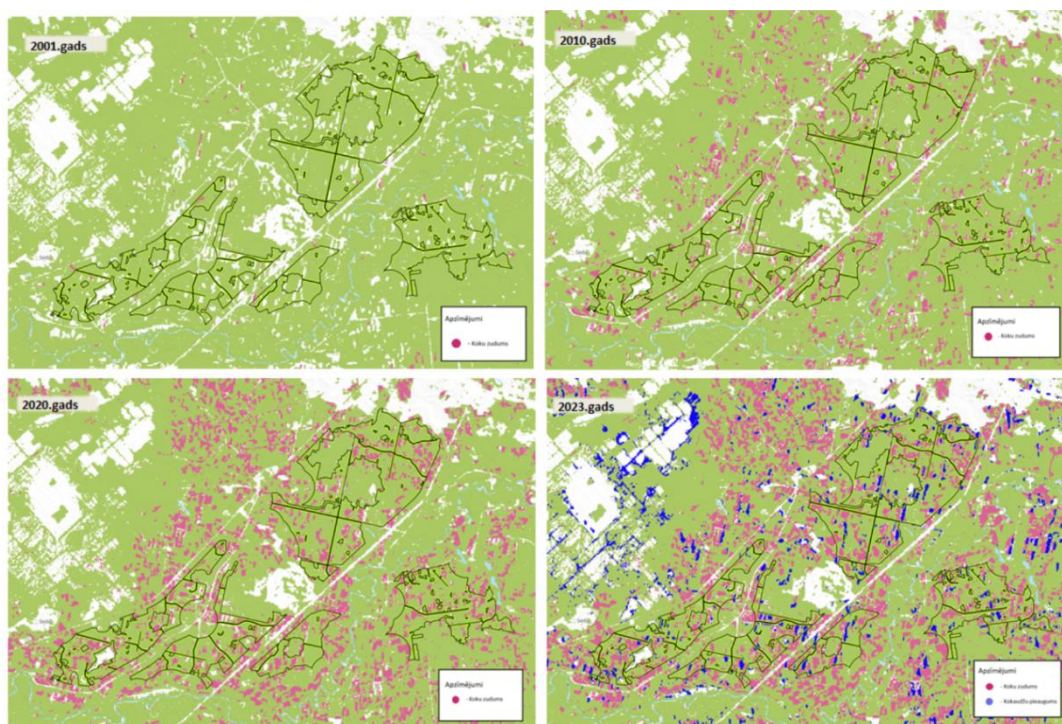


Figure 7.9.3. Changes in forest land in the Valmiera-Valka WPP (2001, 2010, 2020 and 2023)³²⁴

Mitigation measures for Natura 2000 sites

Overall, based on the expert assessment of habitats, vascular plant species, invertebrates, the Proposed Action does not pose a threat to the conservation objectives of protected areas in terms of ensuring a favourable level of protection for protected habitats of EU importance or to the integrity of protected areas at either local or regional level.

In relation to the assessment of impacts on bird species, it should be noted that although the Proposed Action is planned outside the boundaries of Natura 2000 sites, it is surrounded by several Natura 2000 sites that are also sites of importance for birds, DL "Sedas purvs" and AAP "Ziemeļgauja".

For some species, the potential impacts of the proposed WPP cannot be separated into Natura 2000 sites and non Natura 2000 sites due to the ecology of these bird species and the ecological integrity of the sites with adjacent areas, while for the remaining species, no significant impacts of the proposed WPP on the breeding populations of these species in the two large Natura 2000 sites - Seda Marsh and North Gauja - can be identified for any of the species. The already minor impacts will be reduced by the proposed mitigation measures for the NPPF (see Chapter 7.6.3 and summary in Table 7.9.9.).

Table 7.9.9. Impact on *Natura 2000 sites* mitigation measures³²⁵

	Event	Conditions to be taken into account
Project conception dossier		
1.	Infrastructure design	The cable route connection from the Alternative B location to the substation is planned along the A6 road,

³²⁴ <https://www.globalforestwatch.org/>

³²⁵ The actions are defined using recommendations from the Guidelines for wind energy projects and EU nature legislation, Commission Communication C (2020) 7730 final, Brussels, 18.11.2020.

	Event	Conditions to be taken into account
Project conception dossier		
		<p>connecting to the substation using the connection that would be made in the case of the Alternative A group WPP connection.</p> <p>If in the case of WPP park alternatives B or B' it is chosen to construct the cable routes in the NATURA 2000 area AAA "Ziemeļgauja" along the Gailīšu road, then they should be planned on the side of the road where no biotopes have been found - 6270* Species-rich pastures and grazed meadows and 91D0* Bog forests and habitats of the SPA species <i>Dactylorhiza baltica</i> (Baltic cuckoo fritillary).</p>
2.	WPP siting planning	<p>- The location of WPP VV28 needs to be clarified at the design stage, as it is currently too close to the planned micro-reserve for the apodice.</p> <p>- Further information is awaited following investigations carried out in adjacent areas. WPP VV49, VV50, VV51, VV64, VV66, VV67 may be affected by the establishment of a micro-reserve for the lesser spotted eagle</p>
Pre-construction phase		
1.	Pre-construction monitoring of nesting birds	For the monitoring of nesting birds, the "Methodology for the study of the Wind Farm and the preparation of an Expert Opinion" used in the initial study of the site shall be used as a basis ³²⁶
2.	Pre-construction monitoring of soaring birds	Monitoring must be agreed with the competent authority.
3.	Pre-construction monitoring of migratory bird species	Monitoring must be agreed with the competent authority.
4.	Ambient noise measurements	<p>It is also recommended that at least one year of ambient noise measurements be carried out before the wind farm is put into operation, so that they can be compared with measurements during the lifetime of the wind farm.</p> <p>As studies on the effects of noise from VES on Ural Owls (<i>Strix uralensis</i>) are controversial (see Chapter 7.6.2), pre-construction monitoring of this species should be carried out to assess the potential noise disturbance from WPP. This includes studying bird behaviour and adapting the operation of the WPP to</p>

³²⁶ Ūlands, D., Millers, K. 2022. Methodology for the Wind Farm Study and the Expert Report

	Event	Conditions to be taken into account
Project conception dossier		
		the observed data.
5.	Natura 2000 bird species monitoring	The need for Natura 2000 monitoring of bird species in the two Natura 2000 sites adjacent to the site to enable a qualitative assessment of the potential impact of the proposed wind farm on them.
6.	Choosing the best available alternative	<ul style="list-style-type: none"> - When selecting WPP turbines, project promoters should choose WPP turbines that comply with the noise limits. - Taking into account the results of the pre-construction monitoring of bird species, one of the two scenarios VV1, VV82/VV42, VV36 should be chosen; the expert recommends to abandon VV1 and VV82, unless there are some technological reasons why it would be better to abandon VV42 and VV36.
Conditions/restrictions during the construction period		
1.	Restrictions on the construction of a WPP and an assembly and service yard	<p>Harvesting is to be carried out from 1 September to 1 February, and it is recommended that no work involving increased noise and artificial light emissions is planned between 1 February and 1 July;</p> <p>Falls >25 cm diameter need to be retained and moved to adjacent stands.</p>
2.	Restrictions on construction of access road, electricity cable route	Cable routes to be built without felling trees in habitat areas
Operating period restrictions/conditions		
1.	For bird conservation	<p><u>FOR ALL</u></p> <p>Install WPP suspension camera systems;</p> <p>In line with the results of the pre-construction monitoring, assess the current proposals -</p> <p>(1) For the protection of soaring birds, during the period from 1 April to 1 October, the operation of WPPs shall be suspended from one hour before to one hour after local sunrise and sunset,</p> <p>(2) To protect migratory birds in flocks, suspend the operation of the WPP from 15 February to 15 May and from 1 September to 15 November,</p> <p>(3) comply with owl protection measures (noise restrictions),</p> <p>(4) to prevent the 'flicker' effect from WPP VV16 un VV46 on the rookeries between 1 April and 15 May between sunrise and 4 hours after sunrise</p> <p>ALL VV20, 21, 24, 26,28, 30, 31, 32, 33, 81, 88 :</p>

	Event	Conditions to be taken into account
Project conception dossier		
		If a potential Black Stork nest is found , the WPP is located in an area where the breeding site qualifies as a site of long-term importance for the conservation of the population, the WPP cannot be operated.
2.	For the protection of bats	<u>FOR ALL</u> Install WPP suspension camera systems; Suspension or non-activity from 1 May to 30 September during the night from sunset to sunrise if: 1) wind speed at turbine rotor height is 6 m/s or less, 2) air temperature above 6°C, 3) rainfall does not exceed 1 mm/h, Depending on the results of the monitoring, the restrictions could be revised - lifted altogether, relaxed or strengthened
3.	Monitoring of bird species	The results of the monitoring shall be submitted to the competent authority. Based on the results of the bird monitoring, additional conditions may be imposed to mitigate the impacts of the proposed operation during the operation of the wind farm. If monitoring measures show that mitigation measures are ineffective, the competent authorities may also decide that compensatory measures are necessary.
4.	Inventory of birds killed in collisions	The results of the inventory shall be submitted to the competent authority.
5.	Bat monitoring	Acoustic monitoring with ultrasonic detectors. Based on the results of bat species monitoring, additional conditions may be imposed to mitigate the impacts of the proposed operation during the operation of the wind farm. Where monitoring measures demonstrate an impact the ineffectiveness of mitigation measures, the competent authorities may also decide on the need to implement compensatory measures.
6.	Inventory of dead bats	The results of the inventory shall be submitted to the competent authority.

Summarising the assessment of impacts on Natura 2000 sites, it can be concluded that no specific mitigation measures are currently identified as necessary in accordance with the Cabinet of Ministers Regulation of 19 April 2011 No 300 "Procedure for assessing impacts on a Specially Protected Nature Area of European Importance (Natura 2000)".

7.10. Summary of mitigation measures

A summary of the mitigation measures for the WPP included in the recommended alternative EIAs at the design, construction, operation stages is attached as Annex 12 (electronic excel file [due to its size](#)).

Table excel in Annex 12 describes all identified impacts (non-significant and adverse) for each WPP turbine separately, e.g. for WPP No VV81, adverse impacts were identified for the WPP and crew area on birds - black stork feeding area, owls, as well as on landscape - impact on the cultural landscape of Seda from the town centre and impact from the Captain Irv monument.

The table also indicates the mitigation measures identified by the experts for each turbine, e.g. the landscape expert indicates that the maximum height (including wings) of WPP turbine No VV81 is 250 metres. The ornithologist recommends that this WPP should be relocated with the prior agreement of the habitat expert.

It also gives the expert constraints for each WPP, the installation and maintenance area, as well as the access roads and power cable routes, both during construction and operation. During the construction period of the WPP and the assembly service area, for example, the ornithologist has set a condition for the protection of birds in the context of the negative impact of turbine VV1: logging should be carried out between 1 September and 1 February, and it is recommended that no work involving increased noise and artificial light emissions should be planned between 1 February and 1 July. However, the same turbine (VV1) has been restricted by an ornithologist during operation: **Install WPP stop camera systems** - assess current proposals in line with pre-construction monitoring results: (1) stopping WPP around sunrise/sunset to protect soaring birds (from 1 April to 1 October), (2) observing owl protection measures (noise restrictions).

Regarding compliance with the daily_{ADI} values recommended in the WHO guidelines:

- For VPPs VV88, VV85, VV84, VV47, VV46, VV37, VV21, VV16 under Alternative A, mitigation measures to be implemented include: when selecting VPPs, the project promoter should select WPPs with noise emissions that comply with WHO recommendations, install WPPs with the lowest possible noise emissions and aerodynamically improved wings;
- In the case of Alternative B for WPPs VV88, VV85, VV84, VV66, VV47, VV46, VV37, VV21, VV16, mitigation measures should be implemented: when selecting WPPs, the project promoter should select WPPs with noise emissions in line with WHO recommendations, install WPPs with the lowest possible noise emissions and aerodynamically improved wings.

8. Justification of the chosen alternative in the light of a comparison of environmental impacts

The purpose of the Law on Facilitated Procedure for Construction of Energy Supply Structures to Promote Energy Security and Independence is to promote the production of renewable energy, to promote energy security and independence of the Republic of Latvia, as well as to mitigate the processes of negative climate and environmental change. The law provides for a simplified procedure, inter alia, for the construction of WPPs and the infrastructure needed for them. The construction of WPPs is allowed on agricultural and forest land as defined in the municipality's spatial plan.

If the Cabinet of Ministers grants the status of an object of national interest to the proposed WPP park, no municipal approval is required for its construction: once the EIA has been carried out and the opinion of the State Environmental Monitoring Office has been received, the Cabinet of Ministers decides on the approval of the Proposed Action.

The EIA for the proposed action assesses alternatives for the location of the WPP park and evaluates technological alternatives - height alternatives, three different WPP heights.

All the alternatives evaluated would achieve the objective of the Proposed Action to install new WPPs with a rated capacity of up to 8 MW each.

A summary, taking into account the assessments of an ornithologist, a species and habitat expert, a landscape expert, a bat expert and a hydrologist, and the physical impact assessment for all 84 WPP sites assessed in the EIA, is presented in Table 8.1. The red colour is used for WPPs and environmental impact areas where significant negative impacts have been identified, the yellow colour for WPPs and environmental impact areas where adverse impacts have been identified and the green colour for environmental impact areas where no adverse or significant impacts have been identified. For all WPPs, undesirable effects have been identified that can be avoided or reduced by conditions or constraints in the design documentation, during the construction phase or during operation (see Annex 12 for conditions and constraints for recommended WPPs).

Based on this assessment, recommended alternatives for the location of the WPP park have been defined:

Alternative A - 29 WPP: compact area in the SW between the Seda, the Gauja and the Pukši swamp (see Figure 4.1.5 in Chapter 4)

Alternative B - 43 WPPs: the compact area in the SW (29 WPPs of Alternative A) and the feasible WPPs to the N of the Pukši swamp (see Figure 4.1.6 in Chapter 4)

Table 8.1. Summary of expert assessments for all 84 WPPs assessed

Designation:

No adverse or significant effects	Adverse effects detected	Significant negative impacts
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No.	Name of the WPP site	Birds	Bats	Habitat s/speci es	Noise	Flicker	Landscap es	Hydrology
1	VV1	✓ ³²⁷					250/ 275	
2	VV2							
3	VV3							
4	VV4							
5	VV5							
6	VV6							
7	VV7							
8	VV8							
9	VV9							
10	VV10							
11	VV11							
12	VV12							
13	VV13							
14	VV14							
15	VV15							
16	VV16							
17	VV17							
18	VV18							
19	VV19							
20	VV20							
21	VV21							
22	VV22							
23	VV23							
24	VV24						275	
25	VV25						275	
26	VV26							
27	VV27							
28	VV28							
29	VV29							
30	VV30						275	
31	VV31							
32	VV32							
33	VV33							
34	VV34							

³²⁷ šajā tabulā atzīmētas VES attiecībā uz kurām, saskaņā ar putnu eksperta nosacījumiem, jāizvēlas viens no abiem VV1, VV82/VV42 ,VV36 scenārijiem

No.	Name of the WPP site	Birds	Bats	Habitat s/speci es	Noise	Flicker	Landscap es	Hydrology
35	VV35							
36	VV36	✓					250/ 275	
37	VV37							
38	VV38							
39	VV39							
40	VV40							
41	VV41 (at the bottom)							
42	VV42	✓						
43	VV43							
44	VV44							
45	VV45							
46	VV46							
47	VV47						250/ 275	
48	VV48						250	
49	VV49						250/ 275	
50	VV50							
51	VV51							
52	VV52							
53	VV53 (Gauja ridge)							
54	VV54 (Gauja ridge)							
55	VV55 (Gauja kr.k.)							
56	VV56 (Gauja ridge)							
57	VV57 (Gauja ridge)							
58	VV58 (Gauja kr.k.)							
59	VV59 (Gauja ridge)							
60	VV60 (Gauja ridge)							
61	VV61							
62	VV62							
63	VV63							
64	VV64							
65	VV65						250/ 275	
66	VV66						250/ 275	
67	VV67						250/ 275	
68	VV68						250/ 275	
69	VV69						250	
70	VV70						250/ 275	
71	VV71						250	
72	VV81						275	

No.	Name of the WPP site	Birds	Bats	Habitats/species	Noise	Flicker	Landscapes	Hydrology
73	VV82	✓					250	
74	VV83						250	
75	VV84							
76	VV85							
77	VV86							
78	VV87							
79	VV88						250/ 275	
80	VV89							
81	VV90							
82	VV91							
83	VV92						250	
84	VV93							

Comparison of location alternatives A and B in terms of ornithofauna values

In terms of impacts on ornithological values in the area of the proposed wind farm, the two alternatives do not differ significantly. The NE part of the WPP park location Alternative B, which is the divergent part between Alternatives A and B, is generally located in very poor habitats. It accounts for a relatively small part of the total impact of the wind farm. The most ornithologically valuable part of the Proposed Action study area is the forest edge along the VV92 - VV68 line, however, even in the presence of the lesser spotted eagle in the N part of the study area, the Luksti meadow area in the R part of the study area is significantly more ornithologically valuable.

The wood stork, black stork and golden eagle are the three "exclusion" bird species expected to be most affected by the proposed wind park. The closest WPP group to Valka in Alternative B is likely to have an additional impact on one to two roe deer rookeries and a relatively small sector of golden eagle nesting territory compared to Alternative A. It should be stressed that the WPP group does not fully include any of the potentially additionally affected rookeries. The theoretical connectivity between the rookeries and the feeding areas of the golden eagle will be maintained in the case of the construction of the nearest WPP group to Valka, subject to the conditions set by the ornithologist in the WPP.

The isolated impact of the WPP group closest to Valka on the Black Stork population in the vicinity of the wind park is assessed as marginal. Although a micro-reserve has been established to protect the breeding site of the Black Stork to the E of this group, and another breeding area is known in the direction of Mežmuiža (S-SE) from this group, the WPP group area itself is considered to be not very suitable for the Black Stork, as there are few potentially suitable feeding sites for the species - small forest streams and ditches. The Gauja and the Seda with their tributaries are much more suitable. As the foraging conditions of the Black Stork in this WPP group area are suboptimal, the absence of a WPP group would not contribute significantly to the conservation of the species. The nearest known nests of Black Storks are at considerable distances, so habitat loss due to avoidance is not an issue for this WPP group. Similarly to other soaring bird species, the most interesting for the Black Stork in the context of this WPP group is the woodland and the adjacent open landscape with the Seda River and its floodplain along the VV92 - VV68 line, but according to the currently known

information and M. Strazds' recommendations, no additional adjustments to the WPP location are necessary.

Cumulative effects are not expected for two groups of WPP located so far apart (Alternative B), even though they are located in sequence in the predominant direction of autumn and spring migrations. As a naturally separating, significantly different landscape within the forest massif, Pukši bog is a sufficiently distinct feature that the impact of one VEC group on bird species does not sum to the impact of another VEC group on birds. From the point of view of autumn and spring bird migration flows, the proposed alternative placement of the two groups is even considered to be somewhat successful, as the potentially affected migration flows would be significantly higher if the two groups were placed in the NW-SE direction (perpendicular to the current placement).

Comparison of location alternatives A and B in terms of impacts on habitats and plant species

Overall, if the Proposed Action were to be implemented at a scale of 93 turbines without mitigation measures, it would result in significant adverse impacts on protected habitats, protected species and their habitats at local and regional level, and significant adverse impacts at national level. The areas of habitats and species destroyed and adversely affected, in relation to the number of habitats and species found in Latvia, are mostly percentages, but it should be taken into account that the implementation of the Proposed Action affects a large forest area, which is characterised by high biodiversity and large areas of protected habitats and species habitats; the fragmentation of such an area by WPP development sites and associated infrastructure has adverse impacts that extend beyond the areas of natural value specifically affected, such as species sites and protected habitat habitats. Reducing the number of potential WPP turbine sites by recommending alternative A or B for the location of the WPP park also reduces the length of road sections to be newly constructed or reconstructed, thus reducing the fragmentation impact on the forest massif.

The mitigation measures would significantly reduce the number and extent of habitats and species destroyed, but would still result in the destruction of significant areas of habitat 91T0 Lichen-rich pine forests and relatively small areas of habitat 9010* Old-growth or natural boreal forests, resulting in **minor adverse effects** at local and regional scales **and minor adverse effects at national scales**. It is recommended that Alternative A is selected and that the possibility of refining the locations and access roads for VV37, VV39, VV40, VV44 without affecting areas of protected habitats is assessed. For planned WPP sites that cannot be developed without destroying the 91T0 habitat area, restoration or enhancement measures for the relevant habitat type shall also be planned over at least an equivalent area. If Alternative B is implemented, it is recommended that the construction of Sites VV7 and VV70 be completely abandoned, but if these WPPs are to be implemented, mitigation recommendations should be implemented and taken into account.

Adjustments following additional expert assessment of the proposed alternatives

According to the opinions of natural experts, the assessment of the WPP to be implemented was revised and significant environmental impact factors - impact on bird species - were identified for 3 more WPP, and for 4 more WPP it was recommended to choose two out of four, with the choice to be made at the design stage, assessing the engineering conditions. After further assessment of the alternative locations of the WPP Park as defined above, Alternative A has 27 WPPs (of which 25 could be built), Alternative B has 40 WPPs: of which 38 could be built, see Table 8.2.

Table 8.2. Additional expert assessments of the proposed WPPs under the siting alternatives

No.	Before adding to the findings					Addenda to the opinion of the bird expert (E. Dzeņa)	Addenda to the opinion of the habitat expert (A. Pošiva)	Following additions to the opinions				
	WPP	Alternative A	Alternative A'	Alternative B	Alternative B'			VES	Alternative A	Alternative A'	Alternative B	Alternative B'
1	VV1	250 ³²⁸	275	250	275	one of the two scenarios VV1, VV82/VV42 , VV36 should be chosen, the expert recommends to abandon VV1 and VV82, unless there are some technological reasons that it would be better to abandon VV42 and VV36. Pre-construction monitoring should be carried out and then a decision made.		VV1	250	275	250	275
2	VV7			300	300		In the existing layout and access option, the impact on the SSSI - beech tree area, wetland habitats and species habitats, access to be re-planned from A side. Additional assessment for a new site on the site of a previously planned WPP at the design stage	VV7			300	300
3	VV9			300	300			VV9			300	300
4	VV16	300	300	300	300			VV16	300	300	300	300
5	VV20	300	300	300	300			VV20	300	300	300	300
6	VV21	300	300	300	300			VV21	300	300	300	300
7	VV22	300	300	300	300			VV22	300	300	300	300

³²⁸ Šeit (un turpmāk tabulas šūnās ar zilu fonu) norādīts VES torņa augstums metros, kas atbilst VES torņa augstuma alternatīvai (skat. 4.2.2. tabulu).

	Before adding to the findings							Following additions to the opinions				
No.	WPP	Alternative A	Alternative A'	Alternative B	Alternative B'	Addenda to the opinion of the bird expert (E. Dzeņa)	Addenda to the opinion of the habitat expert (A. Pošiva)	VES	Alternative A	Alternative A'	Alternative B	Alternative B'
8	VV24	250	275	275	300			VV24	250	275	275	300
9	VV26	300	300	300	300			VV26	300	300	300	300
10	VV28	300	300	300	300	Location to be clarified later as it is too close to the planned micro-reserve for the apodice, currently the location is maintained		VV28	300	300	300	300
11	VV30	250	275	250	275			VV30	250	275	250	275
12	VV31	300	300	300	300			VV31	300	300	300	300
13	VV32	300	300	300	300			VV32	300	300	300	300
14	VV33	300	300	300	300			VV33	300	300	300	300
15	VV36	250	275	250	275	choose one of the two scenarios VV1, VV82/VV42 , VV36		VV36	250	275	250	275
16	VV37	300	300	300	300			VV37	300	300	300	300
17	VV38	300	300	300	300			VV38	300	300	300	300
18	VV39	300	300	300	300			VV39	300	300	300	300
19	VV40	300	300	300	300			VV40	300	300	300	300
20	VV41	300	300	300	300			VV41	300	300	300	300
21	VV42	300	300	300	300	choose one of the two scenarios VV1, VV82/VV42 , VV36		VV42	300	300	300	300
22	VV44	300	300	300	300	potential impacts on golden eagle		VV44				
23	VV45	300	300	300	300	potential impacts on golden eagle		VV45				
24	VV46	300	300	300	300			VV46	300	300	300	300
25	VV47	250	275	250	275			VV47	250	275	250	275

	Before adding to the findings							Following additions to the opinions				
No.	WPP	Alternative A	Alternative A'	Alternative B	Alternative B'	Addenda to the opinion of the bird expert (E. Dzeņa)	Addenda to the opinion of the habitat expert (A. Pošiva)	VES	Alternative A	Alternative A'	Alternative B	Alternative B'
26	VV49			250	275	Further information should be awaited following investigations in adjacent areas. Implementation of WPP may be affected by the establishment of a micro-reserve for the Lesser Spotted Eagle		VV49			250	275
27	VV50			300	300	Further information should be awaited following investigations in adjacent areas. Implementation of WPP may be affected by the establishment of a micro-reserve for the Lesser Spotted Eagle		VV50			300	300
28	VV51			300	300	Further information should be awaited following investigations in adjacent areas. Implementation of WPP may be affected by the establishment of a micro-reserve for the Lesser Spotted Eagle		VV51			300	300
						This turbine is recommended instead of the VV62	Habitat 91T0 is destroyed on site - 1.8 ha, access road affects 91T0 approx. 2.1-2.5 ha, dune terrain is disturbed	VV61			300	300
29	VV62			300	300	Effects on the rut		VV62				
30	VV64			300	300	Further information should be awaited following investigations in adjacent		VV64			300	300

	Before adding to the findings							Following additions to the opinions				
No.	WPP	Alternative A	Alternative A'	Alternative B	Alternative B'	Addenda to the opinion of the bird expert (E. Dzeņa)	Addenda to the opinion of the habitat expert (A. Pošiva)	VES	Alternative A	Alternative A'	Alternative B	Alternative B'
						areas. Implementation of WPP may be affected by the establishment of a micro-reserve for the Lesser Spotted Eagle						
31	VV65			250	275			VV65			250	275
32	VV66			250	275	Further information should be awaited following investigations in adjacent areas. Implementation of WPP may be affected by the establishment of a micro-reserve for the Lesser Spotted Eagle		VV66			250	275
33	VV67			250	275	Further information should be awaited following investigations in adjacent areas. Implementation of WPP may be affected by the establishment of a micro-reserve for the Lesser Spotted Eagle		VV67			250	275
34	VV68			250	275			VV68			250	275
35	VV70			250	275			VV70			250	275
36	VV81	250	275	250	275			VV81	250	275	250	275
37	VV82	300	300	300	300	choose one of the two scenarios VV1, VV82/VV42 , VV36		VV82	300	300	300	300
38	VV84	300	300	300	300			VV84	300	300	300	300
39	VV85	300	300	300	300			VV85	300	300	300	300
40	VV86	300	300	300	300			VV86	300	300	300	300

	Before adding to the findings							Following additions to the opinions				
No.	WPP	Alternative A	Alternative A'	Alternative B	Alternative B'	Addenda to the opinion of the bird expert (E. Dzeņa)	Addenda to the opinion of the habitat expert (A. Pošiva)	VES	Alternative A	Alternative A'	Alternative B	Alternative B'
41	VV88	250	275	250	275			VV88	250	275	250	275
42	VV91			300	300			VV91			300	300
43	VV92			250	275	Located in the Black Stork Conservation Area - 300 m of the River Seda - not recommended		VV92				
		29	29	43	43				27*	27*	40*	40*
									25* in fact, because 2 WPP (VV1, VV82 or VV42, VV36) will not be implemented		38* in fact, because 2 WPP (VV1, VV82 or VV42, VV36) will not be implemented	

Summary of the comparison of the impacts of the proposed alternatives to the proposed action

Impacts assessing the existing situation in the area of the proposed activity and the situation expected under the alternative to be implemented:

1. Species and habitats
2. Bats
3. Birds
4. Invertebrates
5. Mammals
6. Landscape
7. Cultural history
8. Tourism and recreation
9. Natura 2000
10. Noise
11. Low frequencies
12. Flicker
13. Air
14. Hydrology
15. Environmental risks and accidents
16. Vibration
17. Climate
18. Communication systems

The assessment of the impact scenario has been given a conditional numerical characterisation, summarised in Table 8.3.

Table 8.3. *Impact rating scale*

Rating	Explanation
-3	Significant adverse changes are expected: Violation of environmental quality threshold values or environmental regulatory requirements laid down in regulatory enactments; such effects shall be assessed as an exclusion factor. Where significant adverse effects are identified and the proposed activity is of significant public interest, compensatory measures are required by law.
-2	Slight adverse changes are expected: The proposed activity may result in non-attainment of the target values for environmental quality set out in the legislation and guidelines or significant qualitatively or quantitatively measurable adverse changes in natural resources or the state of the environment compared to the baseline condition.
-1	Minor adverse effects: There may be minimal impacts on natural resources, which do not generally preclude the achievement of the target or threshold values for environmental quality set out in the regulatory enactments, but there are qualitatively or quantitatively measurable adverse changes in natural resources or environmental status compared to the baseline condition.
0	no impact, ambiguous impact or no detectable impact: No qualitative or quantifiable changes in the functions of natural resources and impacts on public environmental rights are foreseeable.
+1	Slight favourable changes are expected: Possible positive impacts on natural resources,

Rating	Explanation
	but relatively minor and/or temporary.
+2	Significant positive changes are expected: The magnitude, likelihood and/or duration of the beneficial effects are significant. The proposed action will result in significant quantitative or qualitative measurable improvements in the quality of the environment compared to the baseline condition.
+3	Significant favourable changes are expected: The proposed action will result in significant quantitative or qualitative measurable improvements in the quality of the environment; the environmental quality objectives set out in the legislation and guidelines will be achieved.

Table 8.4. Comparison of alternatives to the proposed action

Object or type of impact	Alternative for location A		Alternative for location B		Notes
	Technological alternative A	A' Technological alternative	Technological alternative B	B' Technological alternative	
1. Species and habitats	-1	-1	-2	-2	<p>Minor adverse effects at local and regional level and not significant adverse effects at national level. It is recommended that Alternative A is selected and that the possibility of refining the sites and access roads VV37, VV39, VV40, VV44 without affecting the protected habitat areas and without destroying the 91T0 habitat area is assessed.</p> <p>If Alternative B is implemented, it is recommended that the access to VV7 be planned from A. Under Alternative B, the cable route is planned without crossing the Northern Gauja AAP.</p> <p>No significant adverse effects have been identified that would result in any of the alternatives not being implemented.</p>
2. Birds	-1	-1	-1	-1	<p>If the recommended restrictions on the operation of the WPP are complied with, the WPP suspension camera systems are installed and used during operation in accordance with the results of the pre-construction monitoring, the conditions on the deforestation period of the sites are complied with, and other recommendations of the bird expert, including monitoring measures for bird species, minor adverse effects are expected - the two alternatives are not significantly different.</p> <p>No significant negative impacts have been identified that would prevent any of the alternatives for the location of the NPPF from being implemented.</p>
3. Bats	0	0	0	0	<p>If WPP shutdown camera systems are installed, automatic shutdown or non-startup of wind turbines is ensured in accordance with WPP operational recommendations, bat monitoring is ensured in the first and second year after wind turbine start-up, and turbine operating restrictions are respected during WPP operation based on monitoring results, the establishment of a WPP park is allowed under both siting alternatives. The expert concluded that the establishment of a WPP park, subject to certain conditions, is permissible at all 84 WPP sites assessed, although currently no more than 40 WPP sites are recommended for WPP construction.</p> <p>The impact on bat species is assessed as "0", as bat activity in the area of the WPP parks may increase significantly after the construction of the turbines and bats may</p>

Object or type of impact	Alternative for location A		Alternative for location B		Notes
	<i>Technological alternative A</i>	<i>A' Technological alternative</i>	<i>Technological alternative B</i>	<i>B' Technological alternative</i>	
					appear in large numbers in areas where they were not detected during the feasibility study. Bats are strongly attracted to wind turbines, although the reasons for this are not yet clear.
4. Invertebrates	0	0	0	0	The main protection measures for specially protected invertebrate species are the removal of dead wood (fallen trees, stumps, snags) from the built-up area (construction of new access roads and VPP maintenance areas); if this condition is met, the populations of invertebrate species will not be affected. No significant negative impacts have been identified that would prevent the implementation of any of the alternatives for the location of the WPP.
5. Mammals	-1	-1	-1	-1	The construction of the WPP parks will not significantly change the status of specially protected species at national level. Local and wider indirect and cumulative impacts on wild mammals (up to 10 km away from the study area of the Proposed Action) are expected, the consequences and spatial limits of which are currently unknown and unpredictable.
6. Landscape	-1	-1	-2	-2	Scenario A with 25 turbines has the least impact on the landscape. In some places, the impact remains high, despite a significant reduction in impact compared to the maximum model. Scenario 'A' has only a slightly higher impact on the landscape at a regional level. The differences between scenario A and scenario A' are local. Scenario B has a much greater impact on the landscape, with 13 turbines added to Scenario A in the northern part of the wind farm. Scenario B' has the greatest impact on the landscape. The differences between scenario B and scenario B' are local. No significant adverse landscape impacts have been identified that would prevent any of the alternatives for the location of the NPPF from being implemented.
7. Cultural history	-1	-1	-2	-2	Scenario A with 25 turbines has the lowest impact on cultural heritage. In some places, the impact remains high, despite a significant reduction in impact compared to the maximum model. Scenario 'A' has only a slightly higher impact on cultural heritage at the regional level. The differences between scenario A and scenario A' are local.

Object or type of impact	Alternative for location A		Alternative for location B		Notes
	<i>Technological alternative A</i>	<i>A' Technological alternative</i>	<i>Technological alternative B</i>	<i>B' Technological alternative</i>	
					Scenario B has a much greater impact on cultural heritage, as Scenario A adds 13 turbines to the northern part of the wind farm. Scenario B' has the greatest impact on cultural heritage. The differences between scenario B and scenario B' are local. No significant adverse impacts on cultural heritage have been identified that would prevent any of the alternatives for the location of the WPP from being realised.
8. Tourism and recreation	-1	-1	-2	-2	Scenario A with 25 turbines has the lowest impact on tourism and recreation. In some places, the impact remains high, despite a significant reduction in impact compared to the maximum model. Scenario 'A' has only a slightly higher impact on tourism and recreation at regional level. The differences between scenario A and scenario A' are local. Scenario B has a much higher impact on tourism and recreation, as 13 turbines have been added to Scenario A in the northern part of the wind farm. Scenario 'B' has the greatest impact on tourism and recreation. The differences between scenario B and scenario B' are local. No significant negative impacts on tourism and recreation have been identified that would prevent any of the alternatives for the location of the NPPF from being implemented.
9. Natura 2000	-1	-1	-2	-2	Scenario A with 25 turbines has less impact on adjacent Natura 2000 sites. No significant adverse impacts on Natura 2000 sites have been identified that would prevent any of the alternatives for the location of the WPP from being implemented.
10. Noise	0	0	0	0	No exceedances of the noise limit values are not expected as a result of the noise calculations.
11. Low frequencies	0	0	0	0	For low-frequency noise, the limits and procedures in Denmark are used as a basis, as there are no limits in Latvia. The low frequency outdoor noise modelled in the EIA does not reach the lowest indoor level in any nearby development: 15 dB(A) (see Chapter 7.2.2)
12. Flicker	0	0	0	0	The shadow duration target of 10 hours per year is not exceeded in any house (see Chapter 7.3)
13. Air	0	0	0	0	No impacts on air quality are expected such that conditions precluding the

Object or type of impact	Alternative for location A		Alternative for location B		Notes
	<i>Technological alternative A</i>	<i>A' Technological alternative</i>	<i>Technological alternative B</i>	<i>B' Technological alternative</i>	
					implementation of the action can be identified.
14. Hydrology	0	0	0	0	Taking into account that the construction works will be carried out in compliance with the requirements of the Law on Land Reclamation and Cabinet Regulation No 329 "Regulations on Latvian Building Standard LBN 224-15 "Land Reclamation Systems and Hydrotechnical Structures"" and Territorial Use and Building Regulations of Strenči and Valka Municipalities, it is not expected that the construction process of the WPP parks could negatively affect the functioning of land reclamation systems in the territory of the planned WPP parks or their surroundings. Potential impacts on plant species and habitats in the SPAs and SACs can be considered to be insignificant, as the changes would be insignificant and not very noticeable against the background of natural seasonal fluctuations in groundwater levels.
15. Environmental risks and accidents	0	0	0	0	The proposed activity is located entirely within forest land, with no other sensitive receptors, public facilities or residential dwellings in the vicinity. The calculations are based on the risks of natural disasters, mechanical damage, air traffic impact of the WPP fleet and BESS container accident. For each of the predicted risks and emergencies, the EIA defines risk mitigation measures that, if followed and implemented, are not expected to lead to increased risks or emergencies (see Chapter 5.3)
16. Vibration	0	0	0	0	There are no laws and regulations in Latvia that regulate the level of vibration in the environment. No WPP is planned within 800 m of a human dwelling in the proposed action. The vibration magnitude of the WPP at a distance of 300 m was assessed to be lower than the lowest limit value for operating theatres at night set in the now obsolete Cabinet Regulations, i.e. the vibration acceleration should not have exceeded 0.028 m/s^2 (see Chapter 7.2.3).

Object or type of impact	Alternative for location A		Alternative for location B		Notes
	<i>Technological alternative A</i>	<i>A' Technological alternative</i>	<i>Technological alternative B</i>	<i>B' Technological alternative</i>	
17. Climate	+1	+1	+1	+1	The biggest savings will come from replacing fossil-fuelled electricity with power generated by WPPs, which have lower GHG emissions from electricity generation. The _{CO2} emission reductions for Alternative A would be: 813 275, and for alternative B: 1 196 785 tonnes _{CO2} eq. (see Chapter 5.4).
Summary	-6	-6	-10	-10	When comparing Alternatives A and B for the location of the WPPF, Alternative A scores more favourably, but Alternative B is also feasible, as no significant negative impacts have been identified that would make Alternative B infeasible.

Overall, the comparison and analysis of the alternatives for the location and heights of the WPPs presented in Table 8.4 did not reveal any circumstances that would prevent the location or technical realisation of Alternatives A or B of the proposed wind farm. The location and technical feasibility of all alternatives is possible.

Alternative B is primarily recommended because of the advantage of this WPP park in its proximity to the 330 kV high voltage line (less deforested area for the construction of new AST lines) and its proximity to large electricity consumers. As the construction of new substations near high-voltage lines has its own technological limitations, it is most efficient, economically feasible and safe to build generating capacity (WPP).

9. Cross-border assessment

In the context of transboundary impacts, the Republic of Estonia has been identified as the country likely to be affected by the proposed action.

9.1. Transboundary impact assessment for landscape, tourism and recreation

As part of the Estonian territory (part of Valga County, Valga Municipality and the whole of Valga City) falls within the landscape study area, the transboundary impacts of the Proposed Action on the landscapes, tourism and recreation of this part of Estonia have been assessed. Estonian territory is located within 4.2 km of the nearest assessed WPP turbine.

The Estonian Ministry of Climate (Kliimaministeerium) has summarised the views of various stakeholders in a letter to the State Environmental Monitoring Office. It asks for an assessment of the impact on Karula National Park (Karula rahvuspark), half of which lies within 20 km of the nearest turbine, Karula-Pikkjärve Protected Landscape Area (Karula Pikkjärve maastikukaitseala), Koiva-Mustjõe Protected Landscape Area (Koiva-Mustjõe maastikukaitseala).

In terms of turbine locations, the closest turbines to the area of the Proposed Action are the Koiva-Mustjegi Karula AEP turbines 9.1 km away on the right bank of the Gauja River (VV70)). The Karulas-Pikjerva AEP is located 15.7 km from the nearest turbine (VV68). The Karul National Park boundary is 20 km from the nearest turbine (VV68).

In the closest Estonian open areas to the proposed operation, e.g. between Londi and Lepa in Valga municipality, wind turbines would be visible at a distance of 5.5 km.

Lookout towers are important viewpoints. The closest one to the proposed operation is at Tsirgumäe, the Tellingumäe vaatetorn, which is 25 km away from turbine VV68. It offers a wide panoramic view of the Mustjegi River, as well as the territory of Latvia (towards the Cīrgali dune massif). If this and other turbines are also visible in clear weather, they should be considered as background objects.

Taking into account the distance of the Proposed Action from the territory of Estonia, the transboundary impact in the context of the aspects to be assessed is assessed as negligible, corresponding to a rating of "0", or "no impact, uncertain impact or undeterminable impact" according to the impact rating scale (see Table 8.3): no qualitatively or quantitatively measurable changes in the functions of natural resources and impacts on public environmental rights are foreseeable.

9.2. Impact assessment on birds

Impacts on the Republic of Estonia have been assessed in a similar level of detail as for adjacent areas in Latvia. The impacts in Latvia are considered in two zones - 3 and 10 km around the proposed final wind farm configuration. The 3 km zone around the wind farm does not affect the territory of the Republic of Estonia, while the 10 km zone affects 5355 ha (6.2% of the entire 10 km zone) of the territory of the Republic of Estonia (Figure 9.1).

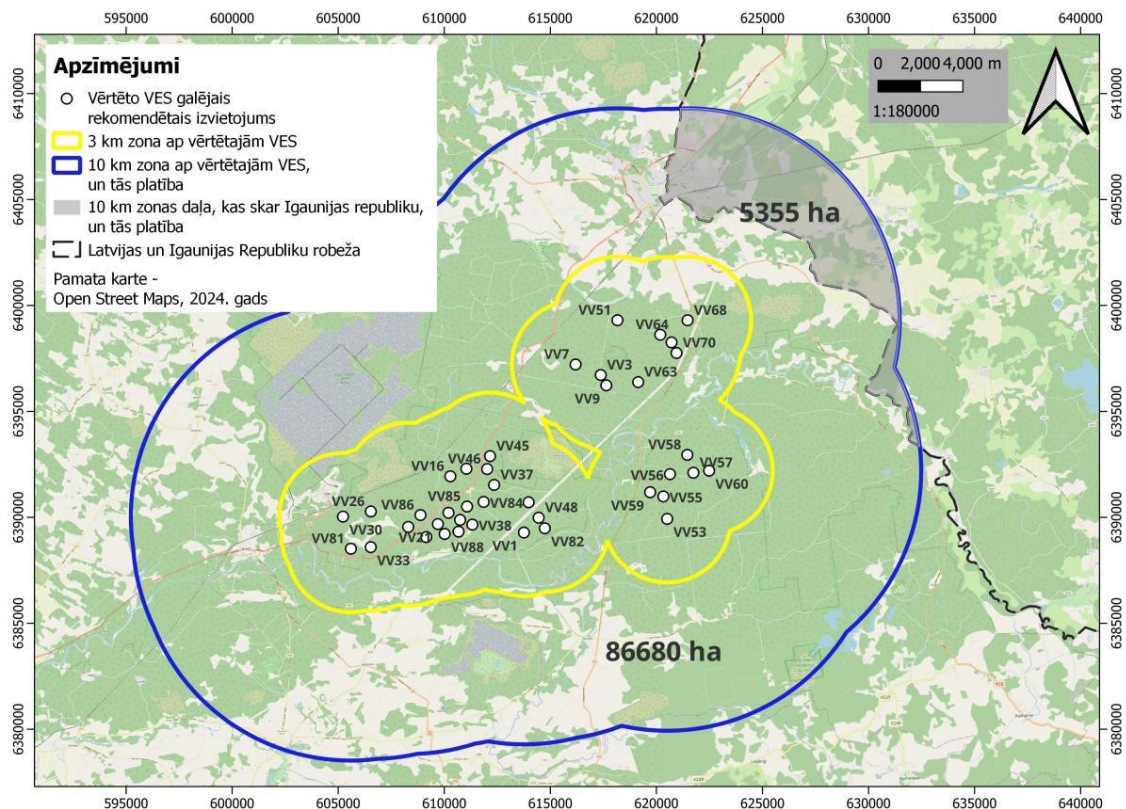


Figure 9.1. The planned 10 km area of the Valka-Valmiera wind farm affects the territory of the Republic of Estonia

The transboundary impact analysis uses bird observation data publicly available in the free databases elurikkus.ee and plutof.ut.ee. Combining the observation data available from both sources, 7,927 bird observations have been recorded in the Estonian part of the 10 km area of influence of the planned wind farm since 1 January 2020.

In a 10 km zone, including the territory of the Republic of Estonia, the expected impact of the planned wind farm on migratory flocks of waterbirds - cranes, swans and geese - was assessed. These species are characterised by regular movements between feeding and roosting sites, and it is therefore recommended to avoid the installation of dense WPP groups along flyways.

The planned configuration of the WPP Park is recommended to avoid dense groups of WPP in the local flyways of cranes, swans and geese. Concentrations of these species groups have been observed in open landscapes near the N part of the planned wind farm, but their local flyways do not cross the territory of the planned wind farm.

Transboundary effects on the crane/swan/goose species group within the territory of the Republic of Estonia are assessed as negligible. In all likelihood, there will be no direct impact at all if the WPP is built.

Other groups of flocking migratory bird species - e.g. waders, plovers, passerines - do not regularly fly locally between roosting and feeding sites. The potential impact of wind farms on these species should be considered at the level of global migration routes and so-called "bottle necks", rather than at the level of local low-flying flyways, as is the case for cranes, swans and geese.

Migration of ducks, herons, sparrows, storks, day and night birds of prey, and other migratory species in Latvia mostly follows a SW direction in autumn and a NE direction in spring, following the so called "flyway". The East Atlantic Flyway³²⁹, more specifically its White-Baltic Sea branch.

Outside areas of concentrations of migratory bird flows caused by natural barriers, migratory bird species fly over land in a broad front, evenly covering the entire land area. The planned national-scale WPP park is located at Latvia's western border. Thus, in spring, the wind farm will have minimal impact on migratory birds nesting in Latvia, but a greater impact on birds migrating through Latvia to the Republic of Estonia and areas to the NNE of Estonia. Some species, especially those that are visually sensitive to the "barrier effect" created by the wind park, will avoid it, others will ignore it or - in the dark part of the day - not see it. The shape of the planned WPP park is longitudinally elongated in the NE-SW direction, which coincides with the main direction of bird migration in the territory of Latvia. Thus, from the perspective of the bird migration route, they are largely spaced behind each other and do not form a wide barrier perpendicular to the migration route, blocking it.

In autumn, a similar picture is expected - the planned wind farm in the SW direction will meet migratory birds right at the Latvian border, affect the populations of migratory bird species in the Republic of Estonia and the area to the NNE of it, with minimal impact on the populations of migratory birds nesting in the territory of Latvia.

Of the range of bird species theoretically migrating through the planned wind farm area to the territory of the Republic of Estonia and beyond, the most endangered, in the bird expert's view, are nocturnal migrants and small-medium sized birds. Thanks to the promising results of WPP camera systems, the most critical group of species - large passerines - is under significantly reduced threat. The fact that these birds may have to slightly change their migration route due to the "barrier effect" of the wind farm is not considered to be a significant negative factor. However, the main point is that the risk of collisions to this group of species has been significantly reduced, so no significant negative impacts on migratory large soaring bird species breeding in the Republic of Estonia and areas to the NE of Estonia are expected. A WPP-free zone of at least 1 km around the most likely feeding sites of Black Storks is also maintained, further reducing the threat to migrating Black Storks.

Taking into account the literature available on the impact of wind farms on migratory species, and mainly emphasising the fact that the proposed wind farm is located outside the concentration of bird migration flows, the so-called "bottle neck" sites, in the opinion of the bird expert, no migratory bird species passing through the area of the proposed wind farm is expected to be significantly negatively affected by the wind farm on the population of the species concerned.

9.3. Overview of transboundary impacts of the Ministry of Climate of the Republic of Estonia

An overview of the transboundary impacts of the Ministry of Climate of the Republic of Estonia and how they have been taken into account in the preparation of the EIA for the Valmiera-Valka HPP is presented in Table 9.1.

Table 9.1. Overview of transboundary impacts of the Ministry of Climate of the Republic of Estonia

No.	Aspects of transboundary impacts to be taken into account in the EIA by the Ministry of Climate of the Republic of Estonia	Posted by	Notes
1.	A WPP park is planned for Estonia.	Ministry of Regional	The landscape assessment takes

³²⁹ BirdLife International 2010, Busse 2001, Busse et.al. 2014

No.	Aspects of transboundary impacts to be taken into account in the EIA by the Ministry of Climate of the Republic of Estonia	Posted by	Notes
	<p>The cumulative visual impact of wind farms should be assessed.</p> <p>Planning documents related to planned WPP parks in Estonia should be taken into account.</p>	Affairs and Agriculture	<p>into account information on planned WPP parks in Estonia. Cumulative visual effects across the border are assessed as negligible.</p>
2.	<p>The proposed action may affect:</p> <ul style="list-style-type: none"> - movement of game, - noise pollution, - the local population, - power grid stability 	Ministry of Economic Affairs and Communications of the Republic of Estonia	<p>Large mammals have relatively high intelligence and good mobility. Their response and speed of adaptation to the WPP parks is currently unpredictable. Studies on the impact of WPP parks on terrestrial wild mammal and domestic animal species have concluded that the results of studies on these species should not be extrapolated from one site to another.</p> <p>The expert recommends that the controlling national authorities should require the developers of the North Latvian and Estonian border wind parks (Figure 3.2.5 of the EIA report) to jointly undertake specialised monitoring of wild mammals in cooperation with the controlling national authorities and scientific institutions.</p> <p>Indirect and cumulative impacts of wind turbines on wild mammals are expected up to a distance of approximately 10 km from the study area of the Proposed Action.</p> <p>A mammal expert opinion on the assessment of the impact of the WPP on terrestrial non-flying mammals has been received as part of the EIA (attached as Annex 4).</p> <p>The noise assessment is presented in Chapter 7.2. No transboundary effects have been identified.</p> <p>In the Republic of Estonia, the local population is not expected to be affected.</p> <p>The stability of the electricity grid in the Republic of Estonia is not</p>

No.	Aspects of transboundary impacts to be taken into account in the EIA by the Ministry of Climate of the Republic of Estonia	Posted by	Notes
			expected to be affected.
3.	<p>The WPP park is located 1.5 km from the Natura 2000 Important Bird Area KOIVA-Mustjoe. The site is also designated as a landscape conservation area. Black Stork breeding in the area is also possible. Attention should also be paid to goose migration and the nesting sites of black grouse.</p> <p>Bats are also present in the area and impacts on bat species are also assessable.</p> <p>Attention should also be paid to the continuity of green corridors, as the Gauja River is an important corridor for the movement of game. Including large predators.</p> <p>Given that significant drainage works are planned, the impact of these works on water quality and fish populations in the Gauja needs to be assessed.</p> <p>Cumulative impacts to be assessed and, if necessary, mitigation measures and monitoring to be planned.</p> <p>If it is found that the impact goes beyond what was originally planned, the environmental impact in Estonia should be further assessed.</p> <p>There are several protected areas within a 20 km radius - Karula National Park, Karula Important Bird Area and Karula Nature Area.</p>	Estonian Environmental Administration	<p>An assessment of the impacts on Natura 2000 sites and birds in the Republic of Estonia is presented in Chapter 10.2.</p> <p>The assessment of bats is presented in Section 7.6.3.</p> <p>The Gauja valley will not be crossed if the proposed Action (Alternative A or B) is implemented.</p> <p>Continuity of green corridors in a transboundary context will not be affected - the construction of the WPP is not planned in the Gauja valley, which is an important corridor for the movement of game, including large carnivores.</p> <p>A mammal expert opinion on the assessment of the impact of the WPP on terrestrial non-flying mammals has been received as part of the EIA (attached as Annex 4).</p> <p>Water quality and fish populations in the Gauja will not be affected.</p> <p>Mitigation measures and monitoring are foreseen.</p> <p>The environmental impacts in Estonia are not expected to exceed those described in Chapters 10.1 and 10.2.</p> <p>Nature experts have assessed that no impacts are expected on the Karula National Park, the Karula Important Bird Area and the Karula Nature Area.</p>
4.	It has been observed that the noise generated by WPPs is more disturbing than the same level of noise generated by roads and airports.	Estonian Health Board	For noise, the lowest limit values we assess are 45 dB at night, 50 dB in the evening and 55 dB during the day, as required by the MC Regulations.

No.	Aspects of transboundary impacts to be taken into account in the EIA by the Ministry of Climate of the Republic of Estonia	Posted by	Notes
	According to the Estonian noise level limits, noise should preferably not exceed 50 dB per day (from 10.00 to 30.00). 7.00 to 23.00) and 40 dB at night (from 7.00 to 23.00). 23.00 to 7.00), as for residential areas.		The noise assessment is presented in Chapter 7.2. No transboundary effects have been identified.
5.	It is noted that the Koiva-Mustjoe N2000 site is marked on the map, but that most of it is also the Koiva-Mustjoe Grassland Natural Area.	Estonian Fund for Nature	The maps have been updated to https://natura2000.eea.europa.eu/
6.	An assessment of the impact on N2000 sites should be included. The continuity of the Gauja River migration corridor must be ensured. This needs to be assessed during the EIA. At the same time, the Estonian side informs that another WPP park is planned about 4 km from the town of Valka and 9 km from the planned WPP park. Estonia will inform Latvia by another letter.	Municipality of Valga	The impact on N2000 has been assessed in chapter 7.9. Information on the Valga WPP Park has been obtained and taken into account in the EIA assessment. The Gauja valley will not be crossed if the proposed Action (Alternative A or B) is implemented.
7.	The transboundary assessment must include protected areas within a 10 km buffer zone around the location of the proposed activity. Impacts on the N2000 sites Koiva-Mustjoe and Aheru need to be assessed. At the same time, clarification is requested on the meaning of the 3 km, 10 km and 20 km zones of influence included in the attached map.	Ministry of Climate	Impacts on Natura 2000 have been assessed, if any. The 3 km, 10 km and 20 km zones of influence were initially delineated within the study and survey areas, which were refined during the EIA according to the area assessed.

In addition, the "Convention on the Transboundary Effects of Industrial Accidents" has been in force since 27.09.2004 and provides for transnational cooperation in the field of industrial accidents. The quantity and hazardousness of chemical substances at the site of the Proposed Operation do not reach the threshold values specified in this Convention, therefore the provisions of this Regulation are not applicable to the construction of the Valmiera - Valka WPP Park and its related infrastructure.

10. Information on the predictive methods or evidence used by the proponent to identify and assess the significant environmental effects of the proposed activity

The following research methods were applied in the preparation of the EIA report:

- analysis of the literature on the impacts of similar facilities,
- field studies
- Experiments,
- calculations and modelling

In preparing the Environmental Impact Assessment Report, a literature review was carried out, summarising the results of studies carried out so far on the positive and negative impacts of the NPS on the environment and society. Although more than 20 years have passed since the first WPPs were installed in Latvia, there have been practically no studies on the environmental and social impacts of WPPs in Latvia so far, therefore the EIA has mainly analysed the experience of other countries with wind energy development and its impacts.

The encyclopaedia "Plants of Latvia"³³⁰ was used for identification and nomenclature of vascular plant species, mosses and lichens (for identification and nomenclature of other species - methodological materials on indicator species of natural forest habitats³³¹). The assessment of the species' occurrence in the country, typical habitats and ecological requirements has been carried out using information from DDPS "Ozols", portal "Dabasdati"³³², unpublished materials from species assessments according to IUCN categories in the project "LIFE for Species" and other materials available to experts.

Habitat assessment and survey was carried out according to the methodology of the project "Creation of preconditions for better biodiversity conservation and ecosystem protection in Latvia" or "Dabas skaitīšana" - "Methodology for the identification of distribution and quality of habitats of EU importance and organisation of works" approved by the Ministry of Environmental Protection and Regional Development and coordinated by the Ministry of Agriculture. The status of protected species and habitats is determined in accordance with Cabinet of Ministers' Regulation No 350 of 20 June 2017 "Regulations on the List of Specially Protected Habitat Types" and Cabinet of Ministers' Regulation No 396 of 14 November 2000 "Regulations on the List of Specially Protected Species and Specially Protected Species of Restricted Use". Guidelines for certified experts in the field of species and habitat conservation on the assessment of the Proposed Action with regard to the construction of forest roads and the establishment, rehabilitation and reconstruction of forest drainage systems³³³.

Field surveys for the assessment have been carried out in and around the area of the Proposed Action by experts on birds, bats, plant species, habitats and landscapes. In the preparation of the EIA report, the Proposed Development area was also surveyed to record the technical condition of the roads and to assess the drainage systems.

In preparing the EIA report and predicting potential impacts, calculation or modelling techniques were widely used to quantify certain impacts. The environmental noise modelling has been carried

³³⁰ Priedītis, 2014. *Encyclopaedia of Latvian plants*

³³¹ Liepiņa, 2018; Meiere, 2018; Moisejevs, 2018; Valainis, 2018

³³² <https://dabasdati.lv/lv>

³³³ Latvijas Vides aizsardzības fonda finansēts projekts Nr. 1-08/29/2023.

out by an accredited noise assessment laboratory using the current version of Sound Plan, which complies with the methods set out in Cabinet of Ministers Regulation No 16 of 7 January 2014 "Procedures for the assessment and management of noise" and standard LVS ISO 9613-2:2004 "Acoustics - Sound attenuation by sound propagation in the external environment - Part 2: General method of calculation".

The Australian "*National Wind Farm Development Guidelines* ", 2018, an experiment conducted in Latvia in 2010 (see description in Chapter 7.3), and EMD International A/S software WindPRO 3.6.366, Enviroprojekts Ltd licence (client) No 8797 were used to assess the flicker effect.

The assessment of landscape impacts has taken into account the Guidelines for the Initial Environmental Impact Assessment of the Construction of Wind Power Plants³³⁴, the Guidelines for Local Landscape Planning approved by the Ministry of Environmental Protection³³⁵, and the landscape impact assessment methodology of the Lithuanian and Latvian researchers Abromas, Kamičkaitė and Ziemeļniece wind farms³³⁶.

A 3D model has been prepared for modelling and visualisation of the landscape changes, using the basic data of the digital elevation model obtained by aerial laser scanning. Aerial laser scanning is an accurate and efficient method of acquiring data from the Earth's surface using LIDAR (*Light Detection And Ranging*) technology. The main data source for the digital elevation model is the 2016 LAS files of the Latvian Geospatial Information Agency, which are available under an open data licence. A digital surface model is an elevation model of the Earth's surface that includes vegetation, the tops of economic features and other objects.

In order to assess the impact of the Proposed Development on cultural heritage assets, an analysis of archival material was undertaken, identifying existing and potential cultural heritage assets, including archaeological assets, located or potentially located within the Proposed Development area.

5.1 "Description of physical characteristics, land use requirements during construction and operation" and 5.3.1. Chapter 5.5.5 on the assessment of the effects of electromagnetic radiation and the operation of the WPP on the operation of communication systems (radio, TV, special communication equipment) in the context of the proposed operation and other chapters also use material from the Environmental Impact Assessment of the construction of four VPPs in Pope Parish, Ventspils District (4 WIND Ltd.)³³⁷, which in turn is the source of the Environmental Impact Assessment of the construction of wind farms Dobeles and Pienava in Dobeles and Tukums Districts³³⁸

³³⁴ <https://www.vvd.gov.lv/lv/media/9969/download?attachment>

³³⁵ https://www.varam.gov.lv/sites/varam/files/content/files/vadlinijas_viet_limenim_2019.pdf

³³⁶ Abromas, J. & Kamičkaitė, J. & Ziemeļniece, A. 2014. Visual impact assessment of wind turbines and their farms on landscape of Kretinga region (Lithuania) and Grobina townscape (Latvia). Journal of Environmental Engineering and Landscape Management. 23. 1-11. 10.3846/16486897.2014.919921.

³³⁷ <https://www.vpvb.gov.lv/lv/ietekmes-uz-vidi-novertejumu-projekti/cetru-veja-elektrostaciju-izbuve-popes-pagasta-ventspils-novada-sia-4-wind>

³³⁸ <https://www.vpvb.gov.lv/lv/jaunums/pazinojums-par-sia-pienava-wind-un-sia-dobeles-wind-ietekmes-uz-vidi-novertejuma-zinojuma-iesniegsanu-vides-parraudzibas-valsts-biroja-atzinuma-sanemšanai>

11. Types of solutions and measures to avoid significant adverse effects on the environment

This chapter summarises how the EIA assesses situations where significant adverse changes are expected (see Table 8.3): environmental quality thresholds or environmental regulatory requirements are breached; such impacts are assessed as an exclusion factor. If significant adverse effects are identified and the proposed activity is an object of significant public interest, compensatory measures must be implemented in accordance with the legislation.

A summary of mitigation measures for the WPPs included in the recommended alternatives, WPP design, construction, operation phases, such as e.g. WPP containment camera systems, recommendations for cable route location, recommendations for logging restrictions, etc., is provided in Annex 12.

Significant adverse environmental effects may be predicted if, in the case of Alternative B, a cable line is constructed parallel to the LVM road *Gailīšu ceļš* and crosses the Natura 2000 site AAA "Ziemeļgauja" in a strip approximately 1.6 km long and 3 m wide to connect to the substation, see Figure 11.1. The figure shows the area required for the electricity cables.

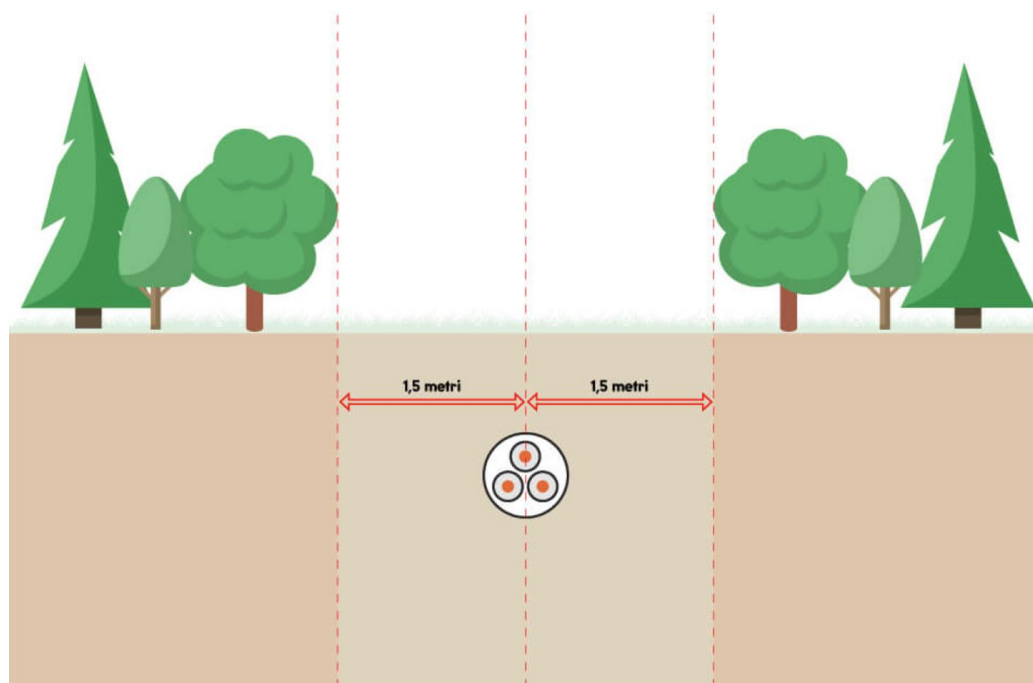


Figure 11.1. Power line route width for cable lines - 3 metres³³⁹

The solution to mitigate the adverse impacts would be to route the cable connection to the substation along the A6 road, connecting to the substation using the connection that would be made in the case of the Group A alternative WPP connection.

³³⁹ <https://www.ast.lv/lv/content/aizsargjoslu-platumi>

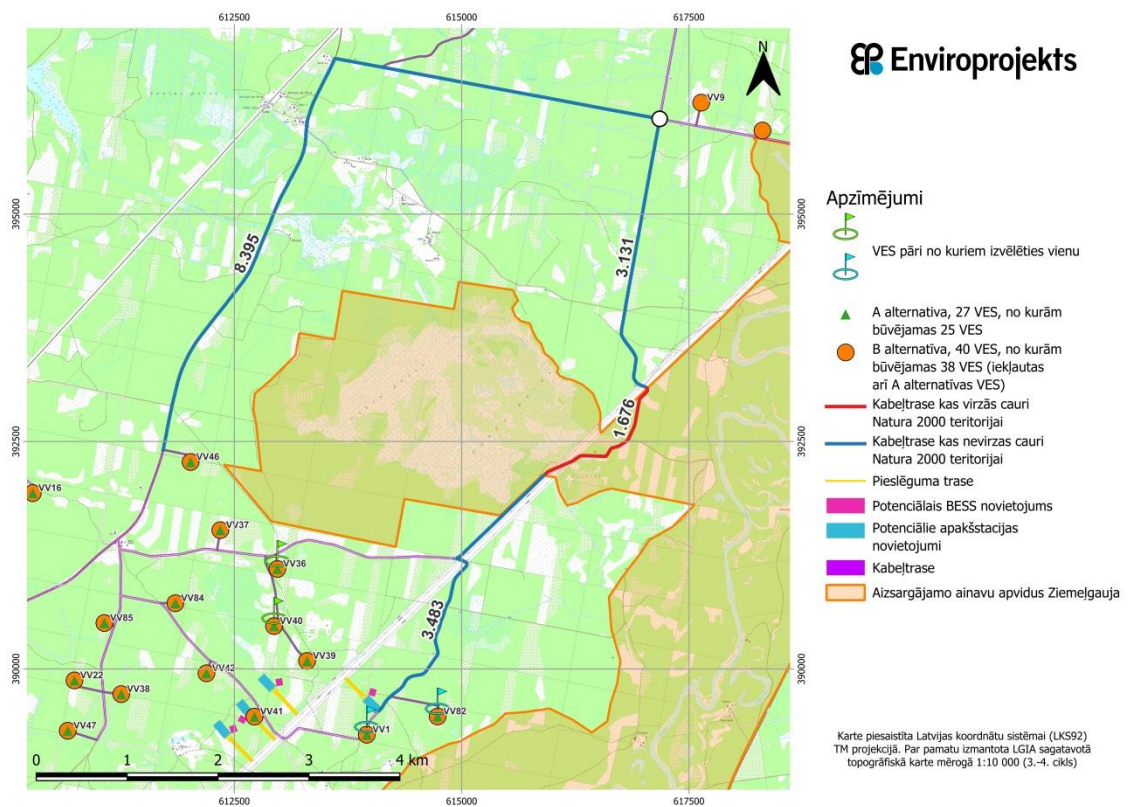


Figure 11.2. Cable location options for connection to a substation

12. Measures to monitor environmental quality and assess greenhouse gas emissions, if necessary (e.g. preparation of a post-project analysis)

The EIA assesses the potential impacts of the proposed WPPs. Impacts such as flicker effects from the WPP, noise pollution, safety risks, impacts on habitats and specially protected plant species, the hydrological regime of the site can be predicted with a high degree of accuracy by assessing the extent of the Proposed Action and using calculation methods. Unfortunately, it is not practicable to assess the precise impacts of the proposed NPS on ornithofauna and bat populations, so the impacts of the proposed NPS on these animal groups should continue to be assessed through monitoring and, if necessary, the introduction of additional mitigation measures not identified in this report.

The scope of the monitoring and the methods to be used have been determined on the basis of advice from experts certified by the Nature Conservation Agency.

Bird monitoring

In order to be able to judge the effectiveness of the proposed mitigation measures and, if necessary, to adjust them, the bird expert recommends monitoring of nesting birds **before and during the operation and construction of the wind farm**. It is also recommended to search for the remains of birds killed in collisions in the vicinity of the WPPs once they are operational. It is also recommended that at least one year of **ambient noise measurements** be carried out **before the wind farm** is put into **operation**, so that they can be compared with measurements during the lifetime of the wind farm.

Due to the lack of studies on the impact of noise from WPP on barn owls (*Strix uralensis*), pre-construction monitoring of this species should be carried out to assess the potential noise disturbance from WPP. This includes studying bird behaviour and adapting the operation of the WPP to the observed data.

For the monitoring of nesting birds, the "Methodology for the study of the Wind Farm and the preparation of an Expert Opinion"³⁴⁰ shall be used as a basis for the initial study of the site. The spring and autumn migratory bird surveys required by the Methodology (retaining surveys of surrounding farmland and low-flying track observations) may be abandoned, as they are already established in the study area, but their variability and the low WPP threat to the species covered by these surveys make this type of survey unlikely to be useful. At the same time, the need for Natura 2000 monitoring of bird species in both Natura 2000 sites adjacent to the site is important in order to be able to qualitatively assess the potential impact of the proposed wind farm on them.

Other records are to be kept in accordance with the methodology. The data obtained will be comparable with each other, including with those already obtained during the initial site investigation. The surveys regularly identify areas for increased attention - currently concentrations of huns, sea eagles and ospreys. In case of new ornithological values identified, possible wind farm construction and, if necessary, operational changes shall be assessed.

Breeding bird monitoring should be carried out annually until the planned wind farm is operational and for the first five years of operation. Then in the 7th, 9th and 11th year of operation, and every third year thereafter. The actual amount of survey work shows that it is optimal to plan for one man-day per WPP to be surveyed per season - so for the 40 remaining WPPs, 40 man-days per season would be needed to carry out quality monitoring. Over time, as knowledge of the area accumulates, the amount of time required per season for monitoring will decrease, but it is not possible to predict to what extent. Optimally, plan one man-day per VES season to be surveyed.

³⁴⁰ Ūlands, D., Millers, K. 2022. Methodology for the Wind Farm Study and the Expert Report.

It is recommended that the search for the remains of birds killed in the collisions should be organised using the methodology used by Lithuanian colleagues³⁴¹. The search for dead bird remains shall be carried out once every 5 days within a radius around the base of the WPP mast corresponding to the height of the WPP mast. The search must be repeated 3 times at 5-day intervals, covering a 10-day period in which the condition before 5 days is known twice in a row. These 3 search cycles must be carried out within each calendar month, except January and November. In each search cycle of 3 times, the surroundings of at least 16 randomly selected WPPs (40% of the planned WPPs) must be searched without changing them during the cycle. The cycles should be repeated year after year on as similar dates as possible. This amounts to 30 searches in total or 10 search cycles per year. This search schedule will provide sufficient data to assess the dynamics of changes in WPP mortality. Twice a census year, an assessment of the effectiveness of scavengers and residue finders should be carried out, calibrating the monitoring results with the results of the assessments. This schedule shall be followed for the first two calendar years of operation of the WPP. After the second full year of counts, the results of the two years of counts are compared. Video recordings from cameras on the suspension systems installed on the WPP are also used as an additional source of data for this assessment. If the results are not significantly different, the search for the remains of dead birds should be repeated once every 3 years throughout the year. Although the searches in Lithuania are carried out by the researchers themselves, dogs have also been used with good results.

Ambient noise should be measured at the planned site of the WPP at least one year before the WPP is installed according to the considerations outlined above, first choosing whether to measure at the WPP as a source of noise pollution, or in an area populated by owls threatened by additional noise pollution. Environmental acoustics are not the responsibility of the author. The author recommends consulting certified acoustic specialists to find the best way to implement the solution. One solution for measuring ambient noise is identified in the Owl Conservation Plan³⁴², which identifies ISO9613-2:1996 as an appropriate method for calculating ambient noise levels in the context of owl species conservation. The aim of the measurements is to develop a correlation matrix between wind speed at the height of the WPP capsule and ambient noise at treetop height. After installation, the WPP should be validated within one year according to the actual level of additional noise generated by the WPP. Every five years thereafter, the matrix developed should be calibrated to the evolution of the vegetation around the WPP, repeating the measurements according to a methodology developed in collaboration with acousticians.

Bat monitoring

The bat monitoring methodology includes:

- 1) acoustic monitoring with ultrasonic detectors,
- 2) counting bat fatalities under selected wind turbines.

Recommendations for acoustic monitoring: monitoring should be carried out by installing automatic ultrasonic detectors in the 15 WPP nacelles to record bat activity from at least 1 May to 30 September. Automatic detectors should aim to cover the entire wind farm area as evenly as possible. In addition to acoustic monitoring, monitoring of bat fatalities should be developed and carried out by selecting for bat fatality counts WPPs at which acoustic monitoring would also be carried out and/or turbines suspected during the work to be causing increased bat fatalities.

During the design of the WPP, in agreement with a certified bat expert, other solutions can be used to mitigate the impact on bats, such as smart monitoring systems equipped with ultrasonic sensors

³⁴¹ Morkūnas J. 2023. Best Practices for Bird Monitoring in Wind Farm Development in Lithuania: Guidelines.

³⁴² <https://www.daba.gov.lv/lv/sugu-un-biotopu-aizsardzibas-plani>

and artificial intelligence technologies that detect the presence of bats in real time before shutting down the turbines.

To facilitate the search for dead bats, a vegetation-free ground surface should be established around the bases of wind turbines, if possible within a radius of at least 50 m, or grass should be cut regularly during the monitoring period. In forests, no special clearing is required to create such a strip.

Monitoring of mammals

Considering that there are no assessments of the impact of wind turbines on non-flying mammals in Latvia based on wildlife studies or monitoring data, the expert does not propose mandatory monitoring requirements for a specific wind park. The expert recommends that the national regulatory authorities should require the developers of the wind parks along the border between North Latvia and Estonia (Figure 3.2.5) to jointly undertake specialised monitoring of wild mammals in cooperation with the national regulatory and scientific authorities. This need is emphasised by all authors of the scientific publications used in the report. Monitoring is carried out in accordance with a monitoring programme developed and agreed with a certified expert.

Take into account the basic requirements for monitoring the impact of wild mammals and evaluating the results of monitoring, as set out in the study "*A synthesis - SWEDISH ENVIRONMENTAL PROTECTION AGENCY REPORT*"³⁴³.

³⁴³ Helldin J.O., Jung J., Neumann W., Olsson M., Skarin A., Widemo F. 2012. The impacts of wind power on terrestrial mammals. A synthesis - SWEDISH ENVIRONMENTAL PROTECTION AGENCY REPORT 6510, 52 pp.

13. Public opinion and opinion polls

13.1. Initial public consultation

The initial public consultation on the Valmiera-Valka WPP Park and related infrastructure project was held from 10 to 30 November 2023. The report on the initial public consultation, submitted to the State Environmental Monitoring Office on 14 December 2023, is attached as Annex 3. The report on the initial public consultation includes the following information: notices on the public consultation in the newspapers "Liesma" No 130 (15299) and "Ziemeļlatvija" No 86 (4382) of 10.11.2023; a report on the notices sent to the residents and the minutes of the initial public consultation meeting held on 23 November 2023.

After the initial public consultation meeting, the State Environmental Bureau sent to the operator of the Proposed Action Latvijas vēja parki Ltd the opinions of the National Heritage Office and the public on the Proposed Action and proposals for the environmental impact assessment received during the initial public consultation, to be assessed and included in the EIA report of the Proposed Action, indicating how the proposals submitted by the public have been taken into account. An overview of how the proposals have been taken into account is attached in Annex 4.

During the preparation of the Environmental Impact Assessment, consultative working group meetings on the Valmiera-Valka wind park were held in February 2024 in Valka and Seda on the following topics: landscape, biodiversity, physical impacts of the wind park and socio-economic feasibility of the wind park and impacts on climate change. Citizens and other interested parties were given the opportunity to participate in informative working group meetings where experts discussed various topics related to the impacts of WPP parks, such as socio-economic aspects, biodiversity, landscape impacts and physical impacts. For several weeks, landscape expert Dāvis Valters Immurs, ornithologist Edgars Dzenis, certified species and habitat expert Anete Pošiva - Bunkovska, environmental experts Līga Blanka and Ieva Anna Arāja, as well as experts from SIA Latvijas vēja parki met with residents and presented the results of their research within the environmental impact assessment and explained the methodology and approach to the aspect under study. In turn, citizens actively asked questions and expressed their additions, proposals and comments.

13. 2. Results of citizens' surveys

In January 2024, the research centre SKDS conducted a survey of Latvian citizens on their views on the environment, climate and energy (see Annex 13).

According to the survey results, the majority of respondents (77%) believe that new renewable electricity generation plants should be built in Latvia (52% would rather, 25% would definitely). 14% of respondents are of the opposite opinion (9% would rather not, 5% would definitely not). In general, men, Latvian speakers in the family and those concerned about climate change in general are more positive about the issue.

According to the respondents, the main reason why Latvia should build new renewable electricity generation plants is to gain energy independence from other countries (52%). The following reasons are also considered important enough: it would contribute to Latvia's economic development by providing a much better electricity supply (43%) and to achieve full energy independence from Russia (37%). Other reasons given are: to reduce the amount of imported electricity and thus improve Latvia's import-export balance (29%), to increase GDP (26%) and to give Latvia the opportunity to become an electricity exporter (24%).

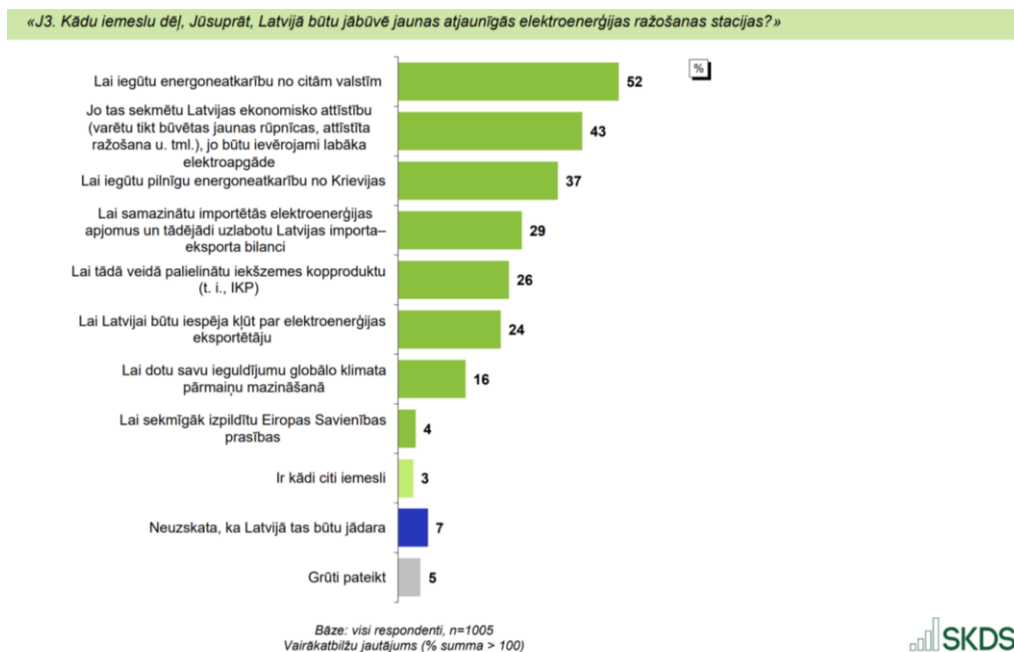
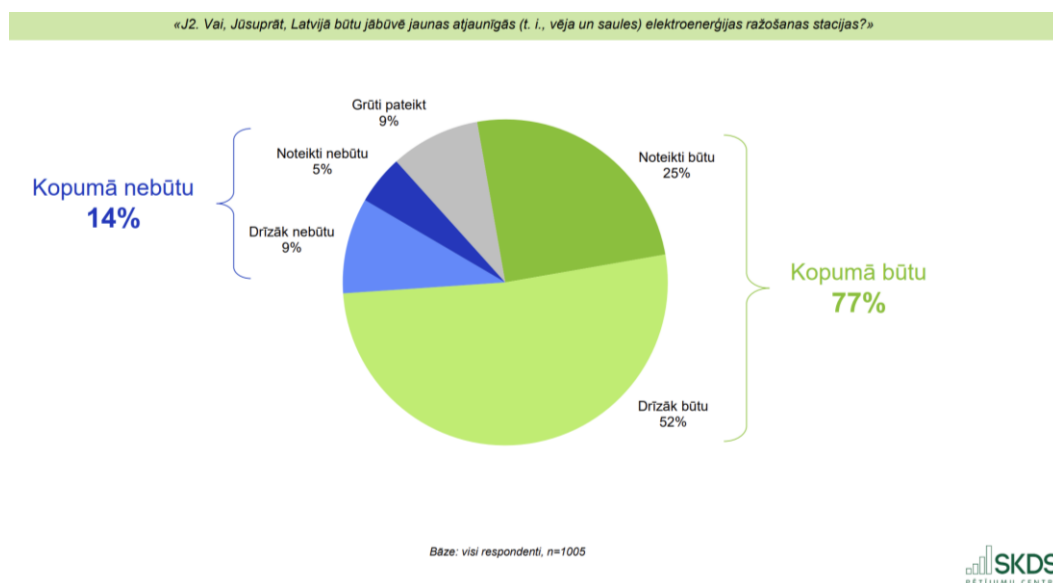
According to the respondents, both wind and solar power plants cause environmental damage. The majority (71%) of respondents feel this way about wind farms (42% rather low harm, 21% rather high

harm, 8 very high harm). More than ½ of the respondents (58%) believe that solar power plants also cause environmental damage (rather small - 47%, rather large - 7%, very large - 4%).

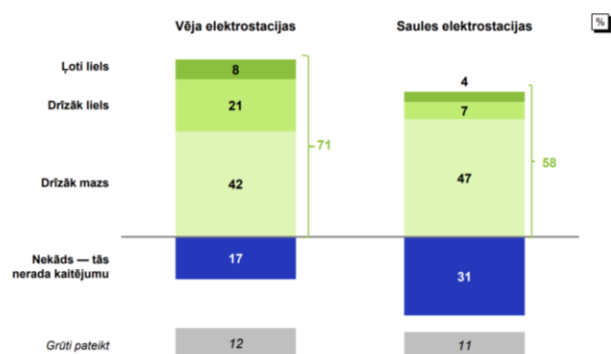
Almost ½ of respondents (47%) would object if there were plans to build a wind farm near where they live. Just over ⅓ of respondents (39%) would have no objection. It is noticeable that older respondents and Kurzeme residents would be more likely to object.

In terms of publicly expressed concerns about the negative impact of wind farms on the lives of nearby residents, more than ½ of respondents generally agree that wind turbines kill birds (56%), that wind turbines negatively affect the value of nearby property (56%) and that wind turbines produce a disturbing sound (54%).

When it comes to the best and most suitable locations for new power plants, the best location for offshore wind is the sea (51%).



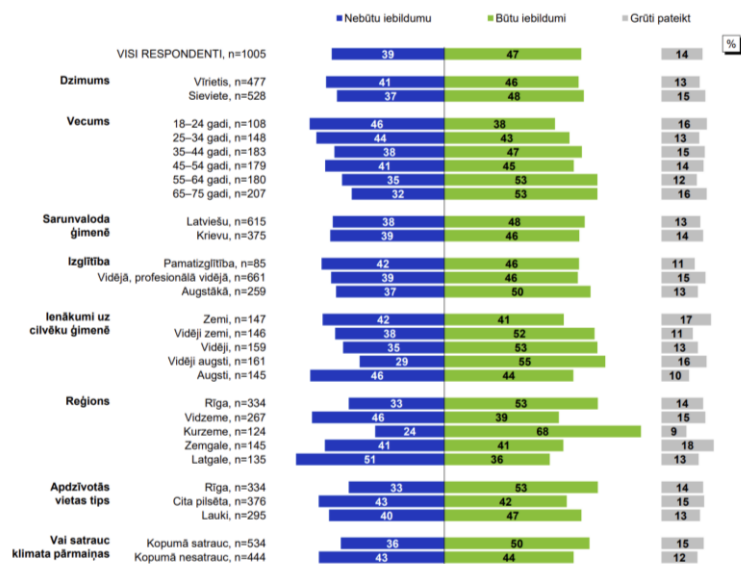
«J6. Ņemot vērā visu, ko Jūs par to zināt, cik lielas problēmas saistībā ar vides aizsardzību rada šādi elektrostaciju veidi? Vai to radītais kaitējums apkārtējai videi ir...»



Bāze: visi respondenti, n=1005

SKDS
PĒTĪJUMU CENTRS

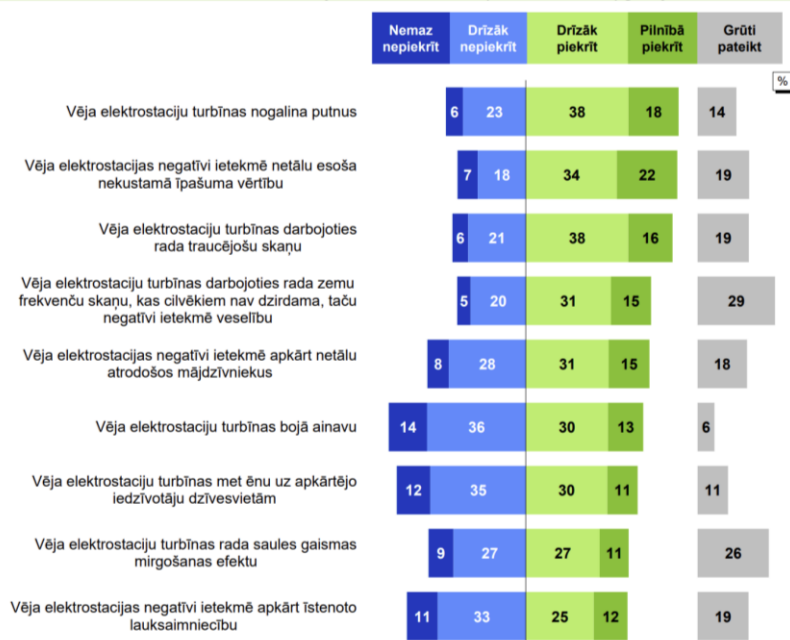
«J7. Gadījumā, ja Jūsu dzīvesvietas apkārtnē parādītos plāni uzbūvēt vēja elektrostaciju parku — t. i., vēja turbīnas atrastos Jūsu tiešās redzamības attālumā — vai Jums pret to būtu vai nebūtu iebildumu?»



Bāze: respondenti attiecīgajās grupās (skat. «n» grafikā)

SKDS
PĒTĪJUMU CENTRS

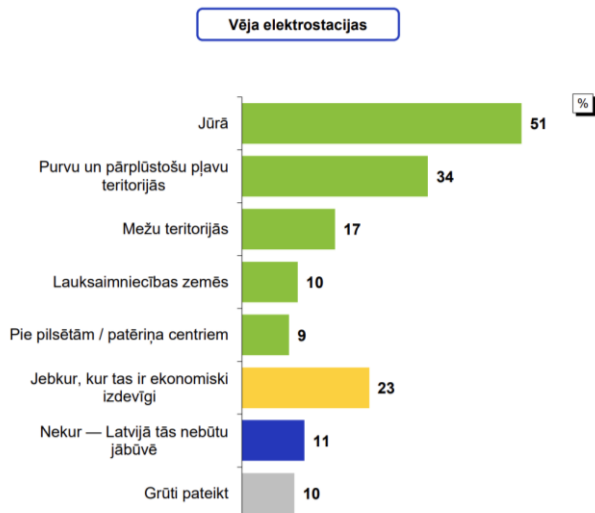
«J8. Publiski ir izteiktas dažādas bažas par to, ka vēja elektrostaciju parki radot negatīvu ietekmi uz apkārtnējo iedzīvotāju dzīvi. Lūdzu, atzīmējiet, cik lielā mērā Jūs piekrītat šādiem apgalvojumiem?»



Bāze: visi respondenti, n=1005

SKDS
PĒTĪJUMU CENTRS

«J9. Kuras no šīm, Jūsaprāt, ir pašas labākās un piemērotākās vietas, lai Latvijā būvētu jaunas vēja elektrostacijas?»



Bāze: visi respondenti, n=1005
Vairākbilžu jautājums (% summa > 100)

J10. Domājot par iespējamajiem jaunu vēja elektrostaciju īpašniekiem, kam, Jūsaprāt, Latvijā būtu jābūvē vēja elektrostacijas?»

Vēja elektrostacijas



Bāze: visi respondenti, n=1005

14. Socio-economic assessment of the proposed action

The construction and operation of the planned WPPs may have both positive and negative socio-economic consequences, both within the area of the Proposed Action and in the national context. Positive effects include investment in the economy, directly and indirectly related job growth, financial benefits from land leases to the property owner on whose land the WPPs are built, increased energy supply on the market, reduced carbon dioxide emissions, contribution to national energy policy objectives. There may be negative impacts on tourism and recreational resources and on the value of real estate for some residents. As the socio-economic consequences of WPP have not been widely studied in Latvia, the information in this report is largely based on the results of studies in other countries.

LIAA has granted the project the status of Priority Investment Project³⁴⁴

14.1. Impact of climate policy on socio-economic benefits

Directive 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (recast) (Text with EEA relevance), designed to create a common framework for the use of RES in the Member States of the European Union by setting mandatory targets for the overall share of renewable energy in final energy consumption and transport fuel consumption in the European Union. According to the "Latvian Long-Term Energy Strategy 2030 - Competitive Energy for Society", the share of energy produced from renewable sources in gross final energy consumption is to be increased to 50%. According to the "Latvian Long-Term Energy Strategy 2030 - Competitive Energy for Society", the share of energy produced from renewable sources in gross final energy consumption is to be increased to 50%. The same objective is enshrined in the Latvian National Energy and Climate Plan 2021-2030, which does not set specific, precise targets for onshore WPPs, but postulates support in principle for their construction in unlimited amounts; the following are the main quotes from the document:

"Desired situation in 2030: 1) sufficient generation capacity is available and the country's energy dependence on imports and fossil resources is reduced; 2) the potential for wind power generation is largely exploited within the capacity of the available infrastructure and, consequently, the share of RES is increased in a cost-effective, market-based manner."

"(..) At the same time, in order to ensure Latvia's energy security and to provide the society with cheap and competitive energy, Latvia should ensure an increase in the share of RES, which should naturally be provided by the most cost-effective technologies. The cost of generating electricity from onshore wind farms has fallen significantly and recent studies show that they are the cheapest of all newly installed technologies, including fossil fuel technologies, for generating electricity."

"It would also be useful to ensure the use of nationally important farmland and forest land for the development of wind farms."

Overall, the Republic of Latvia expresses its unequivocal support for the production of wind energy in free market competition without subsidies, noting that wind energy in Latvia has so far been very little developed and that there are too many unnecessary obstacles to promoting its development. Latvia's National Energy and Climate Plan 2021-2030, updated in 2024, foresees the installation of onshore WPP parks with a total capacity of up to 1.5 GW by 2030. Currently, there are 82 WPP parks (see Figure 14.1) with a total onshore capacity of ~12 GW (excluding those that have been

³⁴⁴ https://www.liaa.gov.lv/lv/programmas/zalais-koridors/atbilstiba?utm_source=https%3A%2F%2Fwww.google.com%2F

discontinued) with Environmental Impact Assessments (EIAs) pending/ongoing/ongoing/completed in various stages of development in Latvia.

IVN Statuss:

- Pārtraukts
■ Tiek veikts
■ Piemērots
■ Pabeigts

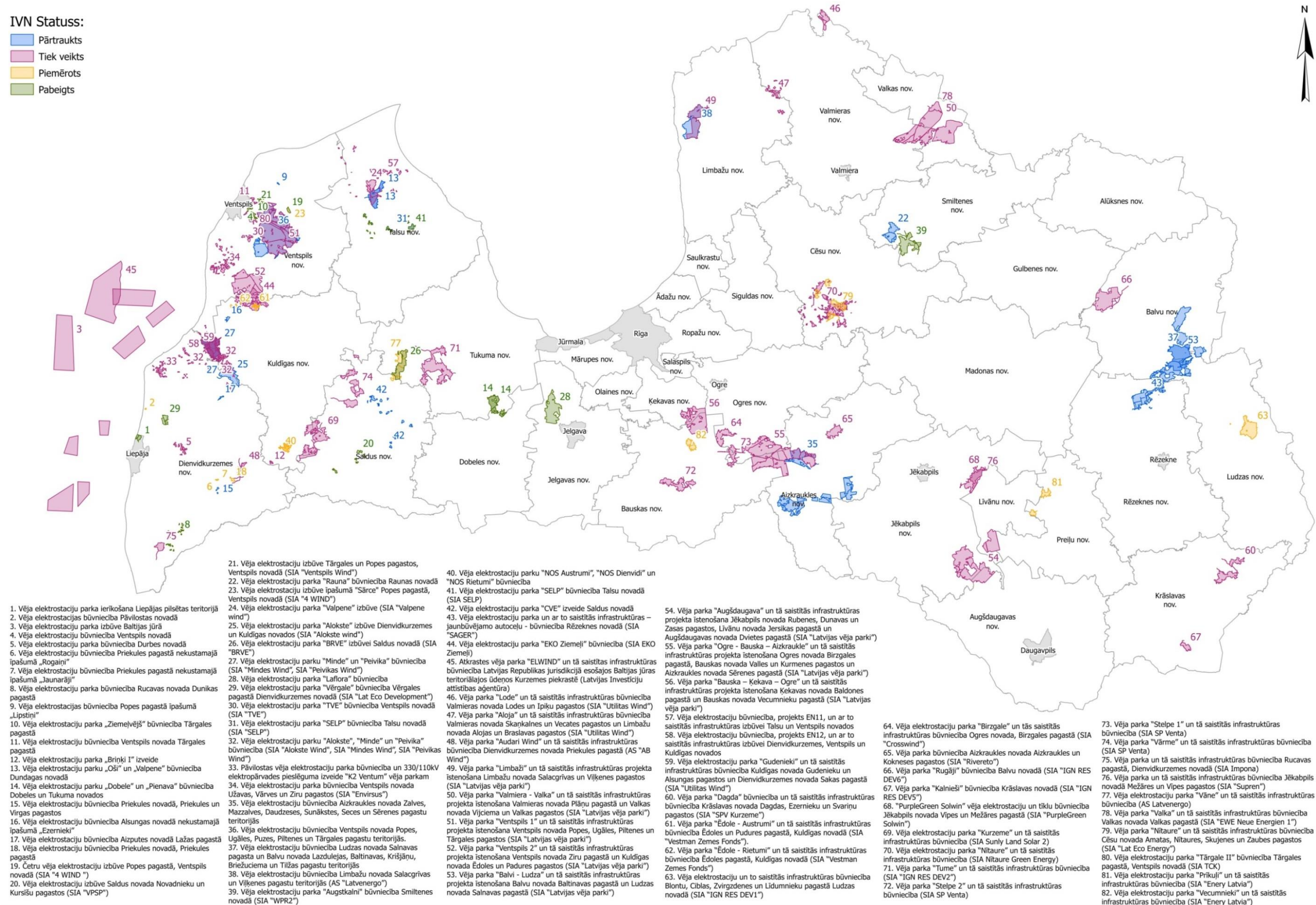


Figure 14.1. *Environmental Impact Assessments submitted/ongoing/continued/completed for 82 WPP parks in Latvia at different stages of development*³⁴⁵

³⁴⁵ <https://www.vpvb.gov.lv/lv/ietekmes-uz-vidi-novertejumu-projekti>), situation as of 23.09.2024

14.2. Current situation and assumptions

Attracting investment is an important factor influencing the development of the economy, and the construction of a WPP should be evaluated in the same way as any other investment that contributes to economic growth in terms of attracting investment. It is expected that several dozens (the exact number to be implemented is not known before and after the completion of this EIA) The total cost of the construction of the WPPs could reach, respectively, tens of millions of EUR, which is a significant investment project.

Socio-economic returns can be divided into the following impact areas:

- Local impacts, which directly affect the location of the project (locality, municipality);
- local impacts, which affect the neighbourhood where the project is located (municipality);
- national impact, which affects the economy of the country where the project is implemented;
- international impact, which affects the economies of other countries (e.g. EU and EEA area).

An important aspect to be taken into account when assessing the impact of the Proposed Action on the economy is not only the total amount of investment, but also the increase in jobs associated with this investment. In the context of employment, the WPP construction proposal is linked to the creation of jobs both during the construction process and during operation. Demand for additional labour will be related to the construction and operation of the WPP itself, as well as to indirectly related activities such as mining for road construction, cement and concrete production, and transport. Referring to the statistics published by the International Renewable Energy Agency (hereinafter referred to as IRENA)³⁴⁶ on the increase of jobs in the construction of WPP parks, as well as the estimates of the proponents of the Proposed Action, it is expected that several hundred persons (depending on the number of WPPs) could be temporarily employed in the construction process of WPPs, The number of persons permanently employed during the operation of such WPPs could be up to 10 (as WPPs are a highly automated technology where the main human resource input is mainly in monitoring and maintenance).

14.2.1. Socio-economic benefits for society as a whole

Increasing the amount of energy produced in Latvia can also be seen as a potential benefit for society, which can affect the price of electricity for consumers. Latvia's economy consumes more than 7 TWh of electricity, some of which is imported every year. The availability of electricity on the market is one of the factors that have a significant impact on its price. Installing additional capacity, as well as increasing the diversity of electricity generation options, can reduce the impact of adverse weather conditions (droughts, when hydroelectric power plants (HPPs) produce little energy and have to import it) on the price of the electricity produced. Several dozen WPPs will not, however, rapidly reduce electricity prices for consumers, as Latvia's electricity transmission system is integrated into the broader Baltic Sea region system, so the generation capacity of these WPPs will be significant at the Latvian level (exceeding 10% of Latvia's electricity generation to date), but relatively small in terms of the overall market size.

Potentially negative impacts are considered to be those on tourism and recreational resources and property values. It is difficult to predict the economic impact of the planned WPP on the recreational

³⁴⁶ <https://www.irena.org/Publications>

facilities in the area, as there is a lack of studies of this kind in Latvia, but studies in other European countries show that:

- When visitors to recreational facilities were surveyed before the construction of the planned WPPs, some indicated that they would no longer visit these recreational facilities after construction;
- analysing the dynamics of recreational users after the construction of the WPP, no significant drop in turnover can be detected^{347, 348, 349}.

These studies reflect the situation for large wind farms close to recreational facilities rather than for a few remote WPPs.

Studies in other countries have shown that the construction of WPPs does not have a negative impact on the value of the usable land, due to the fact that WPPs and associated facilities occupy a negligible amount of usable land, while all other land remains undisturbed. Forestry land is a productive resource whose price is determined by the amount of income that can be earned from its use.

The construction of a WPP has the potential to affect the value of properties that are primarily used for residential development. Foreign studies^{350, 351, 352} have found a correlation between the proximity of WPP parks and property prices, indicating that WPP parks can potentially reduce property sales prices, while other studies^{353, 354, 355, 356, 357, 358} have not found such an effect. In studies where negative impacts have been found, a correlation is observed between the distances from the property to the WPP. The results of the studies suggest that impacts are likely to be occasional, affecting only specific properties that are primarily used for recreation. Studies have also found that the impact of WPP parks on real estate values is more likely to be a deterrent to property appreciation than a direct depreciator. For example, a study in Australia also analysed re-sales and concluded that property values are highly dependent on overall demand in the region and other market fluctuations that are not directly related to the NPS. Factors such as access to services and

347 https://www.nhsec.nh.gov/projects/2013-02/documents/131212appendix_31.pdf

348 C. Aitchison, Tourism impact of wind farms, The University of Edinburgh, 2012

349 V. Braunova, Impact study of wind power on tourism on Gotland, Uppsala University

350 Y. Sunak, R. Madlener, The Impact of wind farms on property values: a geographically weighted hedonic pricing model, Aachen, Germany, 2013

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355 B. Hoen et al., The impact of wind energy projects on residential property values in the United States: A multi-site hedonic analysis. Lawrence Berkeley National Laboratory. LBNL Paper, 2009

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357 G. Canning, L. J. Simmons, Wind energy study - Effect on real estate values in the municipality of ChathamKent, Ontario. Consulting Report prepared for the Canadian Wind Energy Association, Ontario, Canada, 2010

358 Urbis Pty Ltd, Review of impact of wind farms on property values, 2016

transport, economic growth and employment in the region, as well as changes in legislation, have a more significant impact on property values. For example, also in Latvia, information on changes in housing market prices collected by the State Land Service shows that after 2015, when the conditions under which persons can obtain fixed-term residence permits in Latvia were changed, real estate values decreased more significantly than in the foreign studies on the impact of WPP parks on real estate values.

According to the methodology developed by the European Commission "*Guide to Cost-Benefit Analysis of Investment Projects, Economic appraisal tool for Cohesion Policy 2014-2020*"³⁵⁹, where a quantitative economic impact assessment is not possible, a qualitative description of the wider impact on secondary markets, public funds, employment, gross domestic product, etc. is recommended to better explain the contribution of the development project to the achievement of regional policy objectives.

According to the authors' assessment, the main socio-economic impact of the WPP development, which is not quantified, is the impact on the value of real estate in the area of the WPP development. Taking into account that no studies have been carried out in Latvia on the impact of the development of WPPs on the value of real estate, the authors have carried out an assessment of international experience. A number of studies have been carried out abroad, including in European countries with more experience with WPP development, to assess the impact of WPP development on property values in areas adjacent to WPPs. However, the largest study to date has been carried out in the United States, which assesses the impact of NPS development on the value of 500 000 properties in 34 states over a 15-year period (2005-2020). The dataset for this study covers the period from four years before the start of WPP development activities (the WPP development announcement period) in the project area to more than six years after the start of WPP operations.

Overall, the main findings of the study are:

- Residential sales prices that are affected after the WPP development announcement period are limited to properties within a 2-mile (~3.2 km) radius of the WPP development site, and even then the impact on properties within a 1-2 mile (~1.6-3.2 km) radius is much smaller than on those in the immediate vicinity of the WPP;
- Residential properties located within 1 mile (~1.6 km) of the WPP would experience a decrease in value of approximately 11% following the announcement of a new WPP development compared to hypothetical properties located 3-5 miles (~4.8-9.0 km) away;

However, those properties that have been devalued by the WPP development quickly recover any losses, returning to the inflation-adjusted level before the announcement of the WPP development within three to five years of the WPP becoming operational³⁶⁰.

The literature provides mixed data on the number of jobs created by WPP development. The Hillard G. Huntington study "Creating Jobs With 'Green' Power Sources" found that the wind energy sector creates between 0.71 and 2.79 jobs per year for every MW of installed capacity.³⁶¹ Luigi Aldieri Jonas Grafström, Kristoffer Sundström and Concetto Paolo Vinci "Wind Power and Job Creation", analysing 17 scientific articles and 10 reports, conclude that the average number of jobs created is 5.38 per MW in the scientific articles and 5.80 per MW in the other reports. The maximum number of staff

³⁵⁹ https://ec.europa.eu/regional_policy/sources/studies/cba_guide.pdf

³⁶⁰ <https://www.sciencedirect.com/science/article/pii/S0301421523004226?via%3Dihub>

³⁶¹ Hillard G. Huntington, Creating Jobs With 'Green' Power Sources, Reprinted from USAEE Dialogue 17(1), 2009.

required for operation and maintenance is given as 3.44 per MW in scientific papers and 0.29 per MW in other reports. Statistics from the International Renewable Energy Agency show that an average of 50-100 workers are employed during the construction of a WPP of up to 200 MW, and 10-15 people are permanently employed during the operation of the WPP.³⁶² Therefore, the number of jobs created by the Proposed Action could be 50-75 during construction and 5-10 during operation.

14.2.2. Socio-economic impact of the Valmiera-Valka WPP Park

The proposed activity is planned in the administrative territories of Valka and Vijciems parishes of Valka municipality and Plani parish of Valmiera municipality. Detailed socio-economic impact calculations have been prepared for the two alternatives for the WPP Park in question and are attached in **Annex 11**. Socio-economic impacts have been carried out for the Valmiera-Valka WPP Park Alternative A - 25 WPPs and Alternative B - 38 WPPs; if the number of WPP turbines is reduced by 2-3 units during the EIA, the socio-economic benefits will decrease accordingly.

The administrative areas of the WPP development - Valka, Vijciems and Plani municipalities - are characterised by negative dynamics of the declared population. However, with the exception of Vijciems municipality, where there has been a slight increase, there has been a simultaneous decrease in the share of jobseekers/unemployed among the economically active population aged 15-74.

The overall demographic situation of the administrative areas of the WPP development indicates the potential of the WPP development areas to accommodate new jobs related to the development and operation of the WPP, which would employ the population declared in these areas, as well as, if necessary, new population whose migration would be directly or indirectly related to the development and operation of the WPP.

In the context of the business sector, enterprises providing agricultural, forestry and fishery activities dominate (38% of the total number of enterprises in Valka county and 41% of the total number of enterprises in Valmiera county) in the administrative territories of the WPP development, however in both counties enterprises providing other types of economic activities included in NACE classification are also relatively well represented.

In general, the WPP development administrative areas are characterised by a dynamic and diversified business environment, which, taking into account the demographic situation, indicates a readiness to accept the socio-economic challenges associated with the development of WPPs, including the provision of the workforce needed to create jobs during the development and operation phase, servicing the non-local workforce and other services essential and necessary for the development and operation of WPPs.

It should be noted that data on impacts on recreational resources, ecosystem services (mushroom picking, berry picking, etc.) are not quantified in the socio-economic impact assessment due to the quality of available data, but are assessed in other impact assessments, such as recreation in the landscape assessment, ecosystem services in the habitat assessment.

The assessment of the socio-economic factors to be assessed qualitatively shows that, based on international experience, short-term negative impacts on properties in the vicinity of the WPP

³⁶²https://www.irena.org//media/Files/IRENA/Agency/Publication/2017/Jun/IRENA_Leveraging_for_Onshore_Wind_Executive_Summary_2017.pdf

development areas are likely to be of medium-term (three to five years from the start of operation of the WPP) nature and do not lead to significant negative impacts in the long term.

The benefit-cost analysis of the socio-economic assessment uses a socio-economic discount rate of 5%, which discounts future income and losses, to determine the value of the project at today's prices.

The quantifiable socio-economic factors for all alternatives show a very significant overall net present value and an internal rate of return well above the socio-economic discount rate of 5% used in the calculations, which means that the long-term socio-economic benefits offset the potential short-term losses, including in terms of GHG emissions. In terms of socio-economic returns to the development of the WPP, the best performing alternative is alternative "A", with a total net present value of 183 045 458 EUR and an internal rate of return of 18.71% (see Table 14.1 below). Calculating the socio-economic return per WPP individually, the net present value of alternative "A" is 7 321 818 EUR.

14.2.3. Socio-economic benefits - Community levy

When planning the WPP projects, Latvian Wind Parks Ltd. initially envisaged and supported a compensatory mechanism for local communities or a "community payment" aimed at improving the well-being of the local community in whose territory the WPP development takes place, as a result of which community payments can be attributed to the socio-economic benefits of the WPP development project.

On 5 January 2024, the Amendment to the Electricity Market Act entered into force, Article 22¹ "Payments for wind power plants for local community development" of which provides as follows:

1. An electricity producer whose wind power installation is located on the territory of the Republic of Latvia, in the internal maritime waters, in the territorial sea or in the exclusive economic zone and whose installed capacity is equal to or greater than one megawatt shall pay wind power installation payments for local community development for the total installed capacity of each installation;
2. The Cabinet of Ministers shall determine the amount of the payments provided for in paragraph 1 of this Article, the procedure for their payment and monitoring, the deadlines, as well as the purposes for which the payments are used.

The following assumptions are used to calculate the size of the community charge:

- Charge per MW of WPP capacity: EUR 2 500/year;
- Total installed nameplate capacity of the WPP according to the indicative capacity parameters of the NPP provided by Latvijas vēja parki Ltd - 6,8 MW:
 - For alternative "A" (25 WPP): 170 MW;
 - For alternative "B" (38 WPP): 258,4 MW.

According to the authors' calculations, the annual monetary amount of socio-economic benefits for the community in which the WPP development takes place will be as follows:

- For alternative "A": $170 \text{ MW} \times 2500 \text{ €} = 425\,000 \text{ €/year}$;
- For alternative "B": $258.4 \text{ MW} \times 2500 \text{ EUR} = 646\,000 \text{ EUR/year}$.

The total community payment benefits in discounted monetary socio-economic benefits over the project lifetime of 25 years will be:

- In case of alternative "A": EUR 4 693 264;
- For alternative "B": EUR 7 133 761.

14.2.4. Conclusions on socio-economic benefits

In assessing the socio-economic damages to be assessed qualitatively, it can be concluded that, based on international experience, the negative impacts on real estate in the vicinity of the WPP development areas are likely to be medium-term (within three to five years from the start of operation of the WPP) and do not lead to significant negative impacts in the long term.

On the other hand, the quantifiable socio-economic benefits and losses for all alternatives show a very significant overall net present value and an internal rate of return well above the socio-economic discount rate of 5% used for the calculations, which means that the long-term socio-economic benefits compensate for the short-term losses, including in terms of GHG emissions. In terms of socio-economic returns to the development of the WPP, the best performing alternative is alternative "A", with a total net present value of 185 033 941 EUR and an internal rate of return of 18.44% (see Annex 11). However, it is important to note that not all projects, even after the completion of the environmental impact assessment, are implemented to the extent of their proposed capacities.

Table 14.1. Monetary results of the Valmiera-Valka NPP Park alternatives discounted over the lifetime of the WPP (EUR)

Alternative/ Indicator	A (25 WPP)		B (38 WPP)	
	Net present value, EUR	GHG emission reductions, tonnes CO ₂ eq.	Net present value, EUR	GHG emission reductions, tonnes CO ₂ eq.
CO₂ emissions				
Deforestation of the WPP development area	-7 065 992	-41 960	-12 138 593	-71 720
Partial afforestation of the WPP development site	1 510 428	7 010	2 534 373	11 757
CO ₂ emissions during the production phase of the WPP	-41 383 184	-284 800	-62 902 439	-432 896
CO ₂ emissions during the installation phase of the WPP	-2 091 426	-12 800	-3 178 967	-19 456
CO ₂ emissions during the operational phase of the WPP	-4 767 013	-22 400	-7 245 860	-34 048
Substitution of electricity	226 433 136	1 064 000	344 178 366	1 617 280
Total CO₂ emissions	172 635 949	709 050	261 246 879	1 070 917
Increase in employment				
Additional wage income	7 704 728		11 711 186	
Community payments				
Community payment	4 693 264		7 133 761	

Alternative/ Indicator	A (25 WPP)		B (38 WPP)	
	Net present value, EUR	GHG emission reductions, tonnes CO2 eq.	Net present value, EUR	GHG emission reductions, tonnes CO2 eq.
Total	185 033 941		280 091 827	
Internal rate of return, %	18,4405%		18,3174%	

Table 14.2. Monetary results of the Valmiera-Valka WPP park alternatives discounted over the lifetime of the WPP (EUR) relative to 1 WPP in each alternative

Alternative/ Indicator	A (1 WPP)		B (1 WPP)	
	Net present value, EUR	GHG emission reductions, tonnes CO2 eq.	Net present value, EUR	GHG emission reductions, tonnes CO2 eq.
CO₂ emissions				
Deforestation of the WPP development area	-282 640	-1 678	-319 437	-1 887
Partial afforestation of the WPP development site	60 417	280	66 694	309
CO ₂ emissions during the production phase of the WPP	-1 655 327	-11 392	-1 655 327	-11 392
CO ₂ emissions during the installation phase of the WPP	-83 657	-512	-83 657	-512
CO ₂ emissions during the operational phase of the WPP	-190 681	-896	-190 681	-896
Substitution of electricity	9 057 325	42 560	9 057 325	42 560
Total CO₂ emissions	6 905 438	28 362	6 874 918	28 182
Increase in employment				
Additional wage income	308 189		308 189	
Community payments				
Community payment	187 731		187 731	
Total	7 401 358		7 370 838	

Annex 11 also includes a table summarising the socio-economic impacts of WPP development by their indicative impact types - international, national, local and indigenous.

15. Summary of the environmental impact assessment of the proposed action

A SUMMARY will be prepared on xx October as a separate Annex.

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