Čibuk 1 Wind Farm

Environmental and Social Impact Statement

Vetroelektrane Balkana d.o.o./Continental Wind Partners

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A General Information

A1 General Introduction

This Environmental and Social Impact Statement has been compiled by WS Atkins International Limited ('Atkins') on behalf of the Wind Energy Balkan Group, Belgrade (Vetroelektrane Balkana d.o.o., Beograd) and Continental Wind Partners, (together referenced in this document as 'WEBG'). This Statement has been produced in connection with a proposed 158.46 MW Čibuk wind farm development, about 30 km to the north east of Belgrade in Serbia. This Statement presents the findings of the Environmental and Social Impact Assessment (ESIA) carried out on the proposed wind farm. It describes the main features of the development, identifies its significant impacts, together with appropriate management, mitigation and monitoring measures.

This Environmental and Social Impact Statement (ESIS) has been produced in accordance with the international standards required by international financial institutions (IFIs), as the project may require financing from such international investment banks. In addition, in line with the IFIs requirements, the ESIS also addresses Serbian legislative requirements relating to environmental impacts assessment and environmental protection, and the information presented here was used to support the preparation of nationally required Environmental Impact Assessment (EIA), which was adopted in November 2012.

A1.1 Main Project Characteristics

The Čibuk 1 wind farm comprises 57 wind turbines each with a rated output of 2.78 MW. It was determined that the total installed electrical generating capacity of the wind farm will be 158.46 MW as the turbine likely to be selected is the GE 2.5-120 WTG. The main characteristics of the project are:

- the creation of appropriate foundations for the wind turbines and construction of site roads;
- the construction of appropriate infrastructure including underground power cables, a substation and connection to the main grid;
- the transport of turbine components to the site;
- the construction of the wind turbines;
- the operation of the wind turbines for approximately 25 years; and,
- replacement or decommissioning of the wind turbines. In the event that decommissioning is chosen, the process will involve the removal of plant, removal of associated infrastructure where appropriate, and reinstatement of the land.

All raw materials and plant components will be obtained from offsite sources. Therefore, a key aspect of the project during construction is to ensure that appropriate transport routes are in place.

Where possible, local labour will be used in the construction of the wind farm. However, the construction of the turbines will require specialist technical expertise that will be imported from outside the area.

A1.2 Project Location

The proposed site of the wind farm is 30 km to the north east of the city of Belgrade in the municipality of Kovin, Autonomous Province of Vojvodina. The site elevation is approximately 130m above sea level and covers an area of approximately 37 km^2, which corresponds to the area of the Detailed Regulation Plan. The plan is part of the project planning process with the local authority (Municipality of Kovin) and is discussed in detail in Section A.5.5 of this statement.

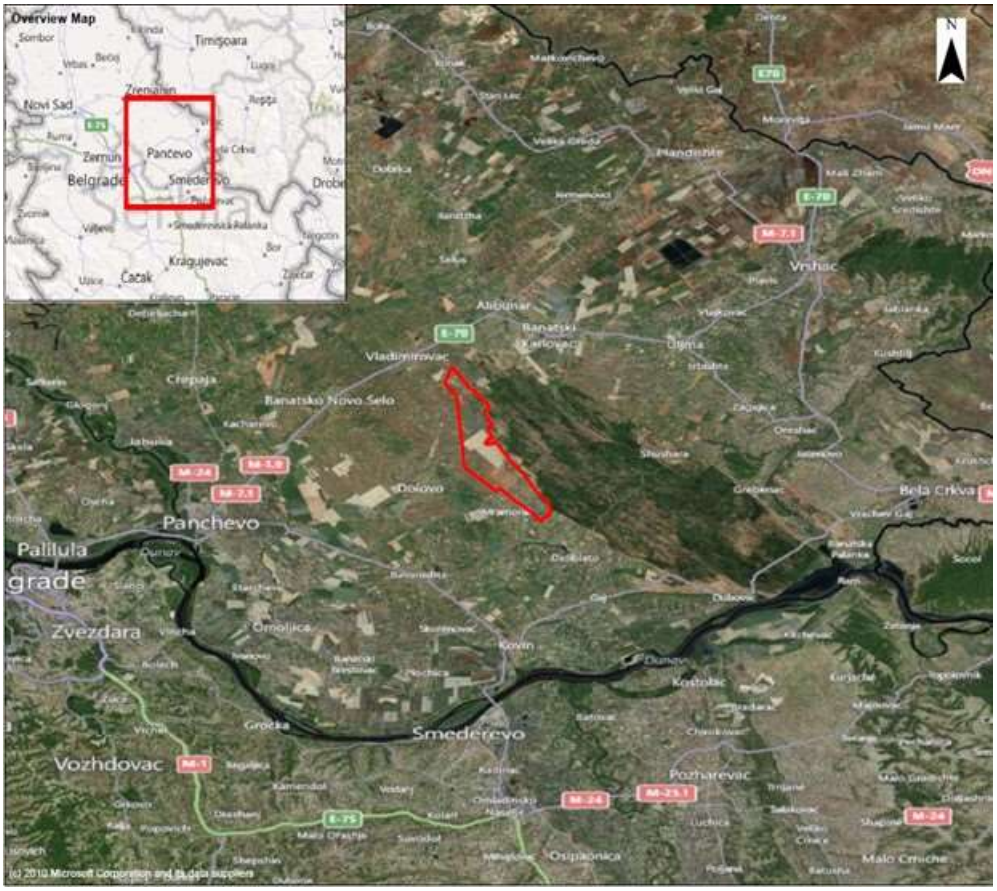


Figure A.1: Location of the Proposed Wind Farm: National Scale

This plan is also presented in Appendix AI.I in A3 format.

A1.3 Project Categorisation

The legislation and standards associated with this project are discussed in detail in the following sections. However, common with most environmental legislation and investment standards is the need to determine the categorisation of proposed developments in terms of their potential environmental and social impacts: this in turn determines the type and depth of impact assessment necessary. In general, the highest category projects are deemed to have the potential to cause the most significant impacts, medium category project potentially have limited impacts and low category project have minimal or no impacts. In the parlance used by international investment banks, the categorisation of projects runs from Category A (highest), through B, to C (lowest).

To determine the categorisation of this proposed project we have:

- reviewed the proposed site layout plans;
- reviewed the engineering design of the proposed project;
- reviewed how the project will be constructed and decommissioned;
- determined the sensitivity of the environment which may be impacted by the proposed project
- identified project stakeholders.

Based on the information available and review of similar projects, this project has been categorised as Category A. The project has been categorised as a Category A project, based on EBRD and IFC criteria because:

- the scale and its location could potentially have significant impacts on the environment;
- the project could potentially have significant socio-economic impacts;

- the project has been categorised as requiring full environmental impact assessment where such assessment is mandatory for facilities for electricity production with capacity equal or greater than 50 MW capacity (i.e. List I facilities);
- there is precedence that similar sized projects elsewhere which have sought external investment have been categorised as Category A projects.

In accordance with international banking standards, Category A projects are subject to:

- full Environmental and Social Impact Assessment (ESIA);
- evaluation of alternatives, including non-implementation;
- recommendation of mitigation or other measures to prevent or minimise impact; and.
- public disclosure.

This Environmental and Social Impact Statement (the Statement) presents the outcome of the assessment process described above. The following sections describe the contents of this Statement and the underlying regulatory and other mechanisms by which the impact assessment of the proposed project is assessed.

A2 Outline of the Statement and Associated Documentation

A2.1 Contents of this Statement

This Statement contains the following sections:

- **Section A:** General Introduction: Includes this section concerning the contents of the statement as well as a general introduction to the project, the project company, background to the ESIA process and the regulatory drivers and scope of the assessment.
- **Section B:** Technical Description: Provides a detailed description of the project including the project rationale, location, project programme, and design. This section also reviews the wind farm design against the IFC Guidelines for Wind Energy (considered to be Best Available Techniques or "BAT") designed and in operation for similar wind farms. Outside of the scope of BAT but also described in this section are the infrastructure associated with the wind farm and connection to the grid. Section B also provides details of project alternatives considered. Where the assessment of impact necessitates a detailed assessment of alternatives compared to the present chosen location, design, configuration etc., this is discussed in more detail in the appropriate sub-section (e.g. ecology sections) of Section D.
- **Section C:** The Existing Environment: Provides a background to the physical, natural history and human characteristics of the proposed project area and surrounding areas which may be impacted upon by the proposed development.
- **Section D:** Assessment of Impact: Provides and assessment of impact of the proposed project in terms of the envelope of the existing environment described in Section C.
- **Section E:** Management, Mitigation and Residual Impacts. Where potential impacts, realised impacts or potential risks have been identified in Section D, Section E proposes how these impacts and risks may be managed or mitigated. Where appropriate management and mitigations have or will be included in the project but residual impacts can or will remain, these are also quantified and discussed.
- **Section F:** Summary of Impacts and Mitigation Measures. This section presents a summary of Sections D and E together with an estimation of the residual impacts once mitigation measures have been implemented.
- **Section G:** Further Information: In this section we have presented the Bibliography and References appearing through this statement, in Sections A-E, including appendices.

A2.2 Documentation Associated with this Statement (Disclosure Package)

The collection of documentation generated by the ESIA process is called the 'Disclosure Package'. In addition to this Statement, the ESIA process has also involved the production of the following documentation:

- Stakeholder Engagement Plan (SEP)
- Non-Technical Summary (NTS)
- Environmental and Social Action Plan (ESAP) and supporting management documents

The purpose and content of each is described below.

The purpose of the **Non-Technical Summary** (NTS) is to give information to everyone that may be interested in the Project. As the name implies, the document is written using non-technical language to ensure that the findings of the ESIA can be understood by the majority.

The **Stakeholder Engagement Plan (SEP)** is a document which identifies project stakeholders, and sets out how the stakeholder engagement will be achieved and managed. Stakeholders are all persons or groups who have a vested interest in the proposed project during any phase of the project life time. Stakeholder engagement encompasses contact, communication and dialogue between the Project and stakeholders through consultation and disclosure. The SEP is

a 'live' document and will therefore be regularly monitored, reviewed and updated to ensure that it is in line with the Project's developments, and incorporates any possible changes to key stakeholders.

The **Environmental and Social Action Plan (ESAP)** details the terms of agreement between finance institutions and the client in order to ensure that the project implementation is undertaken in accordance with the requirements of the finance institution. Other documentation will also be produced which will be used to manage the project, including a Construction Environmental Management Plan (CEMP) and Operational Environmental Management Plan (OEMP). A key driver for the development of these documents is local regulatory requirements, but they also form part of the Environmental and Social Management System (ESMS) required for effective management of projects by international finance institutions. These are developed at an appropriate, predetermined time later in the project development in accordance with local regulatory requirements and the requirements of the finance institutions, if relevant to the project.

A2.3 Availability of the Impact Assessment Documentation

The documentation relating to the ESIA will be available at the following locations:

- The Non-Technical Summary (NTS) and Stakeholder Engagement Plan (SEP) will be placed on the "Čibuk 1" project website (www.wpc.rs). The website will also contain information on where the full documentation will be available in hard copy format. It is expected that the full ESIA, the NTS and SEP in the Serbian language will be available at the Mayor's office in Dolovo.
- The full ESIA documentation, Non-Technical Summary and Stakeholder Engagement Plan, in English will be held at the Continental Wind Serbia d.o.o. office in Belgrade, care of Mr Slobodan Perovic. The office address is Continental Wind Serbia d.o.o., Resavska 23, IV floor, Belgrade 11000; Serbia.
- Information pertaining to the project including the findings of the impact assessment was explained directly to the public through presentations held at three locations near to the proposed facility (Mramorak on 15 June, Dolovo on 7 July, and Kovin on 13 July). The materials and Non-Technical Summary of Environmental and Social Impact Assessment (NTS) were left in these place for several days to provide the public with opportunity to view them. During presentation, a presentation question and answer session was held. All presentations were attended by representatives of WEBG environmental and social experts. This is a requirement under local law. WEBG continues to provide information on the progress of the project to local communities through public meetings which are held at least once a year (in January or February each year) as part of the Social Investment Programme (SIP).

A3 Impact Assessment Approach

A3.1 Introduction

This section describes our general approach to the ESIA of the Čibuk 1 wind farm project. The approach to this ESIA has been informed by:

- the requirements of the international investment banks, namely the requirements of the Equator Principles, the EBRD and IFC;
- Serbian regulatory requirements, in particular the Law on Environmental Impact Assessment (Off. Journal of RS, No. 135/2004, 36/2010) as well as issue specific regulatory requirements such as those associated with noise emissions;
- the requirements of European Commissions, namely EC Directive 97/11;
- guidance applicable to the project, including Guidelines on the Environmental Impact Assessment for Wind Farms, UNDP Serbia, 2010;
- the nature of the project design;
- the environmental and socio-economic background of the proposed project area;
- the expertise of the ESIA team in undertaking similar projects.

The following sections discuss the Impact Assessment process and the regulatory and other requirements to which the assessment adheres.

Throughout this report, potential environmental and social impacts that may be caused by the construction phase of the project are identified using the available information. Where possible an assessment has been made of the likely severity of these impacts based on current information and the experience of the assessors. A detailed assessment of these impacts and the measures to reduce the severity of the impacts will be proposed (termed “mitigation measures”) has been undertake within the ESIA. The impacts and mitigating actions are summarised within the Environmental and Social Action Plan (ESAP).

A3.2 Applicable International Environmental and Social Standards

A3.2.1 Introduction

As described in Section A1.3, this project has been categorised as a Category A project. Since the developer associated with this project is seeking finance from one or more investment banks, the project is subject to the standards of international finance organisations. These standards and how they apply to the project and the assessment of impact are discussed in this section of the Statement. The standards that are applicable to this project are listed below.

- The Equator Principles.
- The policy and standards of the EBRD.
- The policy and standards of the IFC.

The purpose of the standards are to:

- ensure that all projects which are subject to investment undergo appropriate assessment;
- ensure that there are no impacts associated with the proposed investment which are contrary to the bank’s environmental and/or social policies; and,
- prevent reputational or financial damage to the investor.

Also, in order for the project to be in line with international standards, it will be necessary to comply with the requirements of Serbian legislation and EU directives. This is discussed in the section below.

A3.2.2 The Equator Principles

The Equator Principles (EPs) are benchmarks for the financial industry to manage social and environmental issues associated with projects that are sponsored or financed by institutions signed up to the principles. The EPs have been designed to ensure that adverse social and environmental impacts resulting from development are appropriately identified and managed throughout construction and operation. Equator Principle Financial Institutions (EPFIs) are institutions who have publicly adopted the Equator Principles and they commit to only provide loans to projects that conform to the EPs.

In summary, the Equator Principles require:

- EP 1: A scoping assessment to categorise the development in terms of the magnitude of its potential impacts and risks.
- EP 2 & 3: A social and environmental assessment based on the impacts and risks identified in the scoping assessment, taking into account predefined social and environmental standards.
- EP 4: Preparation of an action plan to effectively manage the impacts and risks.
- EP 5 & 6: Undertake appropriate consultation and discourse with affected communities and set up a grievance mechanism to facilitate resolution of concerns and grievances raised.
- EP 7: Undertake an independent review of the process.
- EP 8: Establishment of covenants in financing documentation to ensure compliance with applicable laws and other requirements.
- EP 9: Establishment of a programme of independent monitoring and reporting to ensure appropriate social and environmental performance is maintained.
- EP 10: Annual reporting by the EPFI on experiences concerning the implementation of the Equator Principles

The first EP, Principle 1, involves the review and categorisation of the project. This has been discussed in Section A1.3 of this Statement. The categorisation is conducted to determine the potential nature and scale of impacts and the requirement, if any, for further in-depth assessment in EP – Principle 2. Subsequent in-depth assessment under Principle 2 usually takes the form of an Environmental and Social Impact Assessment (ESIA).

A3.2.3 Specific International Investment Requirements

Guidance on international investment requirements is provided within the EBRD Environmental and Social Policy (EBRD, 2008) and the International Finance Corporation (IFC) Performance Standards on Social & Environmental Sustainability (IFC , 2012). Other detailed documentation also applies, including the IFC Environmental, Health and Safety General Guidelines (IFC, 2007a) and the Environmental, Health, and Safety Guidelines for Wind Energy (IFC, 2007b).

How the EPs are applied to a project varies a little between the EPFI's. For the purposes of this description we will refer to the EBRD process and their terminology. The main steps are:

- Screening Study and EP Categorisation;
- Stakeholder Engagement Plan;
- ESIA Scoping Study;
- ESIA;
- Public Consultation on the ESIA Disclosure Package;
- Management of grievances / objections; and,
- Project Monitoring.

For the purposes of this project a screening assessment report has not been produced. It was clear from the information available to all parties that an impact assessment would be required. The process followed for this impact assessment process is summarised in Figure A.2. For the sake of simplicity, in Figure A.2 the environmental and social assessment process is represented as a single component of the overall process. However, the environmental and social assessment process itself can be split into the following stages:

- Baseline Assessment: Baseline data collection including surveys. Appraisal of current baseline conditions from data collected and surveys undertaken. Prediction and appraisal of how the baseline would be expected to change in future.
- Impact and Effects Prediction: Use of predictive techniques such as models or change indicators to identify likely impacts and to derive their potential effects.
- Impact and Effects Assessment: Allocation of significance and severity levels using defined thresholds and criteria.
- Mitigation and Management: Identification of measures to mitigate adverse effects, and assessment of their effectiveness.
- Identification of Residual Impacts and Effects: Allocation of significance and severity levels (with mitigation in place) using defined thresholds and criteria.

It should be noted that these stages are not undertaken exclusively after the completion of the Scoping Assessment. Instead, it is necessary to partially undertake the sub-stages named above, in order to inform the Scoping Study. Also note, whilst the Stakeholder Engagement Plan (SEP) feeds into the Scoping Study and then the ESIA itself, the SEP and the ESIA essentially run in parallel and inform one another throughout the ESIA process. The balance of each technical and social investigation is agreed with the client, as well as the local regulatory authorities and the EPFI (if appropriate) before the ESIA is completed. This is the point where careful negotiation with the EPFI is particularly important.

While the SEP and Scoping Study are key mechanisms in describing the works that must be undertaken to complete the ESIA Disclosure Package, as the Environmental and Social Assessment Process progresses and further insight of potential issues are identified, this in turn feeds back into the scoping process. For example, ecological investigations may identify potentially sensitive species and/or significant impacts. This may therefore warrant and amendment to the original scope in order that further studies can be undertaken.

In addition to international standards, the Western Balkans Environmental Programme in liaison with the United Nations Development Programme has produced ‘Guidelines on Environmental Impact Assessments for Wind Farms (UNDP Serbia, 2010). This has been used as a key reference document to ensure that the impact assessment corresponds with the requirements of the programme.

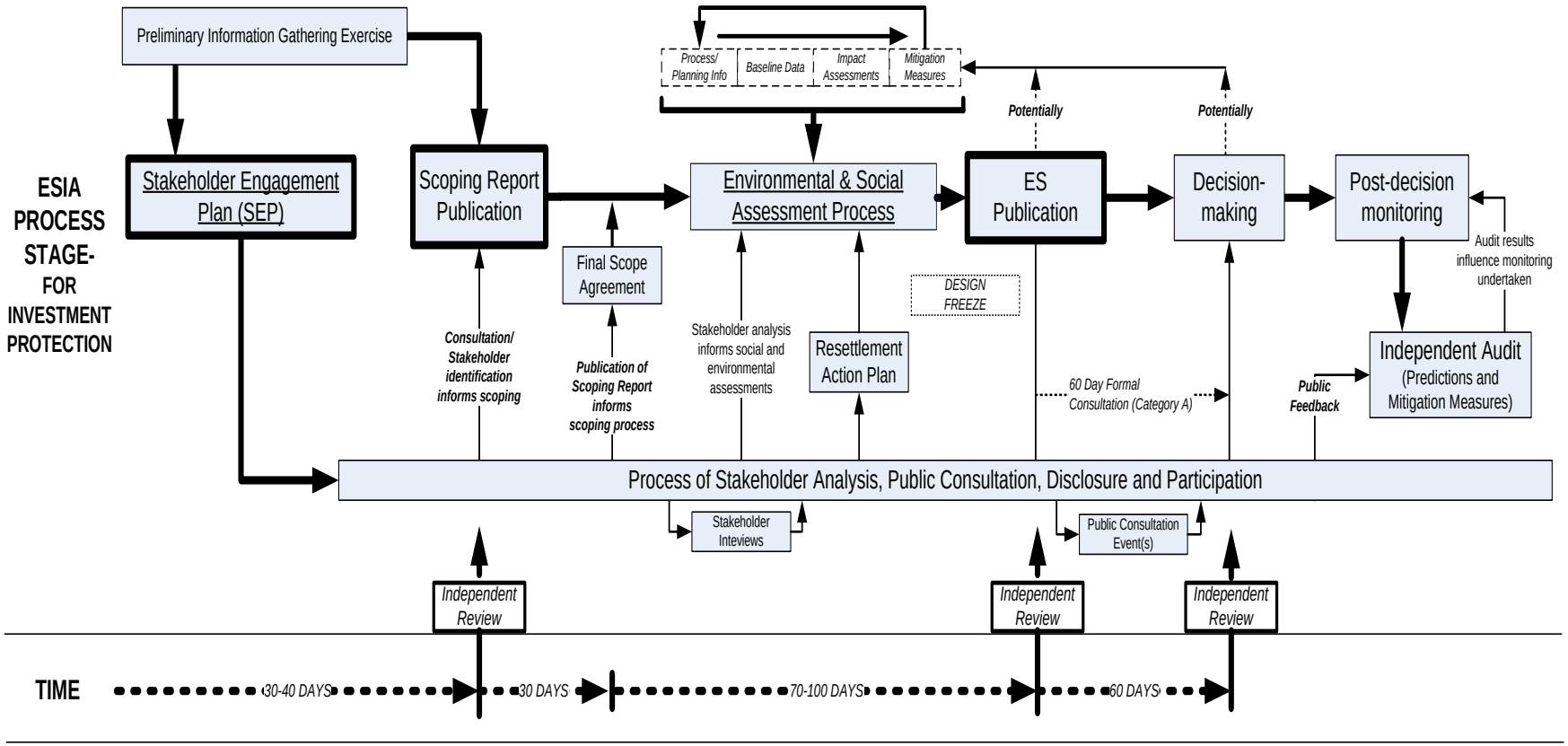


Figure A.2: The ESIA Process

A4 Applicable Legislation

A4.1 Introduction

The following sections provide an overview of the key national and international laws, regulations and designations associated with the proposed project and project area. The laws, regulations and designations presented in the following sections have been determined by the scale and nature of the project and the scope of the project assessment agreed with the Serbian regulatory authorities, the IFC and the EBRD. The scope of the assessment is discussed in Section A5 of this Statement. Since the regulations which are applicable to this project are many and diverse, we have chosen only to include the key requirements associated with this project that are applicable to potential significant impacts. For example, Serbian legislation includes legislation for the projection of groundwater. Since the risk to groundwater associated with this project from construction through to decommissioning, is considered to be negligible, a discussion of groundwater regulation has not been included. However, a full and detailed list of legislation associated with the project will be developed as part of the project management systems from construction, to operation, through to decommissioning.

The competent authorities and organizations which issued their conditions and approvals for the purpose of the Detailed Plan of Regulation of the wind farm were the following:

- Ministry of Defence, Department for Infrastructure (Belgrade)
- Ministry of Interior Affairs, Department for Emergency Situations (Pančevo)
- Municipality of Kovin, Department for construction land, roads and communal issues (Kovin)
- Civil aviation directorate of the Republic of Serbia (Belgrade)
- Institute for Nature Protection of Serbia (Novi Sad)
- Institute for Protection of Cultural Monuments (Pančevo)
- Republic Hydro-Meteorological Institute (Belgrade)
- Republic Institute for Seismology of Serbia (Belgrade)
- Public company for electricity transmission “Elektromreza Srbije” (Belgrade)
- Public company for gas supplying “Kovin Gas” (Kovin)
- Public company for pipeline transport of oil products “Transnafta” (Pančevo)
- Public company for gas supplying “Srbijagas” (Novi Sad)
- Public company for water management “Vode Vojvodine” (Novi Sad)
- Public telecommunication company “Telekom Srbija” (Pančevo)
- Public company for electricity distribution “Elektrovojvodina” (Novi Sad)
- Public railway company “Zeleznice Srbije” (Belgrade)
- Radio-Television of Serbia (Belgrade)
- Oil production company “NIS Naftagas” (Novi Sad)

The location and boundary of the wind farm site is shown in Figure A.1. The proposed site is located on flat agricultural farm land.

A4.2 Local Regulation of Construction and Operation of Wind Farms

The legal framework related to construction and operation of wind farms comprises:

(1) regulations related to energy production, and

(2) regulations related to planning and construction.

An Energy Permit is required by the Law on Energy (Off. Journal of RS, No. 84/2004, 57/2011; the Law amended in December 2012 and published in the Off. Journal of RS, No. 57/2011, 80/2011 – correction 93/2012 and 124/2012) for installation of energy generation facilities of capacity greater than 1 MW. One of the criteria for issuing an Energy Permit is the consideration of the environmental conditions for the project. The Application for an Energy Permit has to contain an overview of environmental protection measures during construction and operation of the wind farm. The authority in charge for Energy Permits is the Ministry of Infrastructure and Energy (currently Ministry of Mining and Energy).

Regulation related to planning and construction (the Law on Planning and Construction, Official Journal of RS, No. 72/2009, 81/09, 24/11; the new Law currently in preparation and expected to be adopted in September 2014) requires three types of permits: (1) Location permit, (2) Construction permit and (3) Operation permit. In order to acquire the necessary permits, a variety of conditions and approvals have to be obtained from the competent institutions during the process.

The Ministry of Construction, Traffic and Infrastructure has the authority to issue the construction permits for energy production facilities from renewable energy sources with a capacity greater than 10 MW. However, for facilities developed on the territory of the Province of Vojvodina, construction permits are issued by the competent Provincial Secretary of Urbanism, Construction and Environment. This is the case for this project.

A4.3 Environmental Impact Assessment of Wind Farms

Since 2004 Serbian legislation on EIA has been harmonised with the related EC Directive 97/11/EC. The full EIA procedure set out in the 2004 Law on Environmental Impact Assessment (Off. Journal of RS, No. 135/2004, 36/2010) comprises the phases of screening, scoping, impact assessment and public consultation.

According to the existing regulation, an environmental impact assessment study is mandatory for facilities for electricity production with capacity equal or greater than 50 MW capacity (List I) (this project falls into this category as its generating capacity of 158.46 MW). An EIA may be required for installations for the harnessing of wind power for energy production (wind farms) with capacity equal or greater than 10 MW (List II), if the competent authority decided it is required.

Environmental impact assessment was conducted as a part of the concept design of the project. According to the Law on Environmental Impact Assessment (Off. Journal of RS, No. 135/2004, 36/2010), the competent authority for an EIA of the project is the same authority which is in charge for issuing the construction permit for the project.

The Law on Nature Conservation ("Official Journal RS", No. 36/09) prescribes that Conditions of Nature Conservation shall be issued for all developments for which the EIA is mandatory. The Law requires protection of migratory species, for projects whose construction cuts off the regular day, night or seasonal migration routes of wildlife, causes fragmentation of habitats or other interferences with their regular life cycle. The location of a wind energy project shall be selected to avoid their habitats and migration routes. Implementation of technical and technological measures is required (e.g. lightning) in order to mitigate the negative impact.

The EIA process in Serbia is shown in Figure A.3 below.

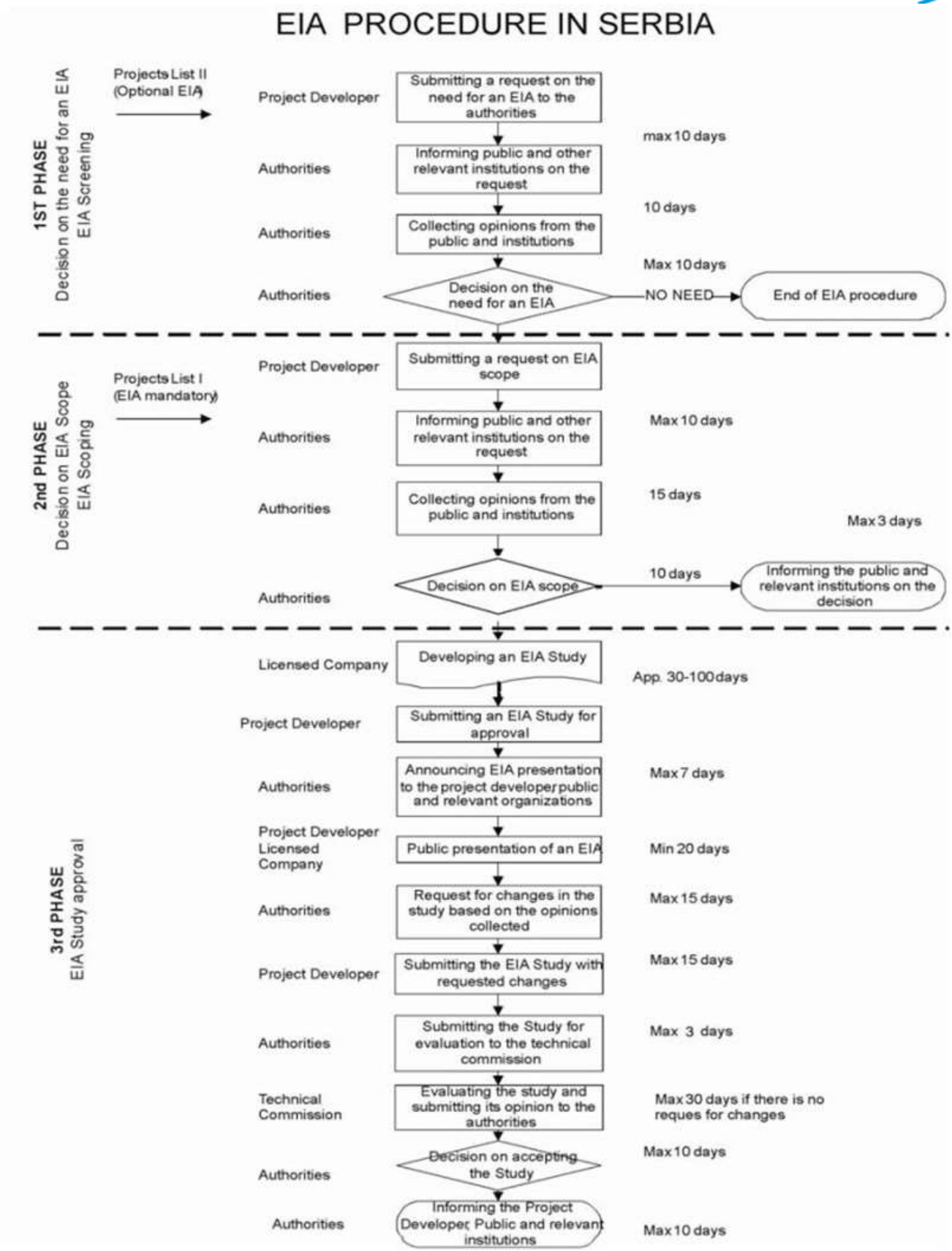


Figure A.3: The Serbian EIA Process

A4.4 Regulatory Controls on Overhead Power Lines

Design and construction of overhead power lines is regulated by the Regulation on technical standards for construction of overhead power lines of nominal voltage between 1 kV and 400 kV (Off. Journal of SFRJ, No. 65/88, Off. Journal of SRJ, No. 18/92) and the Regulation on construction of low voltage overhead power lines (Off. Journal of SFRJ, No. 6/92). Besides the technical standards, overhead power lines are controlled similarly to other linear infrastructure projects, in accordance to planning and construction regulations.

Before design and construction can begin, a set of planning documents have to be prepared and approved by competent authorities. According to the Law on planning and construction (Off. Journal of RS, No. 72/2009; the new Law expected in September 2014), a Detailed Regulation Plan is required as the main spatial planning document for a project. During the formal process of a Detailed Plan preparation, a project developer officially submits requests to a variety of competent authorities and organizations in order to obtain their conditions and approvals in respect to the specific project development and to take them into consideration. Conditions and approvals are related to water and wastewater management, natural heritage, cultural heritage, gas supply, electricity supply, oil pipeline transport, railway network, telecommunications, radio communications, aviation, etc. A Detailed Regulation Plan for OHL was approved by local municipal authorities (Municipality of Kovin and City of Pančevo) in Q3 2013. This was a prerequisite for the project developer to apply for a Location permit.

An issued Location permit is a prerequisite for formal commencement of the environmental impact assessment procedure. According to the existing regulation, an environmental impact assessment study is mandatory for overhead power lines (OHL) of 220 kV voltage (or higher) and longer than 15 km (List I). The relevant authorities confirmed that this project is a List I project even though a 400 kV OHL proposed is less than 15 km long. The Scoping Study for the OHL EIA was prepared in Q4 2012 and the Scoping Request was submitted to the Provincial Secretariat for Urbanism, Construction and Environment in January 2013. Following the public disclosure process and analysis of the extensive Scoping Study, the Provincial Secretariat, in February 2013, issued a decision that EIA is not needed for the OHL.

For the purpose of preparation of Detailed Regulation Plan of the proposed 400 kV overhead power line, WEBG submitted the request for conditions, among other authorities, to the Institute for Nature Protection of Serbia (Novi Sad). In December 2011, the Institute provided their conditions requiring the following:

(1) overhead power lines have to be isolated and adequately marked so the possibility of electrocution or collision of birds and bats is minimised;

(2) in case that during construction works, geological or paleontological heritage is found (fossils, minerals, crystals), the project developer has to inform the relevant Ministry and to protect the findings.

Monitoring of bird or bat fauna in the area of proposed overhead power line has not been required by the Institute for Nature Protection.

A4.5 Summary of Socio-Economic Administrative Boundaries and Regulatory Administration

A4.5.1 Serbian Regulatory Background

The territorial organisation of the Republic of Serbia is regulated by the Law on Territorial Organisation (Official Journal of the RS No. 129/2007). According to this Law, Serbia has two autonomous provinces – Vojvodina in the north and Kosovo and Metohija[1] in the south. The country is divided into 150 municipalities, 23 cities and the City of Belgrade, which is a separate administrative unit. The territories of municipalities and cities are further defined by boundaries of cadastral municipalities[2] within them.

The Law on Local Self Government (Official Journal of the RS No. 129/2007) defines the units of local self-government in Serbia - municipalities, cities and the City of Belgrade. Their bodies of government include: municipal (city) assembly, president of the municipality (mayor) and municipal (city) administration.

Key responsibilities of the local self-governments include: urban and town planning, housing, communal services such as water, transport and heating, local economic development, use and protection of agricultural land, local roads, kindergartens and preschools, primary health care, public information, sport and cultural activities, etc. Some responsibilities are shared with central and/or provincial government, in the areas of education, social welfare, health protection, etc. They are financed out of three basic sources of revenues: (i) own revenues, (ii) shared national taxes, and (iii) a share of revenues assigned to local government units and determined by unique criteria (grant funds).

Local self-governments can also establish local communities on their territories in accordance with the Law on Local Self Government and their statutes, to facilitate the fulfilment of general, common and every day needs of citizens. Local communities are governed by the Local Community Council through Local Community Offices, and supervised by the Local Community Supervisory Board. Members of both bodies are voted directly for a period of 4 years. Members of the Local Community Council vote amongst them for a Chairman and his/her Deputy.

A4.5.2 Land Use and Property Transactions

Land in Serbia is legally categorized as construction land or agricultural land depending on urban / agricultural plans and programmes in place at the time of classification. In accordance with the Law on Planning and Construction, agricultural land can be changed into construction land through the adoption of relevant urban plans (i.e. detailed regulation plans) by local self-governments.

Land needed for construction projects led by the state is typically acquired through the Expropriation Law of the Republic of Serbia. However, privately owned companies cannot be beneficiaries of expropriation and have to acquire land through voluntary transactions regulated by the Law on Obligations (Official Journal of the SFRY No. 29/78, 39/85, 45/89, 57/89 and FRY No. 31/93). This law regulates contracts in general, including land lease contracts.

The Law on Basic Property Relations (Official Journal of the SFRY No 6/80, 36/90 and FRY No. 29/96) and the Law on State Surveying and Cadastral Registry (Official Journal of the RS 72/09, 18/10) prescribe that in case of contractual transfers, real property is acquired only upon registration in the relevant registry.

A4.5.3 Statutory Easements and Use Restrictions

The Law on Planning and Construction (Official Journal of the RS 72/09, 81/09, 64/10, 24/11; expected to be changed in September 2014) provides for certain statutory easements in relation to wind farms and other energy objects. These include over-sailing of wind turbine blades and power lines over adjacent land as well as the right of way through neighbouring land during

[1] In June 1999, the UN Security Council adopted Resolution 1244 to establish the UN Interim Administration Mission in Kosovo (UNMIK). In February 2008, the Government of Kosovo declared its independence, which, to date, has not been fully recognised by the international community or by the Republic of Serbia.
[2] The term “cadastral municipality” is a land surveying category and usually corresponds to the village or neighbourhood that was being surveyed at the time of establishing public records on property.

construction (all of these are envisioned in the draft of the new Law). Affected users of land are to be compensated at market prices for any lost crops and damages.

Similarly, the Energy Law (Official Journal of the RS No. 84/04, 57/11; the Law amended in December 2012 and published in the Off. Journal of RS, No. 57/2011, 80/2011 – correction 93/2012 and 124/2012) provides for the right to access energy facilities for repair or maintenance through neighbouring land. Again, affected users of land are to be compensated at market prices for lost crops and damages, primarily through negotiations and if these fail, through the courts. In addition, during operations, users of neighbouring land plots could become subject to certain use restrictions (e.g. planting trees).

A4.5.4 Lease of Public Land

The Law on Agricultural Land (Official Journal of the RS No. 62/06, 65/08) states that the use of state owned agricultural land is managed through the Ministry of Agriculture. This includes leasing of public land, which is carried out upon a municipal decision, with consent from the Ministry, through public announcements. Revenues acquired through lease, as per Article 71 of the Law, are divided between the state (30%), the province (30%) and the municipality (40%).

A4.5.5 Information Disclosure Requirements

Serbian legislation guarantees to its citizens the right to information, i.e. that everyone shall have the right to be informed accurately, fully and timely about issues of public importance. These provisions are included in the Constitution of the Republic of Serbia: (Official Journal of the RS, No. 98/2006), as well as in the Law on Free Access to Information of Public Importance (Official Journal of the RS, No. 120/04, 54/07, 104/09, 36/2010).

The Law on Planning and Construction of the Republic of Serbia (Official Journal of the RS 72/09, 81/09, 64/10, 24/11) regulates the development and adoption of spatial and urban plans in Serbia, which are all subject to a public disclosure and consultation process. This is described in more detail in the Regulation on the Content, the Method and the Procedure for Developing Planning Documents (Official Journal of the RS No. 31/10, 69/10, 16/11).

Serbia ratified the Aarhus Convention in 2009, by adopting the Law on Confirming the Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters (Official Journal of the RS, No. 38/09). Provisions of the Aarhus Convention were then incorporated into 4 main laws in the area of environmental protection:

- Law on Environment: (Official Journal of the RS, No. 135/2004, 36/2009)
- Law on Environmental Impact Assessment (Official Journal of the RS, No. 135/2004, 36/2009) and the Regulation on the procedure for public participation, presentation and discussion of the EIA Report (Official Journal of the RS, No. 69/2005).
- Law on Strategic Environmental Impact Assessment: (Official Journal of the RS, No. 135/2004, 88/2010)
- Law on Integrated Environmental Pollution Prevention and Control (Official Journal of the RS, No. 135/2004, 88/2010)

A4.5.6 Labour and Working Conditions

Serbia was a member state of the International Labour Organisation (ILO) between 1919 and 1992 and restarted its membership in 2000. The country has ratified 72 ILO International Labour Standards (Conventions), including the eight fundamental Conventions.

Labour and human resource management in Serbia is primarily addressed through the Labour Law of the Republic of Serbia (Official Journal of the RS No. 24/05, 61/05; new Labour Law adopted in July 2014 and published in the Official Journal of the RS No. 24/2005, 61/2005, 54/2009, 32/2013,75/2014). Compliance with labour laws is monitored by the Labour Inspectorate of the Ministry of Labour and Social Policy of the Republic of Serbia.

Other applicable laws include:

- Law on Amicable Resolution of Labour Disputes (Official Journal of the RS No. 125/04, 104/09)
- Law on Strikes (Official Journal of the FRY No. 29/96)

- Law on Mobbing (Official Journal of the RS No. 36/10)
- Anti-Discrimination Law (Official Journal of the RS No. 22/09)
- Law on Preventing Discrimination Against Persons with Disabilities (Official Journal of the RS No. 33/06)
- Law on Vocational Rehabilitation and Employment of Disabled Persons (Official Journal of the RS No. 36/2009)
- Pension and Disability Insurance Law (Official Journal of the RS No. 34/03, 64/04, 84/04, 85/05, 101/05, 63/06, 05/09, 107/09, 101/10)

A4.6 Relationship between International ESIA and Serbian EIA Processes

The two processes are generally aligned in terms of the requirements for assessment of environmental impact. However, the international investment requirements can be seen as a standalone, integrated process and therefore need to encompass the requirements associated with regulatory mechanisms such as those which are part of the local 'planning process' and are outside the formal environmental impact assessment process. For example, issues associated with local grievances arising from land purchase for the project are managed locally by local regulatory authorities. In the ESIA process, these local issues must also be encompassed in the integrated impact assessment. Table A.2 summarises the similarities and differences between the ESIA and Serbian EIA process. To ensure compliance, the more stringent of the two was complied with when a variation between the two was noted. EIA for Serbian legislative process has been compiled and was based on the information contained in this Statement.

Table A.1: Relationship with the Local EIA

Activity	ESIA	EIA	Comments
Screening Study	✓	✓	Due to nature of the proposed project and the clear requirement under bank standards and national legislation, a formal screening study report was not produced for this project. Agreement was made with the EBRD and local regulator that a full impact assessment was required as defined by the categorisation process (see below).
Categorisation	✓	✓	Formal categorisation in accordance with banking standards and national legislation indicated that the proposed project is a Category A /List I project and required a full impact assessment.
Stakeholder Engagement Plan	✓	x	A formal stakeholder engagement plan is not required under national legislation. However, stakeholder consultation is part of the EIA process.
Scoping Study	✓	✓	A Scoping Study was submitted to the EBRD and the local regulatory authorities.
Consideration of alternatives	✓	✓	Both the impact assessment process for the purposes of investment and national regulatory requirements, require the consideration of other feasible approaches, including alternatives locations, technologies, scales and 'no project' options.
Environmental Impact Assessment	✓	✓	The environmental impact assessment requirements are generally aligned. The standards adopted in the environmental assessment undertaken for the purposes of the ESIA should be in line with European and other international best practice. The requirements under the national EIA regulatory process need to ensure compliance with national legislation and not the regulatory requirements outside of the country.
Socio-Economic Impact Assessment	✓	Partial	The impact assessment for banking requirements requires an integrated approach including full deliberation of the socio-economic effects. The national regulatory requirements for impact assessment are primarily focused on environmental requirements with other requirements encompassed in other regulatory (e.g. 'planning') mechanisms. A formal socio-economic impact assessment is not required under national legislation. However, local national legislation does require assessment of effects where impacts are associated with impacts to human health.
Non-Technical Summary (NTS)	✓	✓	NTS required for banking requirements for use as disclosure document. It is recognised as good practice to produce an NTS to provide readily accessible summary of the project key features, an assessment of its

			effects, the proposed mitigation measures and a summary of the residual impacts.
Public Consultation & Disclosure	✓	✓	The public consultation process for both investment and national regulatory purposes run in tandem in this project.
Management of Grievances and Objections	✓	x	A Grievance Mechanism is not a formal requirement under the national regulatory requirements. However, grievances are reported under the consultation process and are encompassed under other regulatory mechanisms (e.g. the local 'planning' process).

A4.7 Regulation of Protected Habitats and Species

A4.7.1 National and International Habitat Designations

The site envisaged for the construction of the Wind Energy Park is situated in the vicinity of the Deliblato Sands Special Nature Reserve, which is protected under the Decree of the Government of the Republic of Serbia (Official Gazette of the Republic of Serbia No.43/02, 81/08) and represents one of the most significant bird habitats in Serbia with 167 recorded species, many of which are protected by the Government Decree on the Protection of Nature's Rarities (Official Gazette, 1993ab).

The wind farm site is, at its closest point, 1.3 km from Deliblato Sands which is also recognised as an "Important Bird Area", a significant, but non-statutory, designation of the NGO Birdlife International. This site is considered to be the equivalent of a Special Protection Area (SPA) for its internationally important bird populations. SPAs form part of a network of Natura 2000 sites, designed to protect areas internationally important for their birds (Birds Directive 2009/147/EC).

Plantlife International has designated the Deliblato Sands as an International Plant Area (IPA). One part of the Sands, the area of "Labudovo okno", encompasses an important stretch of the Danube and adjacent areas as well as the Nera River to the border with Romania and is a Ramsar site i.e. a Wetland of International Importance. It is one of nine Serbian sites designated under the Ramsar Convention, to which Serbia is a signatory. It is a Biosphere Reserve under the UNESCO-MAB programme (2001).

Aware of the significance and sensitivity of the Deliblato Sands, WEBG have agreed with the Serbian Institute for Nature Protection that the border of the wind farm will be at least 1 km away from the border of the Deliblato Sands Special Nature Reserve.

The area of nature conservation is regulated by the Law on Nature Protection ("Official Gazette of RS", no. 36/2009, 88/2010 and 91/2010 – corr.), along with other legal acts and bylaws which directly or indirectly relate to nature and natural resources as delineated by the Institute for Nature Conservation of Serbia (http://www.zzps.rs/), such as the Decree on Conservation of Natural Rarities ("Official Gazette RS", No. 50/93, 93/93).

Being an accession country looking to join the European Union (EU), Serbia also has a duty to begin integrating its legal framework with that of the EU. Relevant pieces of EU legislation to nature conservation are:

- Council Directive 2009/147/EC on the conservation of wild birds (known as the 'Birds Directive');
- Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (known as the 'Habitats Directive').

Recent revisions of Serbian law in relation to the conservation and protection of nature have begun this process of integration with EU law. The Institute for Nature Conservation of Serbia (http://www.natureprotection.org.rs/) states:

> *What is in progress now is the harmonization of legislation from the area of environment protection and nature with the legislation of European Union, where passing the Law on Nature Conservation ("Official Gazette of the Republic of Serbia" no. 36/09 and 88/2010), which regulates conservation and preservation of nature biological, geological and landscape diversity, was of the exceptional importance. Recent changes of this Law have harmonized with the obligations coming from the International Conventions, as well as*

with relevant regulations of European Union from the area of nature conservation, as the Council Directive 92/43/EE3 from 21st May 1992 (Official Gazette EU L 206.22/7/1992 P. 0007-0050) on habitats protection, Council Directive 79/409/EEC from 2nd April 1979 (Official Gazette L 103, 25.04.1979, page 0001-0018) on wild birds preservation, etc.

A4.7.2 Ecological Protection for Wind Farm Developments

At present no official guidance with respect to ecology and wind farms exists in Serbia. Therefore guidance from elsewhere will be identified and applied as considered appropriate.

With regards to international guidance on monitoring sites for the potential impacts of proposed wind farms on birds, the United Kingdom (U.K.) appears to be leading the field.

Scottish Natural Heritage produced guidance on survey methods assessing the impacts of onshore wind farms on bird communities in 2005 (Scottish Natural Heritage, 2005). This guidance was recently superseded by Natural England Technical Information Note TIN069 in 2010 (Natural England, 2010). This guidance outlines in detail the survey methodology that should be followed in order to assess the potential impacts of a proposed wind farm on birds.

These guidance documents also outline the criteria for selecting target bird species (species potentially sensitive to impacts from wind farms). In addition Birdlife International have also produced guidance on species potentially sensitive to impacts from wind farms (either by disturbance, barrier to movement, collision or habitat loss) (Langston and Pullan, 2003).

In 2010, the European Commission produced a guidance document on how best to ensure that wind energy developments are compatible with the provisions of the Habitats and Birds Directives.

The evaluation and risk assessment of potential wind energy sites in the United States of America (U.S.A), and their potential effects to wildlife takes a multi-tiered approach. The stages of assessment include preliminary site screening, site characterisation, and pre-construction monitoring. Standard guidelines call for scientifically rigorous surveys, assessment, and research designs proportionate to the risk to affected species.

Potential affects to habitats should be considered, and developers should evaluate landscape and habitat characteristics. In particular those which are susceptible to habitat loss or fragmentation, or which support species which are susceptible to habitat loss or fragmentation.

With respect to guidance and best practice for ecological assessment of wind farms in the U.S.A. it is first necessary to understand that, in the U.S.A., the environmental assessment and permitting of projects requiring EIA, typically follows state or federal legislative policies and guidance. It is considered that many of the environmental standards currently adhered to in the U.S.A. are commensurate with the standards outlined in the Equator Principles. However, the renewable energy market and associated environmental regulations and guidance are still very much evolving in the U.S.A, and many of the current practices have simply developed as voluntary industry standards, based on prevailing scientific literature. As a result, there is a lot of variation in the methods of assessment currently employed in this sector by different consultants and there has been no accepted procedure.

However, the methodologies adopted by certain reputable consultants regarding avian studies have been based on accepted international guidance (i.e. as used in Europe). The primary agency responsible for overseeing these studies is the U.S. Fish and Wildlife Service (USFWS). The USFWS is encouraging the wind farm industry to conduct lengthy pre-construction and post-construction studies but, currently, post-construction studies are largely voluntarily. Therefore, the amount of effort varies widely, but the voluntary measures may eventually becoming mandatory and the guidelines are expected to become more restrictive rather than less restrictive.

The following summary of the U.S.A approach to survey and assessment methodology is taken from the 'U.S. Fish and Wildlife Service Draft Land-Based Wind Energy Guidelines'. These outline recommendations on measures to avoid, minimize, and compensate for effects to fish, wildlife, and their habitat. The guidelines state that detailed site surveys for bats and birds are recommended, at a level which will identify all common species at a site, and those less common species which are present at a site occasionally throughout the year. Standard survey methods such as point counts, activity transects are recommended, as well as additional techniques such as thermal imagery or radar where there is concern about high risk to nocturnally active species.

The level of data collected should be sufficient to analyse specific risks to individual species, and the risks that may be posed to local populations.

The IFC has produced Environmental, Health, and Safety Guidelines for Wind Energy (April 2007) which provides some general consideration of the impact of windfarms on the natural environment. In relation to impact on birds, the Guidelines state that prevention and control measures should consider:

- Site selection to take account of known migration pathways or areas where birds (and bats) are highly concentrated. Examples of high-concentration areas include wetlands, designated wildlife refuges, staging areas, rookeries, bat hibernation areas, roosts, ridges, river valleys, and riparian areas;
- Configure turbine arrays to avoid potential avian mortality (e.g. group turbines rather than spread them widely or orient rows of turbines parallel to known bird movements);
- Implement appropriate storm water management measures to avoid creating attractions such as small ponds which can attract birds and bats for feeding or nesting near the wind farm.

A4.7.3 Bats

All of the bat species in Serbia are protected under the Nature Protection Act (Official Gazette of the Republic of Serbia, No. 36/09) and/or the Rulebook on Promulgation and Preservation of Strictly Protected and Protected Wild Species of Plants, Animals and Fungi, including the Annexes containing lists of strictly protected species, which make up an integral part of the Rules adopted under the above Law (Official Gazette of the Republic Of Serbia, No. 5/10).

Serbia has ratified and, for the most part, implemented all of the international conventions regulating the protection of bats. The most important of these include the Convention on the Conservation of European Wildlife and Natural Habitats (the so-called Bern Convention) (Official Gazette of the Republic of Serbia, No. 102/07a) and the Convention on the Conservation of Migratory Species of Wild Animals (the so-called Bonn Convention) (Official Gazette of the Republic of Serbia, No. 102/07b). All European bat species are listed in Annex II to the Bern Convention (strictly protected species) except for Pipistrellus pipistrellus/Common Pipistrelle, which is listed in Annex III (protected species). All of the populations of European Bats are listed in Annex II to the Bonn Convention.

The implementation of the Bern Convention in the EU is regulated by the EU Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (the so-called European Habitats and Species Directive) (Official Journal Of The European Union [92/43/EEC]) and all of the bat species are listed in Annex II to that Directive. 13 species that have all also been recorded in Serbia are listed in Annex IV. The Bonn Convention also has a separate implementation instrument in the form of the Agreement on Conservation of Populations of European Bats (EUROBATS), which has not yet been ratified by Serbia.

A4.7.4 Birds

The Deliblato Sands is considered to be one of the most significant bird habitats in Serbia with 167 identified species, most of which have been protected under the Nature Protection Act (Official Gazette of the Republic of Serbia, No. 36/2009) and/or the Rulebook on Promulgation and Preservation of Strictly Protected and Protected Wild Species of Plants, Animals and Fungi (Official Gazette of the Republic of Serbia No. 5/10).

The International Union for Conservation of Nature (IUCN) helps to identify global conservation priorities by producing assessments like the IUCN Red List of Threatened Species which serves as a gauge of biodiversity loss and helps target conservation action. The IUCN extinction Risk Categories have been adapted to the Serbian bird populations by MM Consulting to enable an understanding of the international vulnerability of the birds recorded during the bird monitoring.

A4.7.5 Other Relevant Ecological Legislation

Rulebook on protection of strictly protected and protected wild species of plants, animals and fungi (Official Gazette of the Republic of Serbia no. 5/2010)

This rulebook outlines the protective measures that wild species of plants, animals and fungi are afforded under Serbian legislation. This rulebook contains 135 articles, of which the following are relevant to birds:

Article 36: Protected Species

This article states that 'wild species which are endangered or can become endangered, which have special significance from the genetic, ecological, ecosystem, scientific, health, economical and other aspects, shall be protected as strictly protected wild species or protected wild species.

Protected species within the meaning of this Law are determined on the basis of national and international red lists or red books, expert findings and scientific knowledge'.

Articles 71 – 81: Protection and conservation of wild species

This outlines the protection that protected wild species and strictly protected wild species and their habitats may receive.

Article 81: Measures for the protection of birds and bats specifically refers to wind farms requiring that they are located as to avoid important habitats and migratory routes of birds and bats.

This rulebook lists all protected and strictly protected species.

Rulebook on hunting seasons (Official Gazette of the Republic of Serbia no. 9/2012)

This rulebook lists the species for which hunting is permitted and the seasons within which hunting may take place.

Independent Articles of the Law on Amendments of the Law on Nature Protection ("Official Gazette of RS", no. 88/2010)

Article 55

Ecologically significant areas of the European Union Natura 2000 (see International Guidance section below) shall be identified and shall become a part of the European ecological network Natura 2000 on the day of the Republic of Serbia accession to the European Union

Serbia is currently aligning itself with European legislation in preparation with accession to the European Union. As part of this, proposed Natura 2000 sites are currently being identified. This includes the Deliblato Sands IBA which is currently being considered as a Special Protection Area (SPA) for the suite of birds it supports.

A4.7.6 International Conventions

Bern Convention (1981, 82/72/EEC): Convention on the Conservation of European Wildlife and Natural Habitats

The Bern Convention is internationally binding and aims to conserve wild fauna and flora and their natural habitats. The convention emphasises the need to protect endangered natural habitats and endangered vulnerable species, including migratory species.

The rules relevant for the conservation of special species are listed in articles 6 and 10.

Article 6

Each Contracting Party shall take appropriate and necessary legislative and administrative measures to ensure the special protection of the wild fauna species specified in Appendix II. The following will in particular be prohibited for these species:

- *all forms of deliberate capture and keeping and deliberate killing;*
- *the deliberate damage to or destruction of breeding or resting sites;*
- *the deliberate disturbance of wild fauna, particularly during the period of breeding, rearing and hibernation insofar as disturbance would be significant in relation to the objectives of this Convention;*

- *the deliberate destruction or taking of eggs from the wild or the keeping of these eggs even if empty;*
- *the possession of and internal trade in these animals, alive or dead, including stuffed animals and any readily recognisable part or derivative thereof, where this would contribute to the effectiveness of the provisions of this article.*

Article 10

The contracting parties undertake, in addition to the measures specified in Articles 4, 6, 7 and 8, to co-ordinate their efforts for the protection of the migratory species specified in Appendices II and III whose range extends into their territories.

The Contracting Parties shall take measures to seek to ensure that the closed seasons and/or other procedures regulating the exploitation established under paragraph 3.a of article 7 are adequate and appropriately disposed to meet the requirements of the migratory species specified in Appendix III.

Bonn Convention (1982, 82/461/EEC): Convention on the Conservation of Migratory Species of Wild Animals (CMS) (Serbia acceded 1 March 2008)

The convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or Bonn Convention) aims to conserve terrestrial, marine and avian migratory species throughout their range. This intergovernmental treaty, negotiated under the aegis of the United Nations Environment Programme, is concerned with the conservation of wildlife and habitats on a global scale.

The relevant rules concerning migratory species are stated in Article III:

Article III

Endangered Migratory Species: Appendix I

4. *Parties that are Range States of a migratory species listed in Appendix I shall endeavour:*

- *to conserve and, where feasible and appropriate, restore those habitats of the species which are of importance in removing the species from danger of extinction;*
- *to prevent, remove, compensate for or minimise, as appropriate, the adverse effects of activities or obstacles that seriously impede or prevent the migration of the species; and*
- *to the extent feasible and appropriate, to prevent, recue or control factors that are endangering or are likely to further endanger the species, including strictly controlling the introduction of, or controlling or eliminating, already introduced exotic species.*

5. *Parties that are Range States of a migratory species listed in Appendix I shall prohibit the taking of animals belonging to such species. Exception may be made to this prohibition only if:*

- *the taking is for scientific purposes;*
- *the taking is for the purpose of enhancing the propagation or survival of the affected species;*
- *the taking is to accommodate the needs of traditional subsistence users of such species; or*
- *extraordinary circumstances so require; provide that such exceptions are precise as to content and limited in space and time. Such taking should not operate to the disadvantage of the species.*

Furthermore it is based on the Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (in the following: Birds Directive).

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 aim of the Birds Directive is to provide long-term protection and conservation of all bird species including migratory species naturally living in the wild within the European territory of the Member States and to regulate the management and use of birds.

The relevant rules concerning migratory species are listed in Article 5:

Article 5

Without prejudice to Article 7 and 9, member States shall take the requisite measure to establish a general system of protection for all species of birds referred to in Article 1, prohibiting in particular:

- *deliberate killing or capture by any method;*
- *deliberate destruction of, or damage to, their nests and eggs or removal of their nests;*
- *taking their eggs in the wild and keeping these eggs even if empty;*
- *deliberate disturbance of these birds particularly during the period of breeding and rearing, in so far as disturbance would be significant having regard to the objectives of this Directive;*
- *keeping birds of species the hunting and capture of which is prohibited.*

A4.8 Noise Legislation

The Law on Environmental Noise (Off. Journal of RS, No. 36/2009, 88/2010) is the main legislative document with respect to environmental noise. The permitted noise levels are defined by the by-law document - the Decree on environmental noise indicators, limits values, assessment methods of the noise indicators, the nuisance and the harmful effects (Off. Journal of RS No. 75/2010). The Decree imposes the following noise levels which must not be exceeded:

Table A.2: Serbian Noise Level Limits

Zone	Purpose of the Area	Noise Level (dBA)	
		Daytime & Evening	Night Time
1.	Recreation areas, health institution areas, cultural and historical sites, large parks	50	40
2.	Tourist areas, schools, camps	50	45
3.	Residential areas	55	45
4.	Commercial and residential areas, children playgrounds	60	50
5.	City centre, workshop area, commercial area, administrative area with apartments, zones along highway, regional roads and city streets	65	55
6	Industrial areas, warehouse and service areas, transport terminals with no residential buildings	Noise level at the boundary of this zone shall not exceed the limit value defined for the zone it borders	

The Law on Environmental Noise stipulates that an individual or a company which is the owner or the user of a noise source is obliged to have noise measurements with related noise measurement reports, performed by authorised institutions.

The IFC has produced Environmental, Health, and Safety Guidelines for Wind Energy (April 2007) states that noise impacts should not result in a maximum increase in background levels of 3 dB at the nearest receptor location.

A4.9 Occupational, Health and Safety Law

The Law on Occupational Health and Safety (Off. Journal of RS, No. 101/2005) is the main legislative document regulating occupational health and safety issues in Serbia. The Law was enforced in 2005 and incorporated the principles of the EU Workplace Health and Safety Directive (89/391/EEC).

The Law is based on general principles of prevention and requires: (1) avoiding risks, (2) evaluating the risks, (3) combating the risks at source, (4) adapting the work to the individual, (5) replacing the dangerous by the non- or the less dangerous, (6) prioritizing collective protective measures (over individual protective measures) and (7) giving appropriate instructions to the workers.

Enforcement of the Law is provided by implementation of the set of by-laws (regulations and decrees) which stipulate specific requirements related to the general principles defined by the Law.

Occupational health and safety is under the responsibility of the Ministry of Labour and Social Policy. Particularly, the Directorate for Occupational Health and Safety is in charge for legislation preparation and the Labour Inspectorate is competent for supervision of the legislation enforcement.

In addition to local Occupational, Health and Safety Law standards, international best practice will also be adopted.

A5 Scope of the Environment and Social Impact Assessment

A5.1 Overview of Scoping Study Process

The Scoping Study Report covers the scoping phase of the ESIA study and should be considered in conjunction with the project Social Engagement Plan (SEP). The 'scope' of the assessment refers to the geographical technical and potential impacts boundaries to the issues that need to be addressed in the formal ESIA process and subsequently discussed in this Statement. Therefore, its purpose was to:

- engage stakeholders at an early stage of the proposed development so that they can contribute their views and provide relevant information;
- define the scope of the ESIA;
- identify the potential significant and non-significant environmental effects of the proposed development; and,
- define the methodologies to be used in the ESIA to assess these effects.

In essence, where the Scoping Study determines that either no potential impact will arise from a particular issue or topic area, or that the impact on a receptor is negligible, then the topic is scoped out of the main ESIA. Through this process, the Scoping Study also determines which of the identified impacts are potentially the most significant and therefore warrant detailed assessment. This scoping process is managed as follows with four levels of assessment considered:

- Level I: Detailed Assessment – Undertaken on important environmental and social issues directly associated with the project (i.e. the wind farm) and those which would have an impact on the viability of the project for sale or for investment.
- Level II: Indicative Assessment – Undertaken on important environmental and social issues, either directly associated with the project but where they are less significant, or issues in relation to the activities and infrastructure development that are closely associated with the wind farm development. Indicative assessments will also be undertaken where there is no information and / or data available to undertake detailed assessments.
- Level III: Cursory Assessment – Undertaken on issues which are directly associated with the project but have a low risk of impact or potentially important environmental and social issues as a result of the development, that occur beyond the vicinity of the installation.
- Level IV: Screened Out Activities – Activities, in particular those which are not associated with the project site and also have a low risk of impact.

A5.2 Scoping Study Report Contents

The Scoping Study Report was initially produced in July 2011 and went through several drafts before full agreement on the contents, completed in December 2012. The report contains the following sections:

- Section 1: Introduction
- Section 2: Presents the details of the proposed development and the alternatives being considered.
- Section 3: Identifies the relevant emission standards and environmental quality criteria including Serbian environmental laws and regulations, European Union Directives, and other relevant standards. This section explains how these laws and standards are applicable within the framework of the proposed project.
- Section 4: Presents a review of available environmental and social baseline information.
- Section 5: Identifies the important issues for the ESIA and details the work necessary in order to adequately assess the impacts of the proposed development.
- Section 6: Summarises the scope of the ESIA and presents a work plan summary of the assessments to be undertaken to complete the ESIA.

The report also contains a number of appendices:

- Appendix A – Site Layout: Plan of the proposed area, indicating the extent of the wind farm and the location of the proposed wind turbines plots areas.
- Appendix B – Bat Investigations.
- Appendix C – Bird Investigations.

A5.3 Environmental and Socio-Economic Issues Identified

The following issues were identified in the Scoping Report for assessment in the ESIA:

- Level 1 Issues
  - Process Design and the Application of BAT;
  - Landscape and Visual Impact;
  - Ecology and Nature Conservation Effect ;
  - Noise Impact ;
  - Shadow Flicker Effects;
  - Socio-Economic Effects.
- Level II Issues
  - Traffic and Transport;
  - Radio-Communication and Aviation Effects;
  - Archaeology and Cultural Heritage.
- Level III Issues
  - Land and Groundwater Quality;
  - Surface Water and Effluent;
  - Safety Aspects.

The issues for assessment described above are discussed in more detail in Sections C-E.

There are many issues which have been scoped out of the assessment, some examples and reasons for being scoped out are:

- Level IV Issues:
  - Flora associated with the Deliblato Sands: No link between the proposed project and potential impacts on the flora could be found.
  - Respiratory health effects associated with vehicles accessing the project area. The project does not involve vehicle movements to an extent where there is likelihood of health impact.
  - Impact on groundwater as a result of releases during the operational phase of the project during normal operations (i.e. not excluding accidental/emergency scenarios).

When the ESIA was originally undertaken the Čibuk project was then the only wind farm proposed in the region and was the first to be developed in Serbia. Since then, the interest in wind energy has increased dramatically. At the beginning of September 2014 there are seven wind farms proposed within 30km of the Čibuk 1 Project. The cumulative impact of these windfarms has been assessed as part of the ESIS Update. The cumulative impact assessment includes consideration of the impact on birds and bats, habitat loss, and socio-economic effects.

A5.4 Determination of the EBRD

The EBRD in general agreed with the contents of the Scoping Study but requested that the impact associated with Overhead Power Line (OHL) also be considered. Atkins have incorporated this into the assessment. In addition the EBRD socio-economic team provided comments on the methodology of the proposed socio-economic assessment in order to ensure an appropriate and robust assessment in line with the EBRD Environmental and Social Policy.

During 2014, two other International Finance Institutions (International Finance Corporation and Overseas Private Investment Corporation) also considered the provision of financial support to the Čibuk Project. The ESIS update of September 2014 was completed in discussion with these organisations.

A5.5 Determination of the Regulatory Authorities

The initial steps in the project planning of this project were undertaken in 2009 when, upon the request of WEBG, the local authority (Municipality of Kovin) determined the need for the Detailed Regulation Plan of the Čibuk 1 Wind Farm Infrastructure System. During the formal process of Detailed Regulation Plan preparation, WEBG officially submitted requests to a variety of competent authorities and organizations to obtain their specific conditions and approvals in respect to the project development and to take them into consideration.

The competent authorities and organizations which issued their conditions and approvals for the purpose of the Detailed Plan of Regulation of the wind farm were the following:

- Ministry of Environment, Republic of Serbia (Belgrade)
- Ministry of Defence, Department for Infrastructure (Belgrade)
- Ministry of Interior Affairs, Department for Emergency Situations (Pančevo)
- Municipality of Kovin, Department for construction land, roads and communal issues (Kovin)
- Provincial Secretariat for Urbanism, Construction and Environment (Novi Sad)
- Civil aviation directorate of the Republic of Serbia (Belgrade)
- Institute for Nature Protection of Serbia (Novi Sad)
- Institute for Protection of Cultural Monuments (Pančevo)
- Republic Hydro-Meteorological Institute (Belgrade)
- Republic Institute for Seismology of Serbia (Belgrade)
- Public company for electricity transmission “Elektromreza Srbije” (Belgrade)
- Public company for gas supplying “Kovin Gas” (Kovin)
- Public company for pipeline transport of oil products “Transnafta” (Pančevo)
- Public company for gas supplying “Srbijagas” (Novi Sad)
- Public company for water management “Vode Vojvodine” (Novi Sad)
- Public telecommunication company “Telekom Srbija” (Pančevo)
- Public company for electricity distribution “Elektrovojvodina” (Novi Sad)
- Public railway company “Zeleznice Srbije” (Belgrade)
- Radio-Television of Serbia (Belgrade)
- Oil production company “NIS Naftagas” (Novi Sad).

The Detailed Regulation Plan of the Čibuk 1 Wind Farm Infrastructure System (‘the Plan’) incorporated all conditions from competent authorities and organizations and was officially approved by the Municipality of Kovin in December 2010. Where applicable, the requirements of ’the Plan’ have been incorporated in to the assessment of impact as well as the associated management, mitigation and monitoring measures.

In November 2011, the decision issued by Provincial Secretariat for Urbanism, Construction and Environment (located in Novi Sad), determined that an Environmental Impact Assessment Study must be undertaken associated with the wind farm development. The Secretariat laid out the requirements of the regulator associated with the assessment and they were in line with the assessment proposed in the Scoping Report. Key requirements are that the assessment must include the following elements.

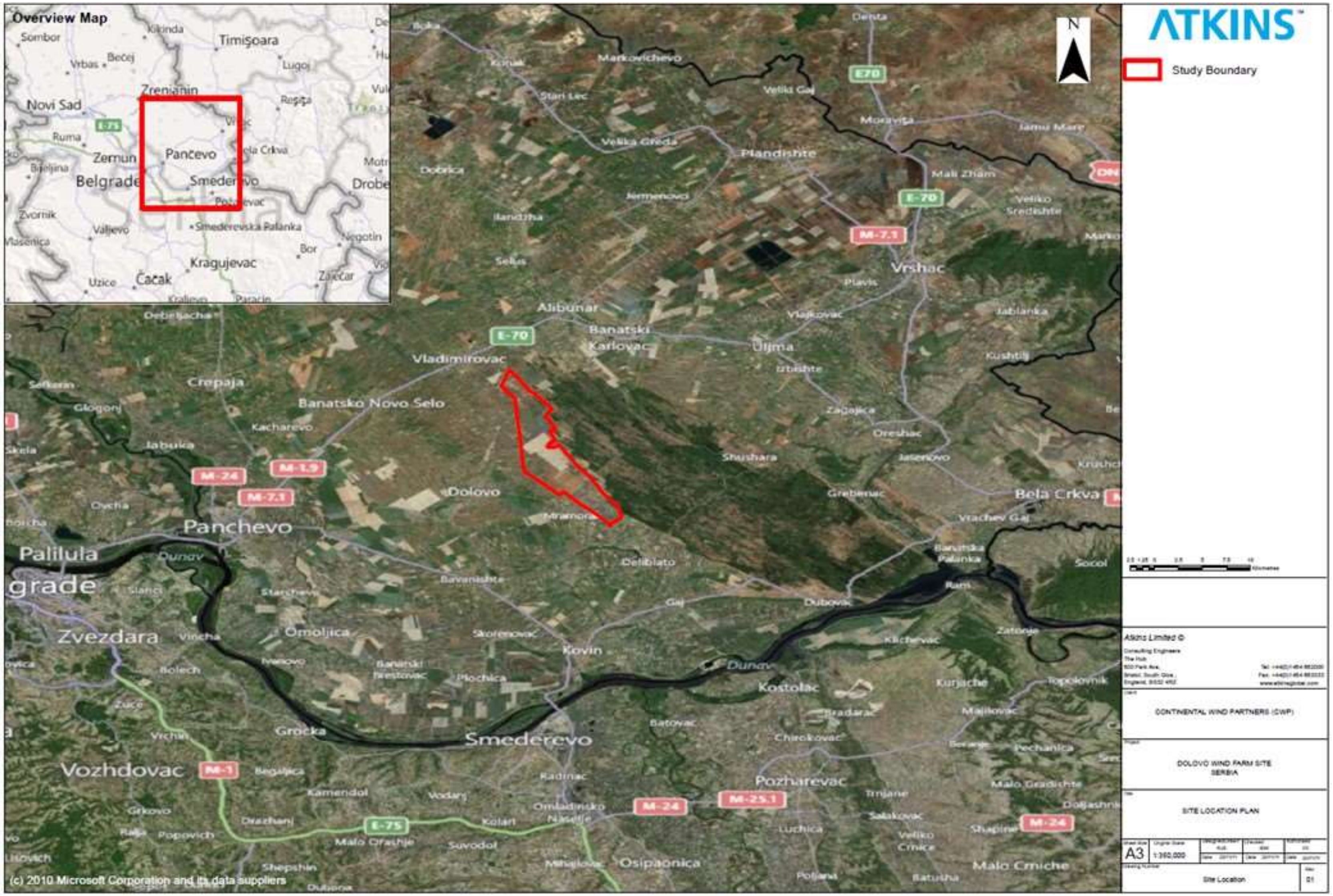
- The Preliminary Design.
- The Study of the State and Conservation of Ornithofauna and Chiropterofauna (Belgrade, 2009).
- The contents defined in Article 7 of the Rulebook on the Contents of Environmental Impact Assessment Studies including an assessment of the impact on ornithofauna and chiropterofauna made using selected indicators, a valuation of the spatial scale of possible impacts and an assessment of the likelihood of the anticipated impacts.
- For the purpose of protecting migratory birds and mammals, wind power plants above 50 MW of installed capacity should be equipped to enable continuous monitoring of the crossing of birds and bats above the territory occupied by the wind power plant.

- Any conditions and approvals obtained from other competent authorities and organizations (during the preparation of the Detailed Plan of Regulation of the Čibuk Wind Farm Infrastructure System).

The ESIA assessment has been undertaken to ensure that the requirements of the local regulatory are encompassed to support the local EIA study. The local EIA was completed and approved by the Provincial Secretariat for Urbanism, Construction and Environment in November 2012. Since the requirements of investment banks are wider than the requirements of the local EIA, this Statement includes elements beyond the local regulatory requirements.

AI Appendices

AI.I Appendix: Site Location Plan



B Project Technical Description and Project Alternatives

B1 Introduction to the Section

This section provides an overview of the 158.46 MW aggregate, 57 turbine wind farm development. The following ancillary buildings and equipment are associated with the development:

- control building;
- substation;
- construction compound;
- access tracks;
- underground cables for onsite electrical infrastructure;
- hardstanding areas;
- transmission lines to the main grid connection.

This section provides an overview of the technical design and operation of the wind farm together with an assessment of the how the design matches with international best practice for wind farms. The section also details the construction and decommissioning activities associated with the wind farm and finally presents an overview of the alternatives to the project design and location.

B2 Outline of the Project

B2.1 Project Rationale

The Republic of Serbia ratified the Treaty establishing the Energy Community between the EU and South-East European countries. Therefore, the country is obligated to adopt an implementation plan of the Directive 2001/77/EC for the promotion of renewable energy sources for electric energy production and the 2003/30/EC Directive on the promotion of the use of biofuels or other renewable fuels for transport. In October 2012, the country negotiated its target with the Energy Community of South East Europe (ECSEE), on setting its 2020 targets as part of the country plans to obtain access to the European Union. The Energy Community accepted that 21% of energy currently used in Serbia comes from renewable resources (which includes large hydro power plants), and agreed that Serbia's target up to 2020 should be 27%.

Following the Energy Development Strategy of the Republic of Serbia by 2015 and the commitment to the South-East Europe Energy Community Treaty, the Serbian Government adopted two Decrees in 2009, enforcing certain privileges for production of electric power using renewable energy sources. Privileges are related to (1) establishment of a "Feed-in Tariff" system, and (2) establishment of the requirements of becoming a "Privileged Electric Power Producer" who uses renewable energy sources to generate electricity. The aforementioned Decrees facilitate the practical use of wind energy as a renewable energy source in Serbia. In July 2011, the Serbian Parliament adopted the new Energy Law, and in January 2013, the Serbian Government adopted all outstanding secondary legislation (Decrees) governing the implementation of the Energy Law, including defining the new set of feed-in tariffs.

In order to support the aspirations of Serbia in achieving their goals for implementing renewables, WEBG have identified in Serbia an ideal opportunity to develop wind power in country. WEBG strategy is to develop wind energy in countries where wind energy is not already established. As the first developer in country, WEBG is committed to pioneering this mode of energy production, promoting clean energy. The company is also a founder member of the Serbian Wind Energy Association (SEWEA) which was founded in October 2010.

B2.1.1 Why the Wind Farm is Needed?

The proposed wind farm is needed because:

- It will provide a valuable source of renewable energy for use within Serbia to support infrastructure development and the national building programme;
- It will strengthen Serbia's energy sector by helping to diversify its energy sources (which proved to be of essential importance after the floods in May 2014)
- It will reduce the need for Serbia to import energy from neighbouring countries;
- It will reduce the country's reliance on fossil fuel combustion;
- It will help Serbia achieve its 2020 targets (27% of total consumption needs to come from renewable energy sources by 2020);
- It will mark Serbia as a developing state with a commitment to reduce its Greenhouse Gas emissions, displacing about 275,000 tonnes of carbon dioxide per year that would normally be emitted if the same amount of electricity was produced from a coal fired power station;
- It will provide local jobs and improvements, specifically during the construction programme.

B2.2 Site Location

The proposed site of the wind farm is located about 30 km to the north east of Belgrade in the municipality of Kovin, Autonomous Province of Vojvodina. It covers an area of about 37 km^2. The location of the wind farm site is shown in Appendix AI.I. The layout of the proposed wind farm is illustrated in Figure B.1, below and the proposed route of the Overhead Power Line (OHL) is presented in Figure B.2.

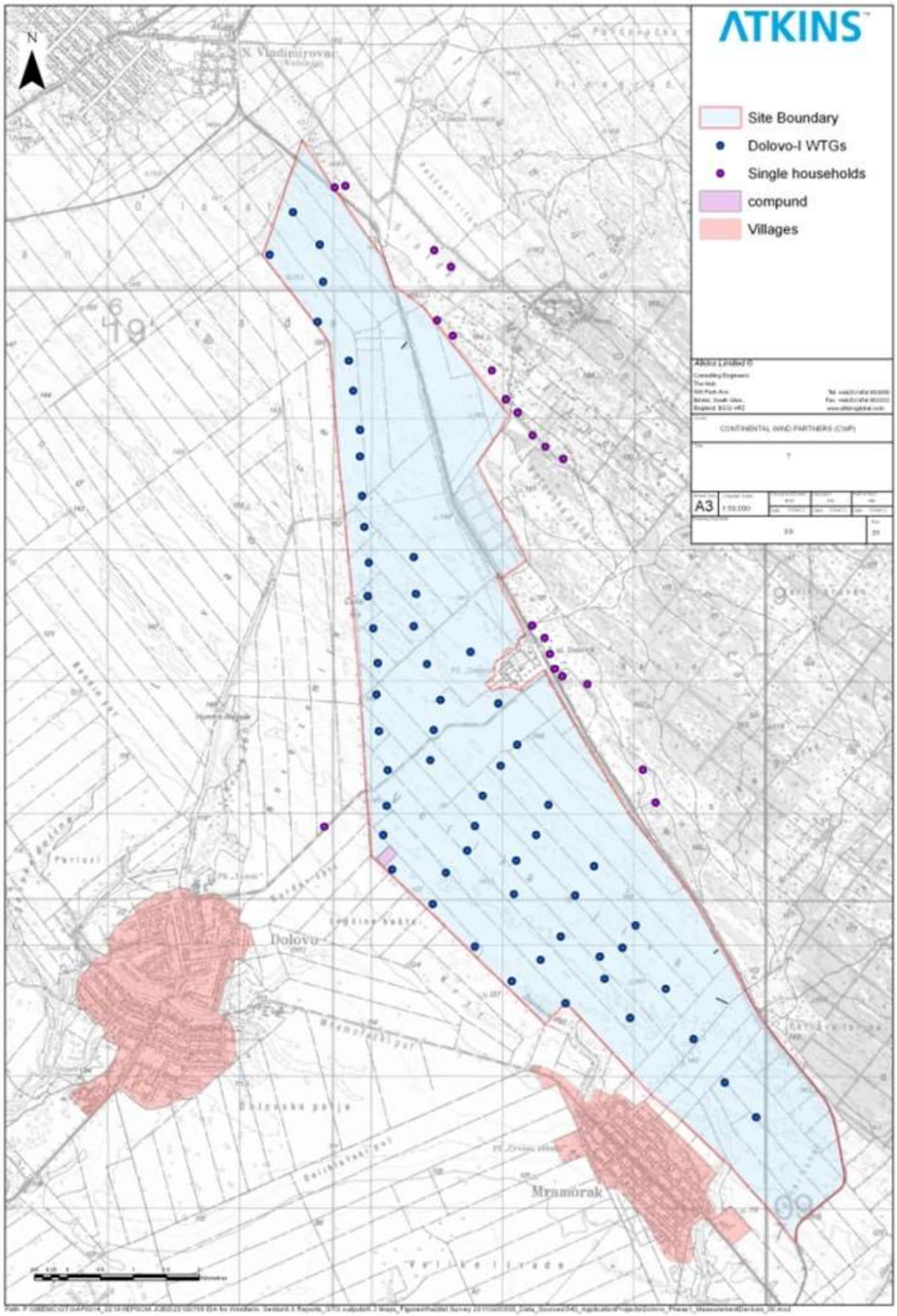


Figure B.1: Layout of the Proposed Wind Farm

The site is currently in agricultural use and is intensively farmed. The local area is sparsely populated with the nearest village, Dolovo, 2 km to the south west of the wind farm boundary,

and there are residences on the north eastern boundary of the site at approximately 1 km. Road access is adequate and provides good connection to the River Danube port at Pančevo (alternative English forms of the city name is 'Panchevo').

To the east, the proposed wind farm is located 1.3 km from the Deliblato Sands Important Bid Area (IBA), a Special Nature Reserve (SNR) and part of Serbia's "Tentative List" for inclusion in UNESCO's list of World Heritage Sites. The Deliblato Sands SNR extends over a 35,000 hectares and extends from the regional road between Belgrade and Timisoara (Romania) and between the Danube river and the lower slopes of the Carpathian Mountains. WEBG have already agreed with the Serbian Institute for Nature Protection that the turbines will be located at a minimum distance of 1 km from the border of the IBA.

The turbine layout is completed and the mast locations (57) have been chosen.

WEBG applied for the environmental permit which was issued in November 2012.

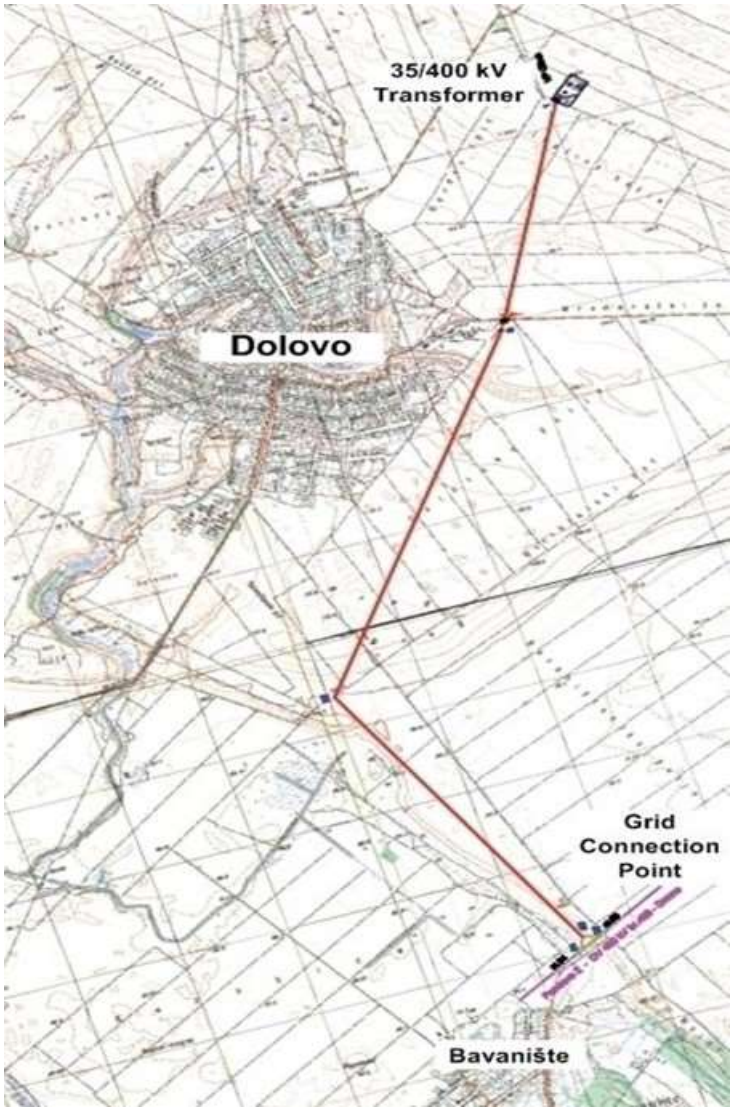


Figure B.2: Route of the Proposed Overhead Power Line

B2.3 Project Timetable

Construction of the proposed wind farm is planned to start during Q2/Q3 of 2015 and be completed by Q4 2016. Installation of the wind turbine generators (WTG) is expected to start Q2/Q3 2015. Since construction is phased, the site will be able to deliver electricity to the grid before construction of all turbines is completed. It is expected that the site will be operational by

Q3 2016, with construction of the overhead power line being completed in time for that, starting in Q2/Q3 2015 and being completed by Q4 2015.

In line with the construction timeline described above, other aspects of the project will also be phased. Development of roads and foundations will be undertaken between Q2/Q3 2015 and Q3/Q4 2016, with the main access roads to the site and the development access roads to the turbine plots to be developed early in the construction phase.

The operational life of a wind farm is typically expected to be 20-25 years. Towards the end of the operational life of the wind farm a decision will be made as to whether the site will be redeveloped in order to continue as a wind energy production site, or to decommission the wind farm. Redevelopment may involve a number of options, including overhaul and refitting to extend the life of the present structures, replacement with like for like turbine structures, installation of bigger or potentially smaller turbines, or the installation of fewer or more turbines. The impact of these activities will be reviewed closer to the end of the operational life of the proposed wind farm, when a plan for the future of the site has been proposed. The impacts of decommissioning involve many similar impacts to construction and have been considered in this Statement.

B3 Description of the Main Plant and Processes

B3.1 Technical Features of the Proposed Wind Turbines

The wind turbines consist of a hollow steel tower with a nacelle to which the fibreglass rotor with three blades are attached. The nacelle houses the generator, gearbox, and control systems. A transformer is located in the base of each WTG tower. The wind turbine design and manufacturer has now been selected and it is likely to be GE. It is likely that GE will provide GE 2.5-120 WTGs, each with capacity of 2.78MW. When the original assessment was done, it was decided to take a “worse case” approach, and the assessment was based on 3.2 MW turbines (maximum rated output).

The wind turbines are large but are of a fairly “standard” size for on-shore designs wind farms. These larger units generate electricity more efficiently than smaller units. Figure B.3 illustrates a generic wind turbine structure (taken from the IFC Environmental, Health and Safety Guidelines for Wind Energy). Assessments were carried out based on these guidelines. It must also be noted that the most extreme dimensions were utilised for the assessment to ensure that the ‘worst case scenario’ had been dealt with. Table B 1.summarises the main technical characteristics of the proposed wind turbines.

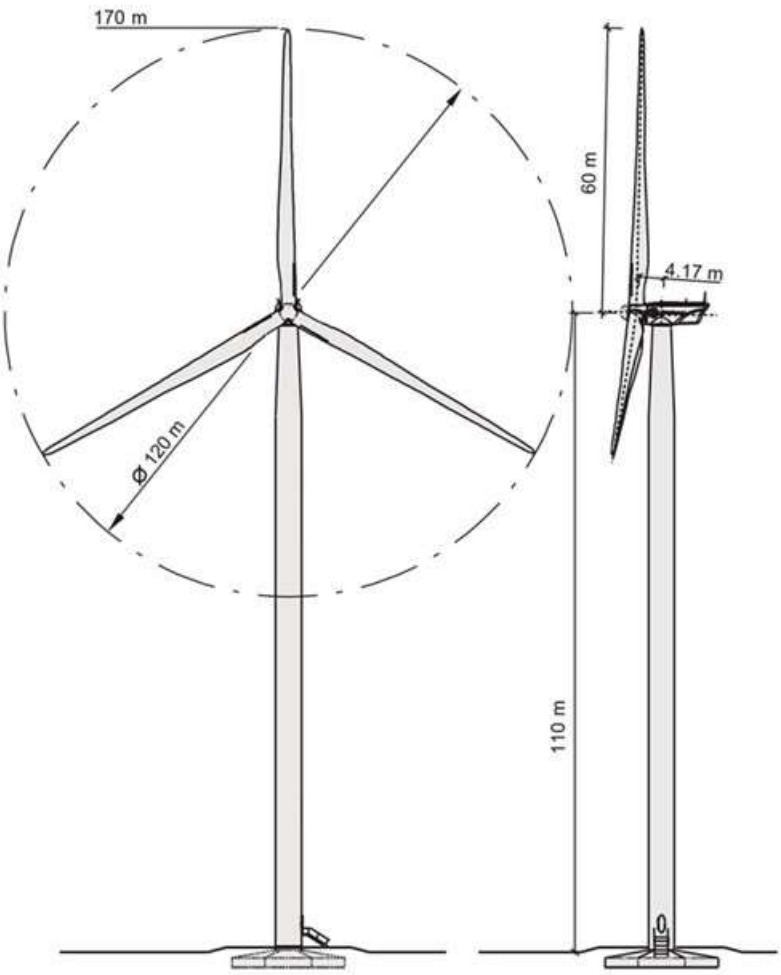


Figure B.3: Dimensions of the Preferred GE turbine

Table B.1: Technical Characteristics of the Turbines[3]

Item	Turbines Specifications[1]
Tower Height at Hub	110 m
Total Height	170 m
Rotor Diameter	120 m
Turbine Output	2.78 MW
Total Number of Turbines	57
[1]Note that the impact assessment was based on a 3.2 MW turbine design which had the following specifications: Hub Height 140 m Total Height 210 m Rotor Diameter 126 m	

[3] Source: Continental Wind Partners/WEBG

B3.2 Wind Farm Operations

B3.2.1 Overview

The following technical details of the wind farm specification are generic, and the exact figures will depend on the final equipment selection.

The five steps of electricity production and distribution from wind power are:

- wind turbine blades are turned by the power of the wind;
- the blades turn a rotating generator which converts wind energy to electricity;
- a transformer in the wind turbine nacelle increases the electricity voltage for transmission to the substation by underground cables;
- the substation increases voltage for transmission over long distances;
- the electricity is transferred to the grid and distributed.

These steps are presented in the figure below.

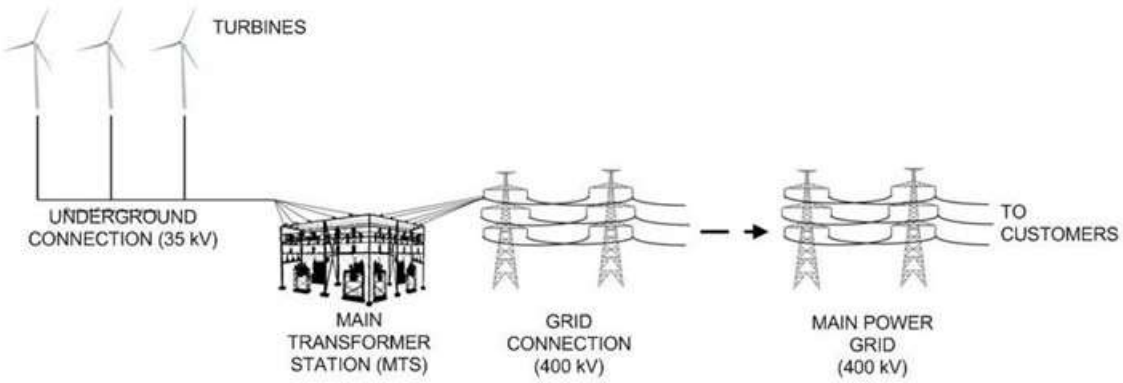


Figure B.4: Energy Production & Distribution Schematic

B3.2.2 Electricity Production

When the wind reaches and maintains constant speeds of over 3 m/s, the turbine rotor starts rotating and drives the gearbox that converts rotor shaft energy (i.e. mechanical energy) into electrical energy through an electrical generator. The wind turbine will start generating electricity at a minimum constant wind speed of 3 m/s, with rotor spins in a clockwise direction and a corresponding output at that speed of approximately 20 kW. At 6 m/s the output is approximately 600 kW but then rises sharply to the maximum power output at 12 m/s, where the turbine will generate the maximum design output of approximately 3000 kW. This will be held up to a constant speed of approximately 25 m/s. At higher wind speeds the turbine blades are stopped for safety reasons and to prevent excessive wear and tear on the mechanisms. Most of the electricity produced by the wind farm will be transferred to the grid but a small amount of electricity will be used by the on-site control facilities and the wind turbines themselves may use electricity when wind speed is constantly in excess of 25 m/s and requires the activation of the hydraulic braking system of the turbine rotor.

The electricity produced by the turbine is transferred to the base of the turbine tower to a transformer unit where it is converted into electricity for transmission into the underground 35 kV wind farm network. Details of the Grid Connection are discussed in Section B5.

The transformer substation complex will measure 200x180 m, covering an area of 3.6 hectares, and comprises the following elements: a distribution substation and switchgear with 35 kV and 400 kV power transformers, a control/management facility and service, parking, traffic access and landscape areas. The internal infrastructure (such as water supply, sewage and low-voltage power supply provided by a 20/0.4 kV internal transformer within the transformer substation) is provided to enable the operation of the transformer substation complex.

B3.2.3 Management Control

Operation of the wind farm will most likely be through an on-site management facility rather than through a fully automated system which is controlled remotely. There will be personnel on site on a permanent basis for the direct control of the wind farm. Nevertheless, each turbine will have a control system for critical functions, monitoring weather conditions and data reporting which will be relayed back to the control centre. The control centre is likely to be situated on the south eastern boundary of the wind farm site and is illustrated in Figure B.1 as the 'compound'. On site staff may also include staff for security and for post construction bird monitoring. The presence of these staff is dependent on the local regulatory and other requirements.

On site there will be a local management control centre which will be a separate unit but located either next to the transformer substation or at a separate construction plot covering a total of 2.45 hectares which will be established for the purpose of constructing the management complex, which will include the management facility and the supporting traffic, parking and landscape areas, and all the necessary infrastructure elements (internal water supply system, sewage, low-voltage power supply, etc.), which will not be shared with the transformer substation complex (this was requested by the Serbian grid operator, EMS). The local control centre will probably be permanently manned, but the final decision has not been made yet.

The main control centre of the wind farm will be remotely located but the location has not yet been determined by WEBG. GE may supply turbines to a number of windfarms in the region and it is possible ta they we create a 'regional;' control centre for all of these developments. This is to be confirmed. It is possible that Maintenance will also be undertaken by offsite staff. Maintenance will be undertaken on as needed basis in line with manufacturer's recommendations and requirements identified by the company technical staff. The impacts associated with the construction of the remote management control centre is outside of the scope of this assessment. However, the effective ability to control the wind farm is included within the scope of this assessment.

B3.2.4 Maintenance

Scheduled and reactive maintenance activities will be undertaken throughout the operational stage of the wind farm. Specific regular scheduled maintenance activities will encompass:

- turbines to identify areas of rust, corrosion and wear, as well as checks of blades and all moving parts for fatigue and potential failure;
- equipment which holds oil to ensure prevention of leakage and/or damage to equipment;
- oils storage and storage of other hazardous substances to ensure effective containment;
- lubricating oil quality in the moving mechanisms and gears (rotor, gearbox, generator) and replacement of non-compliant quality oil;
- all parts and mechanisms whose deterioration may lead to noise emissions outside of the designed operating parameters.

Reactive maintenance activities will include replacement of failed or damaged equipment and parts that cannot be repaired.

Due to the nature of the operations, significant waste volumes are not expected during the operational stage of the wind farm. The largest volume of waste generation will occur in the event of plant or equipment failure and any requirements for replacement of plant or equipment as a result of failure. However, all plant and equipment are designed so as to operate in the environs of the location and therefore, such waste products are not expected but are planned for.

During the operation of the wind farm, typical waste products will be:

- waste oil (lubricating and hydraulic oils);
- packaging waste;
- metal scrap.

All waste products will be managed so as not to cause pollution to the environment and will be disposed of in accordance with local laws. Waste oils will either be removed from site immediately once maintenance is completed or stored on site in appropriate containment within a locked building on site.

B4 Wind Farm Infrastructure

B4.1 Overview of Support Infrastructure

The following support infrastructure shall be in place:

- Areas of hardstanding: Each turbine would require a work area to accommodate the crane and turbine components during construction.
- A network of access roads that connect all the wind turbines.
- An underground electrical network with a medium voltage of 35 kV which will connect the turbines with the substation.
- A 35/400kV (Kilovolt) 2 X 90 MVA (Megavolt Amperes) substation.

B4.2 Associated Plant & Buildings

The following plant and buildings will be necessary in addition to the main wind turbine plant:

- Control building and Substation will be separated. The two buildings will house the switch gear, protection equipment, metering and control equipment, communication equipment and any other electrical infrastructure required to operate the wind turbine development.
- Construction compound: A temporary site compound would be required during the construction period. This would be used for storage of materials, as well as containing office and canteen facilities. It would also include an area for worker and visitor parking.
- Access tracks: A series of access tracks would be required to link the wind turbines to the infrastructure on the site. Existing tracks would be used wherever possible.
- Underground cables: Onsite electrical infrastructure would be likely to consist of underground cabling. The electrical connections from the wind turbines to the control building/substation would be buried in trenches running alongside the site access tracks. Communication links between each wind turbine, the meteorological mast and the control building/substation would be buried in trenches alongside the site access tracks.
- Internal electric power networks servicing the facilities of the transformer substation and the wind farm management facility, which will be established by constructing a connection point at the internal 20/0.4 kV transformer within the TS transformer switchgear and underground power lines.
- The telecommunications infrastructure for the facilities comprising of the transformer substation and management complex of the wind farm is planned to provide a standard telecommunication connection and to enable control of the systems within the complex. Since there is no existing telecommunication infrastructure in the area covered by the plan, it is generally envisaged that the necessary capacities will be provided through a Radio Resource (RR) connection, GSM network or through underground cables. This is yet to be finally decided upon.
- Should the construction of a telecommunication access network be necessary for the purposes of ensuring the secure control of the systems, it will be installed along the corridors of the existing roads within the scope of the plan and harmonised with the already constructed infrastructure, the requirements of the competent distribution enterprise and the rules on the construction and development of the Infrastructure Systems Zone covered by this plan.
- As for the utilities infrastructure in the area, it is planned that the needs for such infrastructure should be secured locally, on the transformer substation and management facility plots. The following are proposed solutions:
    - Potable water will be provided by delivering water to the premises;
    - A borehole well will be constructed on site for ‘grey’ (toilets etc.) water use and fresh water will be supplied at point of use for domestic purposes;
    - The wastewater network will comprise a septic tank to be constructed on the plot and an internal sewage network connecting the facilities to the septic tank. The internal utilities infrastructure systems may be constructed separately for each of the two systems (the transformer substation and the management facility).

B4.3 Transport and Site Access

The site is located about 30km NE from Belgrade. The main access route to the site is from the village of Vladimirovac, to the north west of the site. The western border of site is a local road that has been used widely by farmers. This road intersects the asphalt road connecting Dolovo and Deliblato Sands.

The main transport and site access issues for this project are associated with construction and decommissioning. Large plant items will be delivered to the site from the port at Pančevo on large road vehicles. The route is shown in yellow in Figure B.5. Transport associated with construction is discussed in Section B5.3.2 and that associated with decommissioning is discussed in Section B5.4. Information concerning the local transport system is presented in Section C4.4 of this report and transport assessment of each of the phases of the project is presented in Section D of this report, with construction based impacts (i.e. the main transport impacts) presented in Section D2.3.

Figure B.5: Main access route to the Čibuk WF site

The long term site access route has now been defined and the permitting for it has started. The options which were taken in consideration are discussed in Section B5.3.2. Due to the low number of transport movements associated with the operational phase, no additional transport route development, beyond that developed for the construction phase, will be required. During the construction phase, permanent access routes will be developed to all turbine plots and to the auxiliary plant/control compound. These routes will be used during the operational phase, with the exception of routes associated with movement cranes and large scale turbine components.

B5 Grid Connection

B5.1 Proximity to the Grid

The turbines will be connected to the grid via the nearest viable grid connection point. Consultation with the state enterprise for electric energy transmission and transmission system control (Elektromreža Srbije Public Enterprise - EMS) led to the conclusion that the optimum grid connection option is in the village of Bavanište which is approximately 11km away from the transformer station.

The Main Transformer Station (MTS) Compound will be located at the south western boundary of the wind farm site. The Compound area has been designed to accommodate two control buildings, 35kV and 400kV transformer switchyards and the auxiliary facilities, including the internal roads and water and sewage installations.

B5.2 Wind Farm Power Distribution

The electricity produced by the wind turbines is transferred through underground medium voltage (35 kV) electrical cable system to the wind farm transformer station. The underground cable system will be at a minimum depth of 1.2 m. The medium voltage electricity is converted to very high voltage (400 kV) electricity at the 2 X 90 MVA transformer substation. The substation is planned within the boundary of the proposed project area (see Figure B.2, above). The high voltage electricity from this transformer station will reach the design parameters for transfer to the national electricity grid. The transfer to the grid connection will take place along a new overhead power line.

Transfer of electricity into the system will be through a 400 kV overhead power line running south / south west of the wind farm site to the main grid connection. The route of the overhead power line is illustrated in Figure B.2. The design of the overhead power line is presented in Appendix B.I.

The route of the power line is approximately 11 km with each power line tower being approximately 12 to 25 m in height. The plots for pillars are obtained through permanent easement contracts with private landowners. According to the Analysis of the Optimal Conditions for Connecting the Čibuk Wind Farm to the Electric Power Transmission System, conducted by the Elektromreža Srbije Public Enterprise, it is envisaged that the wind farm shall be connected to the 400 kV high-voltage electric power grid through a dedicated direct connection, 10.7 km south-west of the wind farm site. The main power line connection is the Drmno-Pančevo OH 400 kV No. 453 overhead power line.

The initial analysis of optimum connection route for the Čibuk Wind Farm to the electric power transmission system was prepared by EMS. They assumed that the connection will be a 400 kV feeder bay in a transformer substation of another wind farm (Bavanište, i.e. Kovin). It was also assumed that the total installed capacity of the Čibuk Wind Farm would be 300 MW. Considering that the development of the Bavanište Wind Farm project has been completely discontinued and that it is unknown whether it will ever be constructed, the construction of the transformer substation itself is equally uncertain. Therefore, at the request of Vetroelektrane Balkana, EMS issued its new opinion on 17 November 2009, based on the conditions for the preparation of a detailed regulatory plan, about the possibility of connecting the Čibuk Wind Farm to the transmission system, which enables direct connection of the Wind Farm to the existing 400 kV Drmno-Pančevo power line. In addition, the concept of construction of the Čibuk Wind Farm has been changed by envisaging that two wind farms – Čibuk 1 with the installed capacity of 158.46 MW and Čibuk 2 with the installed capacity of 129 MW, would be connected through the connecting 35/400 kV transformer substation, ensuring the possibility of independent metering of electricity produced by these two wind farms. These considerations and limitations have led to the design of a double circuit OHL running from the transformer at Čibuk 1, connected directly to the existing 400 kV Drmno-Pančevo OHL which has been accepted by EMS.

The Layout of the MTS compound is shown in Figure B.6 (the location of the MTS Compound is shown in Figure B.8). There will be a water supply well inside the compound to provide water for the internal water supply system, including the fire protection tank.

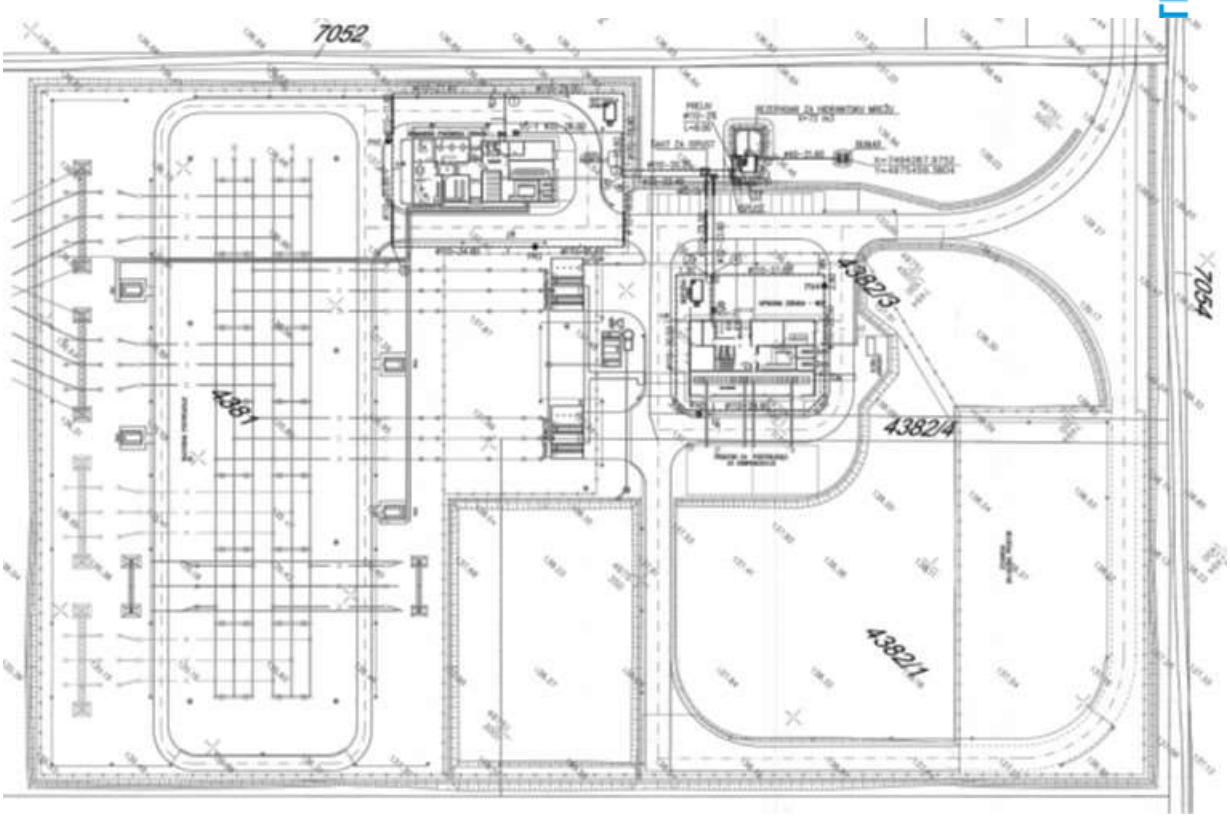


Figure B.6: Layout of the MTS Compound

B5.3 Construction

B5.3.1 Wind Farm Construction

As is often the case with ESIAs of large scale development projects, the details of the main equipment enclosures and laydown areas, methods of construction (e.g. the balance of on-site and off-site fabrication) and the precise building programme is currently a subject of negotiations with EPC contract provider. The selection of the construction contractors has been completed and GE, as a wind turbine supplier and EPC contractor, in cooperation with WEBG, selected consortium made of Porr (Austria) and Elnos (Serbia) as the BOP contractors. GE, Porr and Elnos will carry out construction works, electrical equipment and turbine installation. The construction of the wind farm will involve several working teams that will work in parallel on construction, assembly and installations.

The wind turbines and ancillary plant will be manufactured off-site and delivered to site on large road vehicles. Construction activities will include:

- preparation of the site area for development;
- fill importing / exporting and site levelling;
- construction of site roads and construction pads;
- utilities and services connections to site;
- foundation piling / excavations and concrete footings pours;
- erection of building frames and cladding;
- installation of turbines;
- ancillary plant erection;
- services connections;
- building fitting-out; and,
- commissioning.

Due to the size and nature of the turbines it will be necessary to provide substantial foundations. Also, as is typical of this type of process, there will be a significant movement of materials in and around the windfarm. Typically the topsoil will be used for on-site landscaping or may be given away. The next layer (spoil) is disposed of as close to the site as possible; it can be used for in-filling other excavations, or used as fill material for building embankments, berms etc.

Each plot upon which a turbine is constructed will include the following.

- An octagonal foundation within the circle of 20m in diameter. The foundation has a truncated cone shape, being 3.05m thick at the middle part height of the anchor block, and about 1.4m at the edges. Each base is supported by 25 reinforced concrete piles. These piles are set out in three concentric circles, each having 8 piles and one pile in the centre. The average pile length is 16m and the diameter 0.6m (created by drilling rather than percussion piling). The WEBG supplied estimate for the foundations indicates that each foundation will require approximately around 758 m^3 of excavation and around 800-1000m^3 of concrete is required. The foundation which is located within the foundation platform will be 25m x 25m in size.
- A service platform for the crane. The platform will be sited near the turbine, covering 50 x 25m, and will be made of crushed stone to support the crane used in installing and eventually dismantling the wind turbine.
- There will also be an access road within the plot of land.

There is also a large plot of land for the ancillary structures (transformers, control centre etc.).

The relevant authorities have accepted the planning proposal and permitted the development of the chosen site for construction. Therefore, it is proposed that the construction programme will start during Q1 or Q2 2015 and will run for approximately 18 to 24 months. According to this timetable it is anticipated that the facility should be operational in 2016.

B5.3.2 Transport of Equipment and Construction Materials

The main transport activities will be carried out during the construction stage of the wind farm and will include the following:

- the main components of the turbines;
- the auxiliary plant associated with the wind farm;
- the main plant associated with the construction process, including cranes and concrete batching plant;
- temporary buildings and any other modular structures associated with the wind farm construction;
- road and concrete plinth construction materials, including aggregates, sand and concrete for the concrete batching plant, piling materials and other metal reinforcement materials.

The transport of plant, components and materials to the site can be split in to four phases as:

1. Transport of plant components by ship to the port of Pančevo.
2. Use of the main road network to transport components from the port to the vicinity of the site, and of construction materials, including other large scale equipment and bulk construction materials, that are not brought in to the region via the port of Pančevo.
3. Local transport from the main roads through local, minor roads to the site access point.
4. Transport from local roads at the site boundary to all areas within the site on presently unimproved roads and tracks.

In order to provide optimum transport and assembly conditions for the wind turbines, certain requirements have to be met, as described below. These are based on general characteristics but may vary depending on the final turbine chosen for the project. In general, for each turbine, the access road must be capable to bear the following loads:

- Vehicles:
    - about 50 haul vehicles;
    - 12 to 20 trailers for crane assembly and dismantling;
    - 9 to 13 trailers for the turbine components (3 to 6 for the tower components, 3 for the blades,

- 3 trailers for the nacelle, rotor and tracks, 2 for the controller, smaller parts and hoisting containers);

- Vehicle weight:
  - Maximum axle load will range between 12 and 20 tonnes, for public roads and on-site roads respectively;
  - total load in excess of 150 tonnes;
  - pressure on soil of the crane tracks in the region of 200kN/m^2.

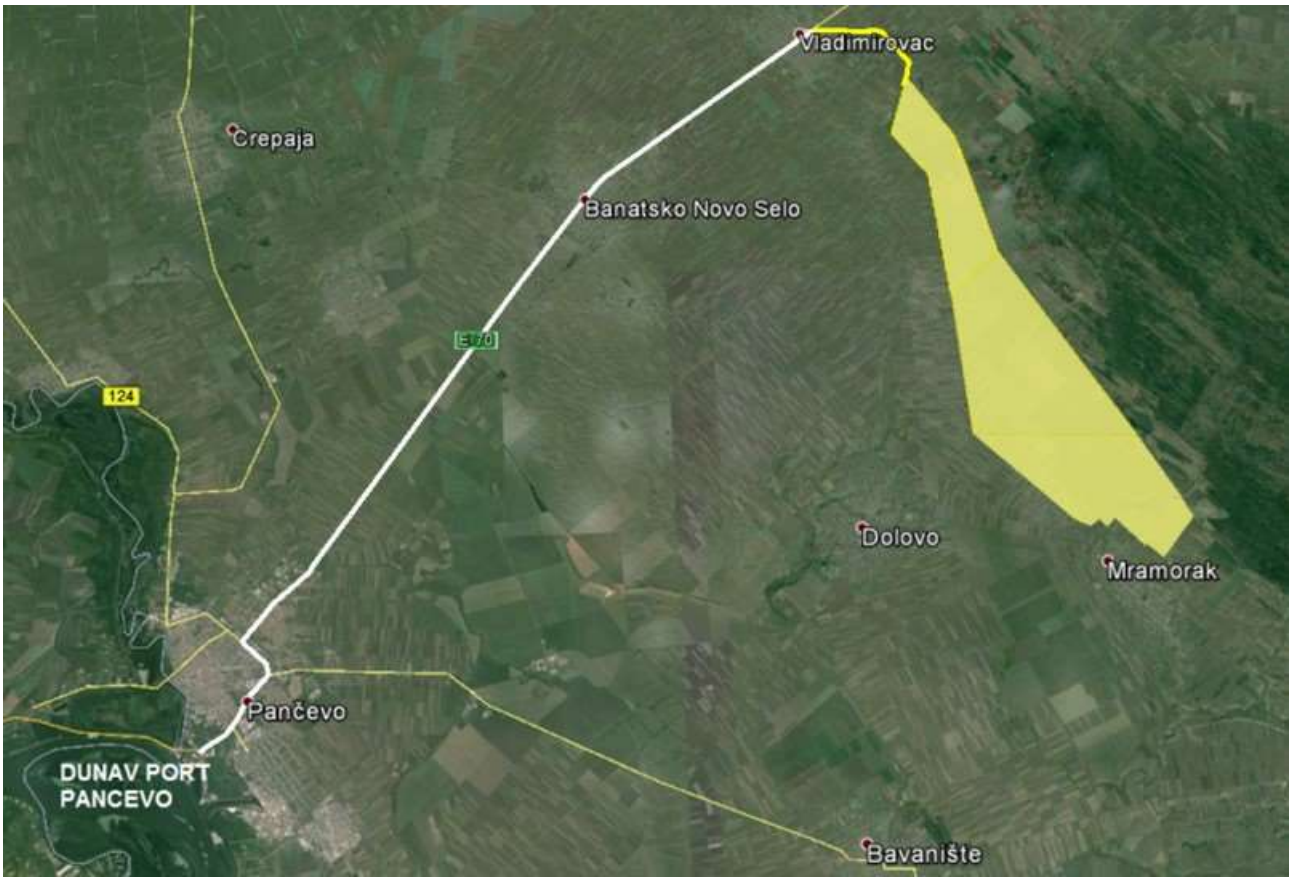


Figure B.7: Route of Site Access to the Project Area

All along the access road, height and width clearance must be minimum 6 metres and width clearance must be 5 metres. In particular, for blade transport, road width in the curves must be extended to a minimum of 7 metres, with a bend radius in excess of 40 m for the transport vehicle, also providing for 50 metre radius clearance in the direction of travel.

The main E-70 road provides an excellent connection route to the site and it will be used as the main transport connection to the site. The main plant components and equipment will be imported via the port of Pančevo. All large items such as cranes and the concrete batch plant as well as and construction materials (e.g. cement aggregates) will also be delivered to site via the E70. All plant, equipment and materials will enter the site at a predetermined and controlled point of entry with majority being held at the Logistics Compound (see below). The transport of all plant components and materials is the responsibility of the main EPC contractor until the 'handover' point which has been defined as the exit from E-70 on to local roads in the village of Vladimirovac.

The final route was determined in close cooperation with the selected turbine supplier and local community representative in such a way to, on the one hand, ensure the least possible disturbance to the local population and, on the other, ensure that citizens benefit from road reconstruction (as the reconstructed roads will remain in the ownership of the local government and will be used daily by the citizens).

To provide access for heavy equipment, improvement of the existing farm service roads will be required involving reinforcement of the embankments and the development of a suitable road system where one does not presently exist. Improvement will consist of laying and compacting gravel where required. Temporary transport requirements such as passing places on site roads for large scale vehicles, will be removed after construction and their condition reinstated for agricultural use. Access routes to the turbine plots will be 'permanent' project features, will be in use throughout the operational and decommissioning phases of the project.

Access road infrastructure will also include the development of temporary platforms for the parking and manoeuvring of oversize vehicles. Agreements concerning these platforms have been finalized. Once construction and assembly activities are completed, the platforms will be decommissioned, and the land they occupied rehabilitated and returned to its owners. The estimated time for the completion of the access roads is approximately 18 months.

Information concerning the local transport system is presented in Section C4.4 of this report and transport assessment of each of the phases of the project is presented in Section D of this report, with construction based impacts (i.e. the main transport impacts) presented in Section D2.3).

B5.3.3 Site Logistics Compound

To ensure the good conduct of construction-assembly and installation works, the contractor companies will also be responsible for site logistics and materials storage. The site logistics Compound will be developed close to the Main Transformer Station (see Figure B.8), located to the west of Dolovo. The logistics Compound will be temporary and will incorporate office space and basic domestic amenities. There will be no permanent accommodation on site.

Once the construction stage is completed, the site logistics Compound will be decommissioned, any materials used will be recycled, the equipment will be taken to other works, and the land they occupied will be rehabilitated.

The logistics Compound will be re-erected, on the same original structure, after the completion of the operational stage of the Wind Farm, to provide for specific activities of the decommissioning stage, after about 25 years from construction stage completion or at whatever time the wind farm is decommissioned.

Figure B.8: Locations of the GE Lay-down Area and the MTS Compound

B5.4 Concrete Batch Plant

The foundations that will support each of the turbines will be constructed in steel reinforced concrete. Each of the foundations is calculated to require about 800 to 1,000m^3 of concrete, depending on the optimization of the design. This is a significant quantity of concrete and it would be impractical to transport ready mixed concrete from Pančevo to the Čibuk site (due to the transportation time and the number of vehicles that would be required).

The concrete will therefore be prepared on site using a concrete batching plant. This prefabricated plant will be provided and operated by Lafarge. The batch plant proposed by Lafarge would be able to produce 700 to 800 m^3 of concrete per day, i.e. sufficient quantity for one foundation per working day (10 hours).

The batch plant will require a land area of 5,000 to 6,000 m^2 and will comprise:

- 2 or 3 cement silos (up to 100t capacity each) to a maximum height of 15.1m;
- 2 or 3 shipping containers for equipment storage;
- 4 aggregate bunkers;
- water/ waste setting pit;
- parking for truck mixers and pumps.

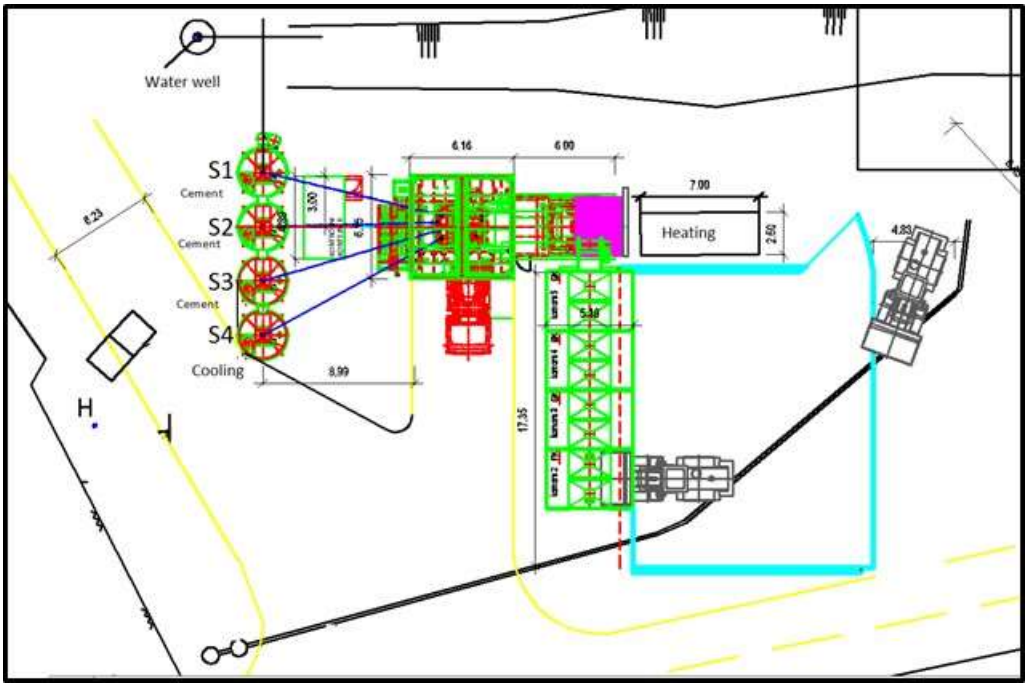
The cement and the aggregates needed for concrete manufacture will be delivered to site by road. In order to optimize gravel transport fleet, it may be necessary to have an additional area of 3,000 m^2 to 4,000 m^2 for a gravel aggregates stock.

The batch plant must have a stable supply of good quality water for concrete production. The batch plant will be located within a few kilometres of Dolovo and it is currently expected that water would be obtained from the village supply (there is considered to be sufficient capacity).

At a production level of 800m^3 per day, the plant would require about 1500 t of gravel per day. To meet the production levels required a fleet of up to 12 trucks (making 5 round trips per day) would be required for the gravel transportation.

The prepared concrete will be transported to turbine foundations using rotating mixer trucks. Each of these trucks has a capacity of 8 to 9 m^3. This means that it will take about one hundred loads to complete each foundation. The trucks will use the internal roads to reach the turbine foundations. To move the concrete from the batch plant, Lafarge would require 4 truck mixers (plus a standby vehicle) and one of the 6 available concrete pumps (of 28, 36, 39 and 41 metre reach).

The figure below shows a model of the proposed batch plant.



It is essential that the emissions from the cement batch plant are carefully managed. This will include particulate release from silo vents, fugitive dust emissions as well as the management of wastewater. The ESMMP will include a series of mitigations to manage these risks. It is expected that the ESAP will expect the particulate emissions from release points, such as silo vents, should not exceed 20mg/Nm^3.

B5.5 Decommissioning

The operational life of a wind farm is typically 25 years. At this stage the situation will be reviewed as to whether the wind farm should be decommissioned or the wind turbines replaced. The decommissioning of a wind farm is not a complicated process and largely comprises the dismantling of the turbines and site clearance. The operational process does not typically involve the use of large volumes of hazardous materials which may result in releases of particularly harmful materials into the ground and therefore, with appropriate management during operation, it should not be necessary to conduct post operational clean up. Basic measures will be included in the design to ensure ease of decommissioning, such as incorporating construction and fabrication techniques that facilitate ease of dismantling and recycling, where appropriate. Key difficulties associated with the decommissioning of a wind farm are the removal of foundations (if considered necessary) and the disposal of turbine blades, if their design does not facilitate ease of recycling.

Prior to decommissioning, the operator or their representatives will produce a decommissioning plan that will be approved by the local authorities before decommissioning commences. The plan will include measures to recycle materials where ever possible. The decommissioning of the Wind Farm will start as soon as the activities of the Wind Farm operations cease and approval has been obtained. The decommissioning stage will take an estimated 1.5 – 2 years and will include the following main activities:

- Dismantling and removal of the constitutive parts of the Wind Farm;
- Environmental rehabilitation in the affected areas.

Decommissioning works will be undertaken by contractors. In providing for specific decommissioning activities at the Wind Farm site, the site logistics Compound will be re-established using the same initial structure as during construction as will any platforms for storage and manoeuvring of vehicles and cranes during decommissioning.

Decommissioning activities will be conducted under safety conditions and in consideration of environmental protection, under the relevant legislation in force at the time of decommissioning.

The turbine reinforced concrete base will not be completely removed. Instead, the concrete will be demolished and excavated down to a depth to be determined prior to decommissioning. Nominally a depth of 1.0 m is expected to be sufficient to allow for agricultural activities to be undertaken safely once the pit has been filled with top soil. Similarly, any ground associated with the wind farm which has been affected will be reinstated. This includes areas of temporary roads, areas where the land has been compressed by heavy plant activities, and laybys and temporary platforms.

There will be no underground electrical cables laid less than 1 m deep as, according to the local regulations and the conditions issued to WEBG, the minimum depth for laying the cables must be 1.2 m. All electrical cables laid more than 1 m deep will be abandoned in place and will not cause any long term significant environmental impact.

B6 Compliance with International Best Practice

B6.1 Background

A requirement for all developments that are subject to funding by IFI's is to ensure that the design is in line with the requirements of the host country or countries of the financing institution, as well as the home country where the development is proposed. In practical terms for IFIs this usually means that there is a requirement for the design to be in line with international best practice as far as is possible. The EBRD, in particular requires assurance that their investments are designed to European standards. Section A3.2 provides an introduction to the scope of the requirements associated with IFIs, including the EBRD, and how design standards are encompassed in the requirements of the IFIs. In brief, the Equator Principles, EBRD Environmental and Social Policy and IFC HSE Guidelines.

In order to ensure that the design is in line with host country standards and international best practice, a review of the design against relevant standards has been undertaken. Various terms can be used to define such an assessment. For the purpose of this ESIA we have opted for the term 'Best Available Techniques' (BAT) assessment. BAT is defined in Article 2 of the IPPC Directive 2008/1/EC (as superseded by Directive 2010/75/EU on Industrial Emissions, the IED, Article 3) as:

"the most effective and advanced stage in the development of activities and their methods of operation which indicate the practical suitability of particular techniques for providing in principle the basis for emission limit values designed to prevent and, where that is not practicable, generally to reduce emissions and the impact on the environment as a whole:

> *(a) 'techniques' shall include both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned;*
>
> *(b) 'available techniques' means those developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or*

produced inside the Member State in question, as long as they are reasonably accessible to the operator;

(c) 'best' means most effective in achieving a high general level of protection of the environment as a whole."

It is clear from the definition of BAT, that assessments typically encompass review of the key parts of the design and management of large scale industrial installations. However, the general approach adopted for BAT assessments is suited to an assessment of the project design of the proposed Čibuk 1 wind farm, while we recognise that a wind farm is not a complex polluting industrial installation in the way that a cement plant is for example. Perhaps a more useful definition of BAT is defined in Appendix 1 of the OSPAR Convention:

[BAT] "means the latest stage of development (state of the art) of processes, of facilities or of methods of operation which indicate the practical suitability of a particular measure for limiting discharges, emissions and waste".

In Europe, where an installation falls under the Industrial Emissions Directive (IED), the design of an installation is reviewed against a BAT Reference (BREF) Note, issued by European Integrated Pollution, Prevention and Control Bureau (EIPPB). However, since wind farms do not fall under the IED, there is no formal BAT Reference (BREF) Note. Due to the absence of a formal BREF note other available international standards were used in order to derive BAT for the purposes of this assessment. This is not unusual and Atkins have successfully undertaken a similar approach for other wind farm projects as well as other industrial projects which fall outside the IED, such as Liquefied Natural Gas (LNG) terminals. For the purpose of this assessment, we have also encompassed worker and community health and safety issues, since they are key issues associated with the construction of wind farms. Such issues are not normally considered in BAT assessment undertaken for the purpose of the reviewing design of installations regulated under the IED.

The key documents drawn upon for this assessment are as follows:

- Environmental, Health, and Safety Guidelines for Wind Energy (IFC, 2007b);
- Wind Energy Tool Kit issued by the New York State Research and Development Authority (New York State Research and Development Authority, 2009)
- Guidelines on the Environmental Impact Assessment for Wind Farms (UNDP Serbia, 2010).

Where other documents have also been drawn upon they are referenced in the text of this assessment.

B6.2 Wind Farm BAT

The main issues associated with operation of wind farms, for which a BAT demonstration is required, are considered to be:

- Visual impact;
- Noise
- Prevention of species mortality or disturbance and prevention of habitat alteration;
- Light and illumination;
- Water quality and erosion prevention during construction;
- Community health and safety and nuisance (e.g. electromagnetic interference, aviation and radar, ice throw, interference with television signals);
- Implementation of appropriate management systems;
- Decommissioning and site closure and restoration.

These issues are discussed in more detail in the following sections and the review of the present design against BAT is presented in Section B6.3.

B6.2.1 Visual impact

The visual impact of the turbines and their interaction with the surrounding countryside can typically be remedied by consideration of the character of the surrounding landscape, and the impact the wind farm may have from all perspectives. Consultation with local communities is

important, to incorporate local community values into the wind farm design. Specific measures may also include (IFC, 2007b):

- Minimising ancillary structures, such as fencing, roads, overhead power lines and removal of defunct turbines;
- Avoidance of construction on steep slopes to prevent scarring of the ground and re-vegetation using only native species;
- Keeping the size and colour (light grey or pale blue) of the turbines uniform, unless visual impact can reduced by painting the lower part of the tower in graduated green in order to blend into the landscape;
- Avoiding graphics or lettering.

In addition, the Wind Energy Toolkit (New York State Research and Development Authority, 2009) identifies aesthetics as the most important issue for local communities. The document identifies the need for developers to accurately assess the potential for visual impact, and also recommends good communication, meaningful consultation throughout the process and planning as key to mitigating adverse community reaction. The use of large turbines to minimise their number and maximise their separation is considered to represent best practice for minimising visual impact. The actual potential for impact should be assessed taking into account all the points from which it may be viewed (the “viewshed”), and in winter and summer when the character of the surrounding landscape is different.

The United Nations Development Programme (UNDP) guidance for Serbia (UNDP Serbia, 2010) does not add any specific visual impact mitigation recommendations, other than advising developers to have regard to potential landscape and visual impact.

In summary, the site should be designed so as to minimise visual impact where possible, the turbines should be painted a suitable colour to blend in with the sky as viewed from the ground, whilst ensuring good visibility from aircraft. Light blue, or light grey is typically used. Graphics and logos should be avoided. These measures represent BAT for this project.

B6.2.2 Noise

Noise control should focus on mechanical sources in the nacelle, and aerodynamic noise from the movement of air over the blades and rotor. For mechanical noise, the main control measures are usually in the form of good mechanical design and acoustic enclosure. Aerodynamic noise is best controlled by having as low a rotation speed as possible, commensurate with the required electrical generation efficiency, using for example variable speed turbines or pitched blades. Wind farms should not be positioned close to residential or other sensitive receptors (IFC, 2007b).

The Wind Farm Toolkit suggests that distance is the best mitigation for noise impact from wind farms. United Nations guidance (UNDP Serbia, 2010) also indicates that use of solid towers rather than lattice structures and the use of 3 bladed designs reduce aerodynamic noise.

In summary, the distance from the wind farm to noise sensitive receptors combined with the choice of turbine size and design, will, according to the available guidance, ensure that annoyance from noise is minimised and represents BAT for this project.

B6.2.3 Prevention of Species Mortality or Disturbance

Wind farms can result in bird and bat collisions with the turbine blades or towers. More long term impacts can arise from changes to habitat and changes to prey species and disturbance resulting in temporary or permanent displacement. Operators should select sites to avoid known migration routes or areas of high species concentrations. Turbines should be closely grouped and be orientated parallel to known movements, and surface water should be managed to avoid pond formation, which may be attractive to various species (IFC, 2007a).

The potential for loss of habitat from wind farms is considered likely to be low, and general measures to minimise impact from construction and operation, as set out in the IFC General Guidelines, may be considered BAT (IFC, 2007a). The Wind Energy Toolkit refers to minimising tree removal, consideration of topography to avoid steep areas to minimise cut and fill, and mitigation through re-vegetation (New York State Research and Development Authority, 2009).

The Wind Energy Toolkit goes on to indicate that lattice type towers can attract roosting birds, notably raptors, and their replacement with tubular towers reduces potential for perching and collisions. It also considers bat deaths from collisions and barotraumas (rapid changes of air pressure near the turbine blades). It recommends pre- and post-construction monitoring, particularly in the spring and autumn migration seasons, to enable the impact of the development to be demonstrated. Mitigation measures might include turbine relocation in the extreme case, burying electrical cables, installing bird diverters from overhead lines, minimising lighting on operational buildings and the substation and operational alterations during migration seasons to reduce strikes (New York State Research and Development Authority, 2009).

The Collision Impact Assessment methodology has been undertaken using the methodology developed by Scottish National Heritage (SNH). The SNH Guidance describes a methodology for assessing in full the impact of windfarms on ornithological interests, taking account loss of habitat, due to the construction of turbine bases and tracks, displacement of birds as a result of disturbance, and potential mortality through collision. The SNH methodology is now considered to be international benchmark standard. In practice, most birds do take avoiding action: they may detect either an entire wind farm array, or an entire wind turbine, and alter their flight lines to avoid the structures; or they may at close quarters see an oncoming blade and take emergency avoiding action. Studies show that a high proportion of birds take effective avoiding action. However, as it is very difficult to assess “no-avoidance” (and the data available on avoidance factors is limited and often relates to topographic and climatic conditions) the methodology assumes that no avoiding action takes place.

The aim, normally, is to estimate the number of bird collisions over a period of time such as a year. The calculation proceeds in two stages:

Number of birds colliding per annum = number flying through the rotor (Stage 1) x probability of bird flying through rotor being hit (Stage 2)

The Serbian UNDP guidance (UNDP Serbia, 2010) concurs with the need for assessment of potential impact on fauna, and notes that although this is not yet mandatory at this stage of the EU accession process, assessment of potential impact on Natura 2000 sites should be considered. The proximity of Deliblato Sands, an Important Bid Area (IBA) and tentative UNESCO World Heritage Site, underlines the need for the potential impact on fauna to be considered, and it has been agreed with the Serbian Institute for Nature Protection that there will be a minimum distance of 1km between the boundary for the development and the boundary of the IBA (UNDP Serbia, 2010).

In addition, the use of solid towers rather than lattices, the minimising of the number of turbines by using a larger design, and their careful alignment in the same direction, will minimise potential impact on species. In addition, water management measures will ensure that on site ponding is avoided, to minimise attracting bird species. These measures represent BAT for this project.

B6.2.4 Shadow and Flicker

Flicker caused by the sun casting shadows of the rotating turbine blades, can cause annoyance to human receptors. Similarly, blade glint from new turbines can cause annoyance, particularly at dawn and dusk when the sun is at a low angle. Turbines should be oriented to avoid residential property being in the “flicker zone.” Paint should be non-reflective (IFC, 2007a).

The Serbian UNDP guidance (UNDP Serbia, 2010) suggests a control limit for wind turbines within 500m of residential property, of 30 hours per year or 30 minutes per day. Further, flicker should not be a problem at distances of greater than 10 rotor diameters (maximum 1,260m) (IFC, 2007a). However, assessment of the potential for flicker indicates that this will not be a problem with this project (see Section D3.3 Landscape and Visual operational impacts) and therefore black polyurethane coated blades will not be necessary.

B6.2.5 Water quality and Erosion Prevention

Surface water quality can be impacted by increased erosion and sedimentation. General pollution prevention measures and erosion prevention typical of construction sites are identified in the IFC Guidelines (IFC, 2007b) and the Wind Energy Toolkit to prevent this impact (UNDP Serbia, 2010). There are no significant surface water bodies in the vicinity of the project. The Danube is some 20km distant to the west and south. In order to prevent soil erosion, construction on steep

slopes should be avoided and erosion measures implemented. Where necessary surface water runoff management adopted and re-vegetation should be implemented.

B6.2.6 Community Health, Safety and Nuisance

Community health and safety hazards specific to wind energy facilities primarily include the following the IFC guidelines for wind farms (IFC, 2007b): The key issues and BAT measures are summarised below:

Aircraft and marine navigation safety

This is not anticipated to be an issue for the Čibuk 1 project. The nearest major airport, Belgrade, is some 30 km to the south west of the project site. There is a landing strip situated within 10 km of the proposed project which is not in use. Nevertheless, the operator will undertake to install suitable anti-collision lighting and marking systems, in consultation with the air regulatory traffic authorities before installation. The decision of the authorities is that 23 (WTGs numbered 2, 4, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 36, 37, 38, 44, 48, 57, 62, 64, 68, 73, 78) out of 57 turbines need to be marked with lights and only on the nacelle.

Blade and ice throw

Guidelines produced for the EC suggest a safety threshold of 200-250 m from any turbine, beyond which there is no significant risk from ice fragments (Moregan et al, 1998). The IFC suggests that 300m is sufficient (IFC, 2007b).

The IFC states that, in periods of significant frost and ice, de-icing will be undertaken, if the turbines are to continue to operate, in order to minimise risk of ice throw. This also has the added benefit of optimising energy generation capability during these weather conditions. In situations where turbines are operating in cold climates, the installation of blade heating should be considered. This requirement is detailed in reference sources such as Technical Requirements for Rotor Blades Operating in Cold Climates, published by the German Wind Energy Institute (Seifert, 2003) and Wind Energy Production in Cold Climate, published by the Finnish Meteorological Institute (Tammelin et al, 1998).

Another and/or additional option is to equip the wind turbines with vibration sensors that can react to any imbalance in the rotor blades and shut down the turbine if necessary. In summary the measures which may be applicable to this wind farm as delineated by the IFC include:

- Curtail wind turbine operations during periods of ice accretion;
- Post signs at the perimeter of the wind farm, in all directions;
- Equip turbines with heaters and/or ice sensors; and
- Use synthetic lubricants rated for cold temperature.

Electromagnetic Interference

There are a number of potential remedies should there be interference to telecommunication systems. However, it should be noted that the authorities have issued opinion to WEBG that no such interferences are expected. In general, potential interferences may include (IFC, 2007b):

- Modifying placement of wind turbines to avoid direct physical interference of point-to-point communication systems;
- Installing a directional antenna;
- Modifying the existing aerial; and
- Installing an amplifier to boost the signal.

Remedies in the event of television interference can include:

- Site the turbine away from the line-of-sight of the broadcaster transmitter;
- Use non-metallic turbine blades;
- If interference is detected during operation:
  - Install higher quality or directional antenna;
  - Direct the antenna toward an alternative broadcast transmitter;
  - Install an amplifier;

- Relocate the antenna;
- If a wide area is affected, consider the construction of a new repeater station.

Public access

Security will be provided to the site at various levels, as recommended by the IFC (IFC, 2007b), including (but not limited to):

- Locking of each individual turbine tower access door;
- Operating a permit to work system to prevent unauthorised access;
- Warning signs on site access roads;
- Control of access roads to the turbines and associated equipment;
- Fencing off maintenance and equipment storage areas; and
- Dissemination of information on safety zones and the hazards posed by the turbines in the local community.

B6.2.7 Environmental management and accidents

The minimisation of environmental impact, and the prevention of accidents that may have environmental consequences, should be managed by implementation of suitable management systems including environmental management systems. These should be developed for the installation to a suitable standards such as ISO standards.

The systems should be in place throughout the project life cycle, in particular in order to minimise the risk of impact due to accidents and their consequences on the environment, including human receptors. Ideally, an integrated management system will be in place to cover environmental and health and safety management, certification to ISO14001, OHSAS18001 or similar standards as earlier as possible in the project lifecycle. Since the construction phase will be the project phase of potentially the most significant impacts, the management systems should be in place before construction begins.

B6.2.8 Monitoring

Best practice associated with assessment of impact is to ensure that appropriate survey work of wildlife (habitats, birds bats etc.) and potential impacts on human receptors (e.g. noise) is undertaken both pre and post-construction. However, such monitoring is typically outside the scope of a BAT assessment. As defined in Section 6.1, BAT assessments are focused on the operational design of the facility and technologies that are integral to the operational design. Pre-Construction survey methodologies are discussed in Section C of this Statement and post-construction monitoring is discussed in Section E.5 of this Statement.

Typically, in the case of industrial installations, emissions monitoring technologies are used in order to ensure that emissions are within the designated limits and to determine potential pollution impacts from the industrial installation. It can be argued that analogous to this in the case of wind farms is the use of permanent monitoring techniques, where they are determined to be necessary and where the feedback from the monitoring techniques will have a direct bearing on the day to day operational management of the wind farm. Such techniques could include monitoring of animals in flight and noise monitoring, where the data received may be used to alter the operations of the wind farm. The important factor being that the information feedback loop is short. In the case of monitoring of animals in flight, techniques such as visual observation, radar or thermal imaging could be used to provide early warning of, for example, migrating birds which are on a flight path through the wind farm. In the case of noise, continuous noise monitoring at sensitive locations may, when noise levels from the wind farm increase during certain climate conditions (e.g. where cross winds increase wind shear, resulting in high noise levels), lead the operator to switch to noise suppression mode.

There are no prescriptive or mandatory requirements in any of the key references detailed in Section 6.1 to implement any of the measures detailed above as a matter of course. The use of monitoring techniques which may provide live feedback to wind farm operators is gaining some traction, as described in some recent expert guidance notes, such as Natural England Technical Information Note TIN069 (Natural England, 2010). However, these requirements are only necessary if the local environmental conditions dictate that they are necessary. These are site specific BAT requirements rather than the more general BAT requirements described elsewhere

in this section. Data collected during 2+ years of monitoring indicates that there are no bird and/ or bat flight paths through the proposed project area that will lead to significant bird and/ or bat mortality. Therefore, the installation of permanent monitoring techniques, such as radar, is not considered BAT for any wind farm.

Noise modelling undertaken using worst case scenarios indicate that significant noise impact is highly unlikely.

While the above techniques may provide additional information feedback loops to the operator and the regulator, their installation does involve some considerable CAPEX and OPEX costs. A key element of BAT assessment is associated with 'cost-benefit' and the 'proportionality principle'. From the information available, in the case of both permanent radar and noise monitoring, the cost of installation and operation far outweighs any benefit and therefore, under the principle of proportionality any prescriptive requirements for their installation does not pass the proportionality test.

It is noted that the monitoring of the potential impact on the bird populations will continue following construction. The monitoring results will be reviewed after two years and the potential benefits of radar will reconsidered.

In conclusion, the installation of permanent noise monitoring stations, is not considered to be BAT for the proposed installation.

B6.2.9 Decommissioning, site closure and restoration

Decommissioning should be undertaken so as to prevent undue risk to the environment. Much of the BAT associated with decommissioning should be incorporated into the design phase. While, the decommissioning of a wind farm is not a complicated process, largely comprising of the dismantling of the turbines and site clearance, the appropriate management controls should be in place. There are in general, similar to the standards required during the construction and operational process.

A key element of BAT for decommissioning concerns 'ease of decommissioning'. The project should be designed to allow for ease of decommissioning. Basic measures should be included in the design such as incorporating construction and fabrication techniques that facilitate ease of dismantling and recycling, where appropriate. Key difficulties associated with the decommissioning of a wind farm are the removal of foundations (if considered necessary) and other underground structures (such as cabling) and the disposal of turbine blades. At present, the design of turbine blades (i.e. thermoset polymer materials) does not facilitate ease of recycling. This is an industry wide issue, with the development of alternative materials construction (e.g. thermoplastic polymers) being researched in order to make wind farm construction more sustainable. The alternative disposal mechanisms are landfill which is a problem throughout Europe due to lack of landfill space, and incineration in waste to energy plant, which results in emissions of harmful gases and/or requires sophisticated abatement technologies which have their own environmental impact. However, since readily recyclable wind turbine blades are not presently an openly available technology, we consider that they are not at present a BAT requirement.

The design stage should appropriately consider these issues and ensure that the site can be restored to a status contiguous to its state prior to the development. Further, decommissioning of structures should be undertaken in such a way as to minimise health and safety issues to workers involved in decommissioning.

Typically, wind farm operational processes do not involve the use of large volumes of hazardous materials which may result in releases of particularly harmful materials into the ground and therefore, with appropriate management during operation, it should not be necessary to conduct post operational clean up. Where ancillary structures, such as transformers are part of the design, these should be designed so as to prevent releases to the environment of hazardous chemicals. In the case of transformers, the transformer pad should incorporate secondary containment in order to ensure that there have been no releases into the ground during the course of operations that will give rise to ground contamination issues.

In summary, decommissioning planning starts at the design stage and the design should facilitate ease of decommissioning. Where ever possible materials should be recycled and the site should be restored to its state before development. There should be appropriate management systems

in place to prevent harm to the environment and health and safety risks to workers and the public.

B6.3 BAT Assessment

In general, as summarised below, the project has been located away from sensitive receptors, and designed to represent BAT, in terms of:

- The size and number of turbines to be used and the turbine design selected;
- Organisation and management of construction;
- The measures to prevent impact from ancillary activities.

Table B.2: BAT Assessment Table

Indicative Requirement	Control Measures for BAT	BAT Justification
Management Systems	Bespoke EMS to ISO14001 and OHSAS18001, or equivalents. Certification preferred but not essential.	IMS to OHSAS18001 and ISO14001 to be implemented. Appropriate management systems in place at all project phases and certification within 2 years of start of construction. Preventative maintenance regime incorporated into EMS.
Accidents	Accident Management Plan under EMS/IMS in accordance with relevant guidance including local regulatory requirements.	
Visual Impacts	Consult the community on the location of the wind farm to incorporate community values into design. Consider the landscape character during turbine placement Consider the visual impacts of the turbines from all relevant viewing angles when considering locations. Minimise presence of ancillary structures on the site by avoiding fencing, minimizing roads, burying intra-project power lines, and removing inoperative turbines. Avoid steep slopes, implement erosion measures, and promptly re-vegetate cleared land with indigenous native species only. Maintain uniform size and design of turbines (e.g., direction of rotation, type of turbine and tower, height). Paint turbines a uniform colour, typically matching the sky (light grey or pale blue), while observing marine and air navigational marking regulations. Avoid including lettering, company insignia, advertising, or graphics on the turbines.	Distance to nearest receptor approximately 1 km. Distance to nearest settlement 1km. Area is relatively flat. Erosion prevention measures to be employed. Re-vegetation will be using only native species. Turbines will be light grey or pale blue without highly visible graphics or lettering. It has been communicated that the vendors lettering might be on the nacelle. However, based on previous experience we do not believe that this will have a significant visual impact. The blade tips may be painted red. This would not represent BAT and should be avoided. On-site electrical connections to be underground. Slopes to be avoided where possible. Erosion prevention measures such as native species re-vegetation to be used.
Noise	Mechanical noise from machinery (e.g., gearbox, generator) should be minimised by good engineering design and incorporation of acoustic enclosure techniques into the nacelle design. Aerodynamic noise from the turbine blades should be minimised by good engineering design, covering issues such as rotational speed (including the use of variable speed), turbine blade wake turbulence and pitched turbine blades (including variable blade pitch). Aerodynamic noise from the tower should be minimised by good engineering design of the tower configuration (e.g., lattice towers may give rise to greater noise emission levels than cylindrical towers). Siting of wind farms in close proximity to sensitive noise receptors (e.g., residential property, hospitals, and schools) should be avoided.	Distance to nearest receptor approximately 1 km. Distance to nearest settlement 1km. Larger turbines used, so fewer in number. Noise targets will be complied with at receptor locations. Use of modern design of wind turbine reduces noise from nacelle and turbine blade design. On-demand monitoring can be applied and the blade speeds can be modified as appropriate.

Indicative Requirement	Control Measures for BAT	BAT Justification
Species Mortality, Injury or Disturbance (birds and bats)	Selection of wind farm sites should take into account known migration pathways or areas where birds and bats are highly concentrated (e.g., wetlands, designated wildlife refuges, staging areas, rookeries, bat hibernation areas, roosts, ridges, river valleys, and riparian areas). Turbine tower and blade heights should be maintained below observed typical elevations of migratory bird and bat pathways. Turbine rotational speed should be as low as possible to enhance visibility to birds and bats. Turbine arrays should be configured so as to avoid potential avian mortality (e.g., group turbines rather than spread them widely or orient rows of turbines parallel to known bird or bat movements); Storm water management measures should be designed so as to avoid creating attractions such as small ponds which can attract birds and bats for feeding or nesting near the wind farm. Tower design should avoid creating potential nesting sites for birds (e.g., lattice towers).	Here are no significant migratory pathways through the windfarm. Project is >1km from Deliblato Sands boundary as agreed with the SINP. Larger turbines to be used, in alignment. Large 3 blade rotors minimise rotation speed. Solid tower rather than lattices to avoid encouraging roosting. There will be no impact on surface water drainage during the operational stages. During construction, any ground compacted or otherwise damaged which may leading to pond formation, will be reinstated to an appropriate condition.
Shadow Flicker and Blade Glint	Wind turbines should be sited and orientated so as to avoid residences located within the narrow bands, generally southwest and southeast of the turbines, where shadow flicker has a high frequency. Turbine location should also take account of the potential for blade glint, although the likelihood reduces as the blades soil with age. Consideration should be given to the use of non-reflective coating on turbine towers to minimise sunlight reflection.	Project unlikely to cause significant shadow flicker. The distance to nearest receptor just over 1 km (1,038m); an occupied house on the northern edge of Mramorak. There is the potential that there could be some very minor impact for a few hours a day for a few days a year. The situation will be monitored and if there is an impact then WEBG will close down the turbine for the 'at-risk' hours. Distance to nearest settlement 2 km. Black polyurethane coated blades will not be required.
Habitat Alteration	Access road gradients should be minimised to reduce storm water run-off induced erosion. Road drainage design should take account of road width, surface material, compaction, and maintenance. Access road maintenance should be conducted in such a way as to minimise the potential for impact (e.g., use of de-icing measures). Disturbance of extant water bodies should be minimised (e.g., by the use of single span crossings). Drainage systems should be designed so as to minimise and control infiltration. The design and installation of the turbine tower should take account of the need to ensure structural stability of existing topography.	Site is relatively flat. Gradients will be minimised and road drainage designed to suit terrain. Erosion prevention measures identified above will minimise surface water runoff. No significant surface water in the immediate vicinity of the project. The Danube is some 20km distant to the west and south. Re-vegetation will be using only native species. On-site electrical connections to be underground. Erosion prevention measures such as native species re-vegetation to be used in order to maintain biodiversity.
Water Quality	The design and installation of turbine foundations, underground cables and access roads should take into account the potential for increased erosion and sedimentation of surface waters.	Erosion prevention measures identified above will minimise surface water runoff. No significant surface water in the immediate vicinity of the project. The Danube is some 20km distant to the west and south.

Indicative Requirement	Control Measures for BAT	BAT Justification
Community Health, Safety and Nuisance: Aircraft Navigation Safety	The design and installation of wind turbines should take account of the fact that blade tips, at their highest point, may reach more than 100 metres in height. If located near airports or known flight paths, a wind farm may impact aircraft safety directly through potential collision or alteration of flight paths. Air regulatory traffic authorities should therefore be consulted before installation, in accordance with air and marine traffic safety regulations. When feasible, avoid siting wind farms close to airports or ports and within known flight path envelopes. Use anti-collision lighting and marking systems on towers	The nearest airport, Belgrade, is some 30 km to the south west of the project site although there is a landing strip, in no use, situated within 10 km of the site. Discussions with air regulatory traffic authorities indicate that suitable anti-collision lighting systems on the towers (nacelle) to be used.
Community Health, Safety and Nuisance: Blade / Ice Throw	The design and siting of wind farm installations should establish safety setbacks (exclusion zones) such that no buildings or populated areas lie within the possible trajectory range of the blade. Whilst such safety setback ranges are unlikely to exceed 300 metres, the range can vary with the size, shape, weight, speed of the rotor and the height of the turbine. The design of the safety setback range should take account of climate issues (e.g., the potential for ice throw will be limited to colder regions). Wind turbines should be equipped with vibration sensors that can respond to any imbalance in the rotor blades and shut down the turbine. The wind turbine should be maintained in accordance with a planned preventative maintenance regime. The design of the wind farm installation should incorporate the use of warning signs to alert the public to potential risk.	Will curtail wind turbine operations during periods of ice accretion. Will post signs on the perimeter. Blade heating not used, but vibration sensors that can react to any imbalance in the rotor blades will be in place and shut down the turbine. Due to the low risk of ice formation (the site are is not characterised as a 'cold climate') the installation of heated blade systems is not proportional and therefore, we consider it unnecessary. Synthetic lubricants used, rated for cold temperature; Preventative maintenance regime incorporated into EMS.
Community Health, Safety and Nuisance: Electromagnetic Interference – Aviation Radar	The design and siting of wind farm installations should consider equipment, component designs and materials of construction that minimise radar interference, including the shape of the turbine tower, the shape of the nacelle, and the use of radar-absorbent surface treatments (e.g., rotor blades made of glass-reinforced epoxy or polyester). Wind farm design should consider the geometric layout and location of turbines and potential changes to air traffic routes. Wind farm design should consider relocation of the affected radar and radar blanking, or use of alternative radar systems, to cover the affected area.	The nearest airport, Belgrade, is some 30 km to the south west of the project site. Measures to be considered in light of any interference being caused and complaints received.
Community Health, Safety and Nuisance: Electromagnetic Interference – Telecommunication Systems	The design and siting of wind farm installations should consider the modification of wind turbine placement to avoid direct physical interference of point-to-point communication systems. Consideration should be given to the installation of directional antennae on communication systems. Consideration should be given to the modification of the existing aerial / antenna. Consideration should be given to the installation of an amplifier to boost the signal at the reception antenna.	No telecommunications systems present in close proximity to the project have been identified which may be impacted by the project. Measures to be considered in light of any interference being caused and complaints received.

Indicative Requirement	Control Measures for BAT	BAT Justification
Community Health, Safety and Nuisance: Electromagnetic Interference – Television	The design and siting of wind farm installations should consider locating the turbines away from the line-of-sight of the broadcaster transmitter. Consideration should be given to the use non-metallic turbine blades. If interference is detected during operation, the following measures should be considered: - Installation of higher quality or directional antenna; - Direction of the antenna toward an alternative broadcast transmitter; - Installation of an amplifier at the reception antenna; - Relocation of the reception antenna; If a wide area is affected, consideration should be given to the construction of a new transmission repeater station.	Distance to nearest receptor approximately 1 km. Distance to nearest settlement 1km. Measures to be considered in light of any interference being caused and complaints received.
Community Health, Safety and Nuisance: Electromagnetic Interference – Public Access	The design and siting of wind farm installations should consider the use gates on access roads. Consideration should be given to fencing the wind farm site, or individual turbines, to prohibit public access close to the turbine; Consideration should be given to the prevention of access to turbine tower ladders. Consideration should be given to the posting of information boards about public safety hazards and emergency contact information.	Each individual turbine tower access door to be locked. Permit to work system to be in place to prevent unauthorised access. There will be no gates to be in place on access roads to the main turbine site since the site will be open. Ancillary plant will be housed in secure compounds and warning signs will be used at entrance roads (particularly during construction), at the wider wind farm site and at ancillary plant compounds. Control of access roads to the turbines and associated equipment. Dissemination of information on safety zones and the hazards posed by the turbines in the local community.
Decommissioning and closure	Selection of site, design, construction and equipment selection should take account of closure / decommissioning requirements. Outline Site Closure Plan should be developed at an early stage in the life of the facility. The Plan should expanded and developed immediately prior to decommissioning and closure, taking account of site-specific issues, and should include measures for prevention of pollution during decommissioning / closure activities. Provision for mitigation measures should be considered where appropriate.	Basic design measures to be taken during design to minimise potential decommission and closure impacts. No significant hazardous substances to be used. Wind farm construction to employ materials and techniques that can be recycled. Recycling of blades is not at present an adoptable technology and is therefore not relevant.

B6.4 Conclusions

In terms of the design we conclude the proposed wind farm and ancillary structures will comply with the BAT we have derived for this assessment. At present the appropriate design aspects have been incorporated into the project at an early stage and we expect that in order that BAT compliance is achieved throughout the project lifecycle, appropriate management systems will be developed from construction through to commissioning.

B7 Project Alternatives

B7.1 Introduction

We have included an outline of the project alternatives in this section because this work has already mainly been undertaken at an early stage in the project planning process. It is not the purpose of this Statement to present a detailed assessment of the project alternatives, in particular site alternatives. However, where applicable throughout this document, the proposed impact of the chosen site and design will be discussed in terms of the potential alternatives.

B7.2 No Project Alternative

The no project scenario is that the wind farm is not built. In the event that the wind farm is not built there will be no negative impacts in terms of those that might be typical of wind farms (noise, visual impact, flicker etc.). The municipality of Kovin, on which territory the wind farm is supposed to be built, and the surrounding communities will in this scenario feel negative impact because they do not receive the financial and other rewards associated with the construction of the wind farm as a major private investment in this otherwise economically challenged area. From a national perspective, there will be a negative impact in that Serbia will be more reliant on importing their energy requirements and also the country will not be developing renewable energy sources in line with its international obligations.

B7.3 Alternative Locations

As part of WEBG's scoping for a suitable location, alternative locations were investigated. Alternative project locations are illustrated in Figure B.9, also including the location of Čibuk 1 in relation to the alternative locations. The alternative locations and the reasons for their rejection for development are as follows:

- **Bela Crkva**: Initial investigations were undertaken, including bird surveys undertaken by Ecoda Consulting (Ecoda Consulting, 2010). The site at Bela Crkva was found to have a higher habitat biodiversity than Čibuk with a higher amount of shrub and tree vegetation. Further, there was a higher possibility of impacts concerned with flight paths of migrating birds and waterfowl at the Bela Crkva site. Therefore, the company concluded that the environmental risks associated with the site could not be easily overcome and that Čibuk 1 was a more suitable location.
- **Popadije**: An initial assessment of the site was undertaken and the company representatives visited the site. However, the terrain was deemed to be unsuitable because of its complexity.
- **Cestobrodice**: The location assessed and wind measurements were undertaken. It was decided by the company that the site was more complex than Čibuk 1 in terms of wind turbine location.

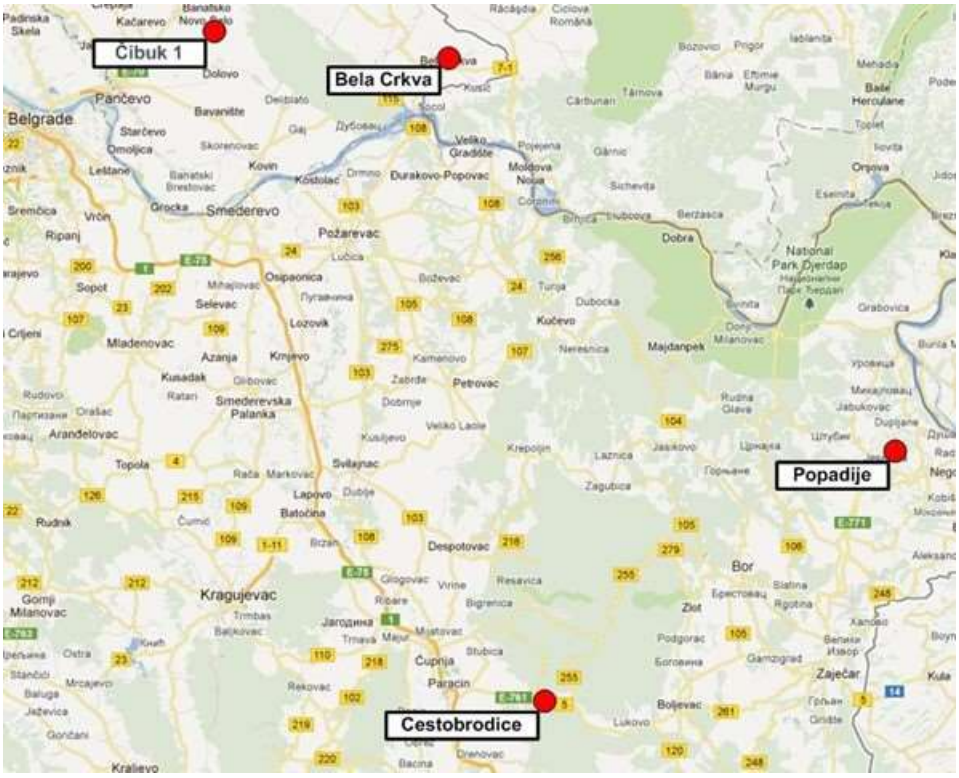


Figure B.9: Alternative Project Locations

B7.4 Alternative Project Configuration for Čibuk 1

Early in the planning process, WEBG considered alternative scenarios associated with the wind farm at the proposed site. These were as follows:

- Scenario 1: Installation of 100 wind turbine generators (WTGs);
- Scenario 2: Increased spacing between the turbines in order to minimize noise and shadow cumulative impact; and,
- Scenario 3: Application of a 1+ km buffer to move away from Deliblatska Pescara, reducing the number of WTGs to 57.

The early assessments undertaken by developer moved the design away from Scenarios 1 and 2, with Scenario 3 being the design proposed by the developer and is subject of the detailed assessment present in this Statement. At present no further scenarios are proposed, with the acceptance of Scenario 3 by the regulatory authorities and investors in the proposed project.

B8 Alternatives Site Access

Realistically, there are only two routes that could be used for the delivery of major plant items to the site, see Figure B.10. The easterly exit from Pančevo would provide the shortest distance but the roads or narrow and would pass through the centre of Dolovo. The deliveries would then be made to the GE Compound towards the centre of the windfarm. The nuisance and potential road safety implications of operating heavy vehicles through the centre of a small town was considered to be unacceptable and the E70 was selected as the preferred route.

The use of the E70 means that the heavy vehicles will pass through the town of Vladimirovac. This means that the vehicles will enter the windfarm site from the north, see Figure B.8.

There are three potential routes from Vladimirovac to the wind farm site. INSERT IMAGE HERE.

After discussions with the Mayor of Vladimirovac it has been agreed that the best route from the E70 will use the northern most road, see Figure B.11. This route was chosen as having the lowest number of residential houses. This route (in blue on Figure B.11) will require the

upgrading of the local road to meet the size and weight requirements for the delivery vehicles. At the point marked with a red circle on Figure B.11, the route will change on to what is currently a farm track. In addition to the upgrade of the road to the windfarm, WEGB have agreed to continue to upgrade the local road as it runs for another 4km into the Deliblato Sands recreational complex. It is hope that this upgrade will help support the development of the Deliblato Sands as a tourist area.

Figure B.10: Alternative Project Locations

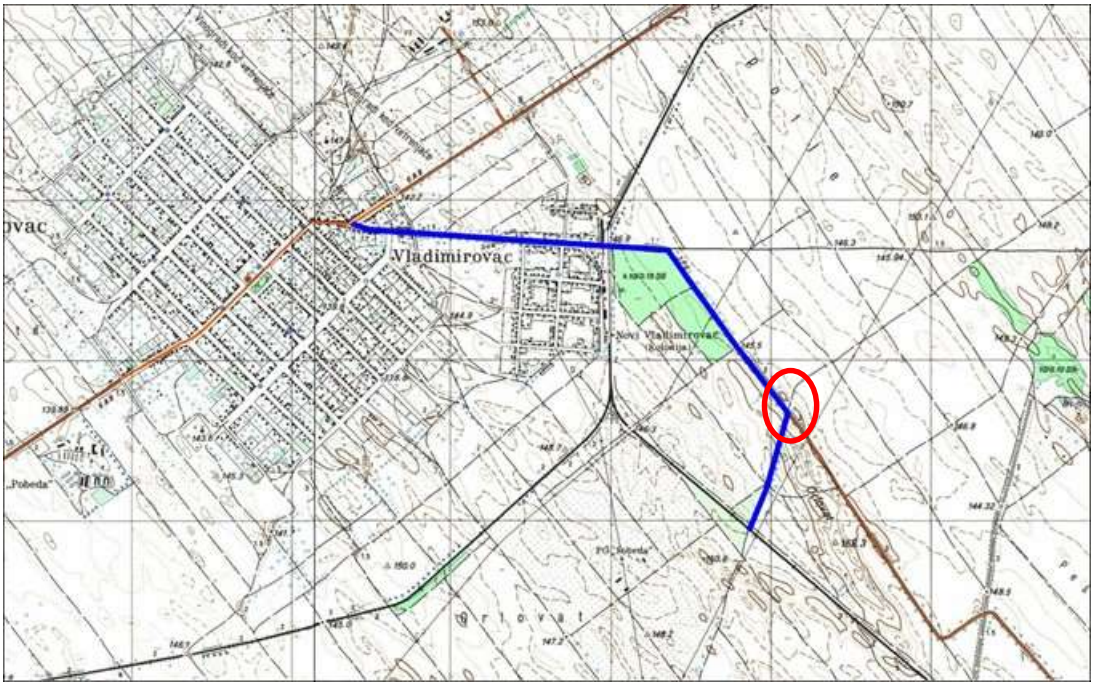


Figure B.11: Routing through Vladimirovac

B8.1 Greenhouse Gas Emissions Assessment

An assessment of the potential emissions of greenhouse gases from the proposed installation has been undertaken using the EBRD Methodology for Assessment of Greenhouse Gas Emissions (EBRD, 2010). The EBRD assessment methodology focuses on the following:

"… estimate the change in GHG emissions (ΔGHG) brought about by investments. This is the difference between the emissions following the implementation of the project investment and the emissions that would have occurred in its absence. "

Where 'GHG' is 'Greenhouse Gas Emissions'

Greenhouse gas assessments for renewable energy projects are undertaken using the methodology are based on the following assumption:

"Renewable energy power generation projects are assumed to displace the emissions associated with the national average grid electricity generation."

This is because other electricity generation techniques, specifically those associated with combustion of fossil fuels emit high levels of carbon dioxide (CO_2), an important greenhouse gas and contributor to climate change. This is relevant in Serbia since most of the electricity (over 70%) is generated from combustion of fossil fuels, lignite in particular, with no electricity produced by wind power or nuclear power and, the remaining energy produced in large hydropower plants.

Although greenhouse gases will be released directly or indirectly as a result of construction of the wind farm (e.g. the production of the cement used for turbine foundations results in significant emissions of CO_2), these embodied GHG emissions are common to the construction of other types of power plant, and may often be significantly lower in the case of wind farm development. Therefore, as per the EBRD requirements, the focus of the assessment is GHG releases during operation, or, as wind farms and other renewable energy plant do not produce CO_2 during operation but instead displace the energy demand from conventional sources, the assessment is based on CO_2 displacement.

The EBRD methodology is to use grid electricity emission factors which are expressed in '*grams of carbon dioxide emitted per kilowatt hour of electricity produced*' (gCO_2/kWh) to estimate the GHG emissions/displacement. The grid emission factors presented in the EBRD guidance include those for Serbia, including for projects which displace generation, such as wind power projects. The displacement factor for such projects in Serbia is 0.792 tCO_2/MWh (US Energy Information Adminstration, 2007), which equals 0.792 gCO_2/kWh.

The estimated energy production of the project, based on figures supplied by WEBG, is 445,000 MWh/per annum (CWP, 2011). This is approximately equivalent to a 32% utilisation factor of the proposed design, based on a 160 MW wind farm. In April 2013, in wind report produced by Garrad Hassan, energy production of the project was estimated at 449,100 MWh/per annum, which is approximately equivalent to a 35.5% utilization factor of the proposed design, based on a 144.2 MW wind farm (CWP, 2014). In order to determine the CO_2 displacement the following simple calculation is undertaken:

Total MWh/per annum of the wind farm X Country Grid Electricity Emission Factor = CO_2 displaced

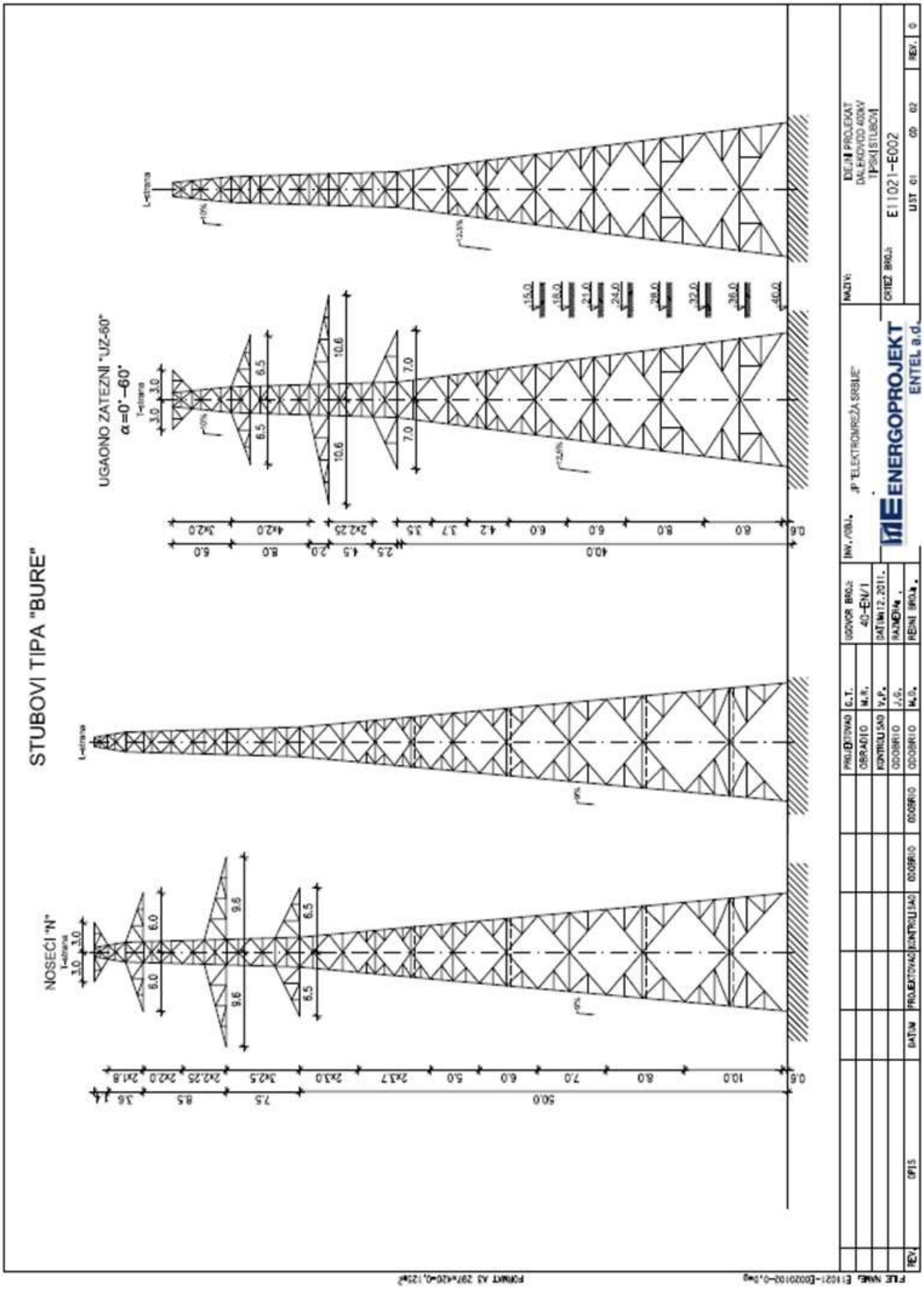
445,000 MWh/per annum X 0.792 tCO_2/MWh = 352,440 tCO_2/per annum displaced

The amended design is based on smaller turbines which are 22 % smaller than the original but the same total number of turbines will be constructed. Based on the amended smaller design, we conclude that the wind farm will displace **274,903 tonnes of carbon dioxide every year** during its operation that would otherwise be produced if the electricity was produced by conventional electrical power generation.

B8.2 Conclusions

Review of the project alternatives indicates that of the practical alternatives considered, the proposed location and design is the most appropriate for consideration of detailed impact assessment. Further, the project will significantly offset greenhouse gas emissions from present conventional sources.

BI Overhead Power Line Design



C The Existing Environment

C1 Introduction

The following sections provide a detailed overview of the Physical Environment, Natural History (i.e. ecology) and Human Geography (i.e. socio-economic baseline) of the proposed project site and its surroundings. The information presented is based on available information from local and governmental sources, publically available databases, survey work and research undertaken by other parties (referenced) and survey work and research undertaken by Atkins and their associates.

C2 The Physical Environment

C2.1 Geology and Hydrogeology

The site is located in the north-eastern part of Serbia (the Province of Vojvodina), in the very southern part of the Neogene Panonnian basin – a wide plain spreading over the Central Europe bounded by the Carpathian Mountains, the Alps and the Dinaric Alps. The Panonnian basin is a typical deep tectonic depression predisposed by regional faults.

The site is located on the Quaternary eolian deposits of upper Pleistocene age. Wide project area is a plateau composed of Quaternary eolian sediments consisting of loess, sandy loess and sand. The geological map of the wider project area is presented in Figure C.1.

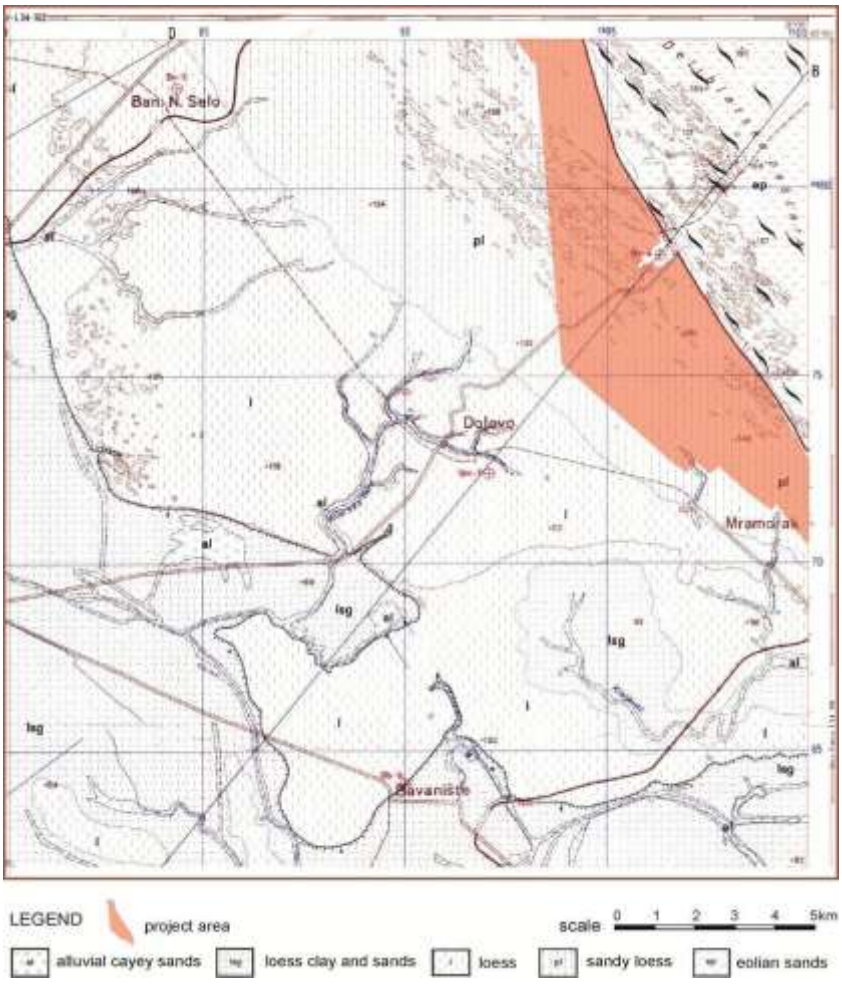


Figure C.1: Geologic Map of the Wider Project Area (Official Geologic Map of Serbia, Pancevo Sheet)

The total thickness of Quaternary deposits is approximately 100 meters. In the vertical cross-section they comprise alternation of loess, fine to medium grained sands, sandy clays and clays.

In October 2011, detailed geotechnical investigations were undertaken by a local geotechnical company (Geoput, 2011) covering the entire site area. Investigations have been done in order to meet the Conceptual design and the project construction requirements.

Lithological cross-sections have been identified by drilling of seven soil borings until the depth of 30 m below ground level. Two main lithological portions have been identified at the soil boring logs:

- Loess and sandy loess (Q^{pl}) until the depth of 7-12 m b.g.l.(depending on site topography)
- Eolian sand (Q^{ep}) underlies below 12 m

The lithological cross-section is presented in Figure C.2.

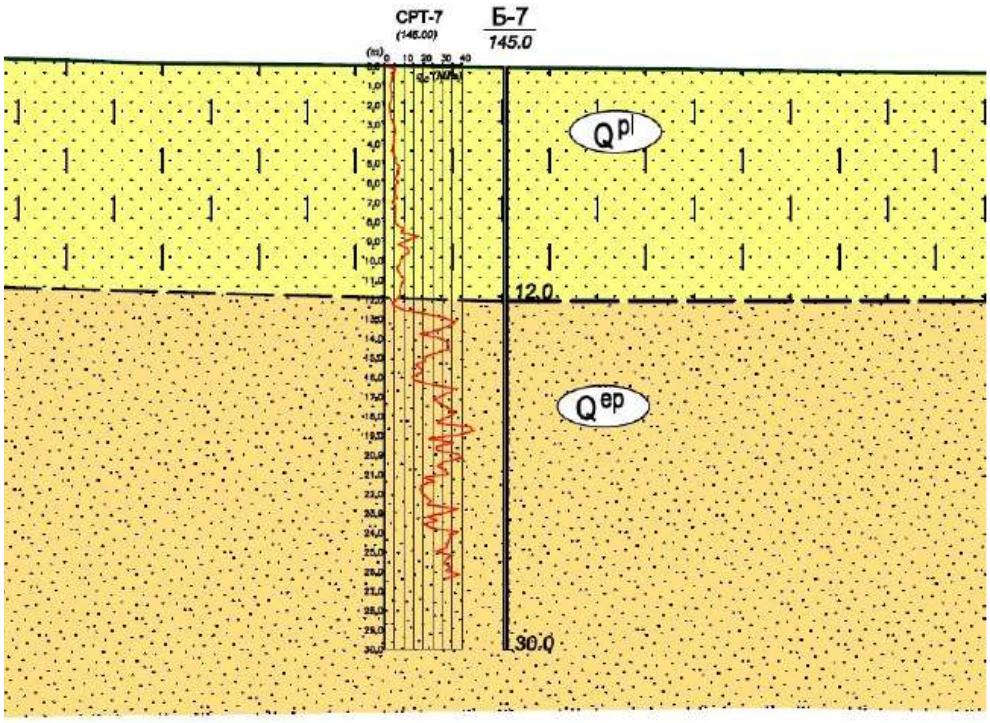


Figure C.2: Lithological Cross-section at the Project Site (Geoput d.o.o., 2011)

Loess and sandy loess (Q^{pl}) – this layer consists of eolian (or aeolian) deposits, specific for this region, pertaining to wind activity. It is a sandy loam of yellowish-grey colour with typical porosity. This loess surface layer has been identified all over the project area. Its thickness varies between 7 m and 12 m depending on surface topography.

Eolian sand (Q^{ep}) – this layer consists of dusty sand, fine to medium grain size, medium to well compacted, yellowish-brown and grey in colour. It underlines eolian loess. It is identified in all boring logs until the drilling depth (of 30 m b.g.l.) while its thickness is much higher reaching the depth of about 100 m b.g.l. (according to the available official geologic map and previous geologic investigations in a wider area).

Quaternary eolian deposits are underlain by a thick Neogene complex (Pl_1) consisting mostly of clay, sandy and marl layers.

Hydrogeological characteristics of the project site are described based on the findings of geotechnical investigation complemented with some of the existing hydrogeological background data. Figure C.3 presents the schematic conceptual hydrogeological model (cross-section) at the project site.

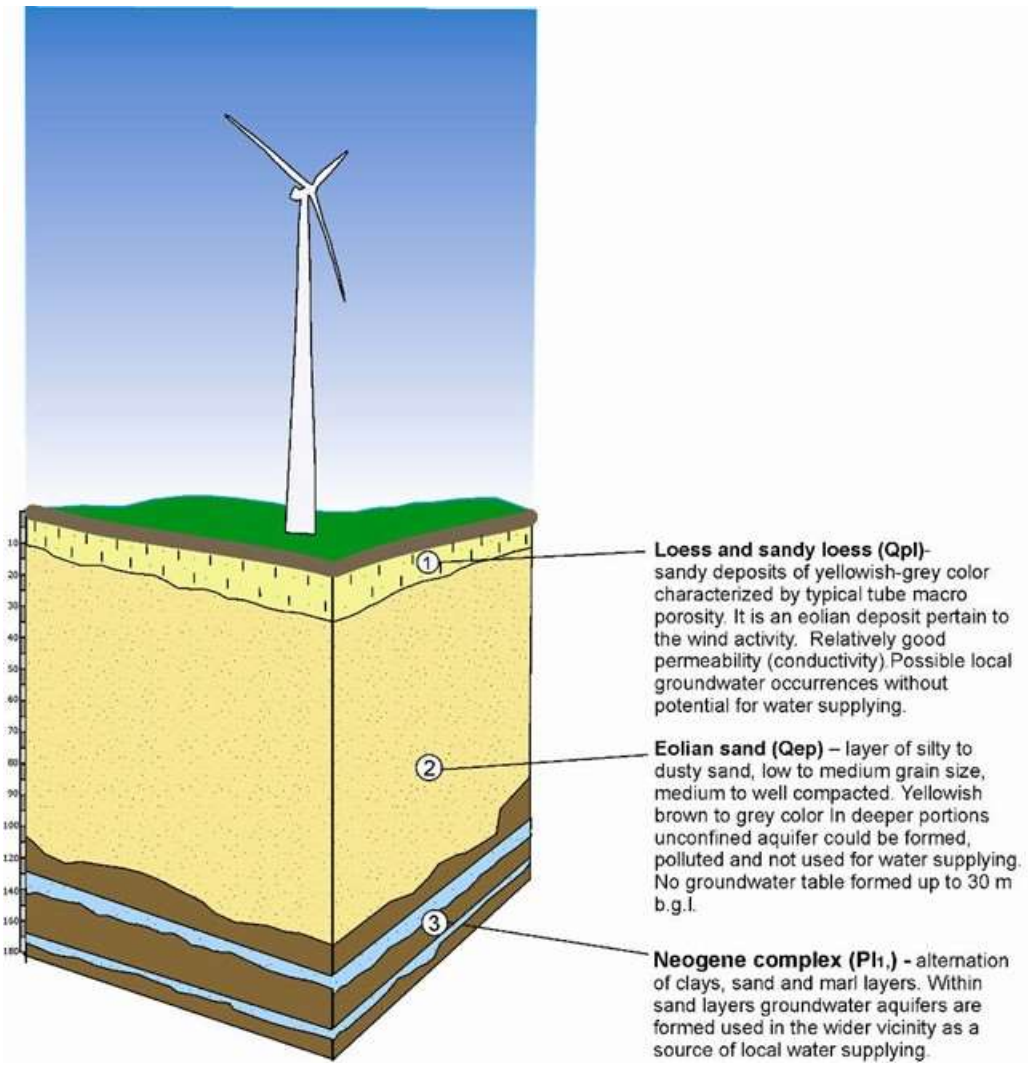


Figure C.3: Schematic Hydrogeological Cross-section at the Project Site

The upper portion, up to the depth of about 12 m b.g.l. consists of permeable loess deposits (layer 1 in Figure C.3). Apart from the intergranular porosity, loess is traversed by narrow tubes macro-pores presenting the traces of plant remains. Some local unconfined aquifer zones may occur within the sandy loess portion. However, such local aquifers do not contain significant quantity of groundwater and are not significant as a source of water supplying. Groundwater level is mainly formed very deep below the ground surface. Aquifer recharge is fully based on precipitation.

Below the sandy loess portion there is a layer of higher permeability, consisting of eolian silty sands (layer 2 in Figure C.5). The lower portions of this layer are most likely saturated with groundwater forming the local aquifer of the intergranular type of porosity. However, during the drilling works no groundwater table was identified until the final drilling depth of 30 m b.g.l. An exception to this was the borehole B-42 where groundwater level occurred at 15 m b.g.l. which was interpreted as a local groundwater accumulation formed over some zone of a lower permeability.

Thick Neogene complex underlies the Quaternary eolian deposits at depths of between 100-150 m b.g.l. The main groundwater resources are located in these deep Neogene structures. In the surrounding settlements groundwater is extracted by deep wells and used for local water supply. In a wider project area (almost all over the Vojvodina province) groundwater from the shallow aquifers is highly polluted partly by its origin and mostly by the long-term intensive agriculture activity and low sanitation level.

Due to a relatively low permeability of the overlying strata and the fact that the main aquifers tapped for water supplying lies in the intervals deeper than 100 m.b.g.l., the groundwater vulnerability on the site is considered low.

C2.2 Seismology

General Background Information

According to the Regulation on technical standards for design of engineering objects in seismic areas (Off. Journal of SFRJ, No. 52/90), the Seismology map of Serbia (1987) and the Map of seismology hazard of Serbia (1998) shall be used. According to those maps, for the return period of 200 to 500 years, the project area is located in seismic zone 6.5-7.0° on the MSK-64 scale (Medvedev-Sponheuer-Karnik), shown in Figure C.4. The same Regulation defines three ground types (hard, semi-hard and soft) according to which the ground in the project area belongs to "soft" type.

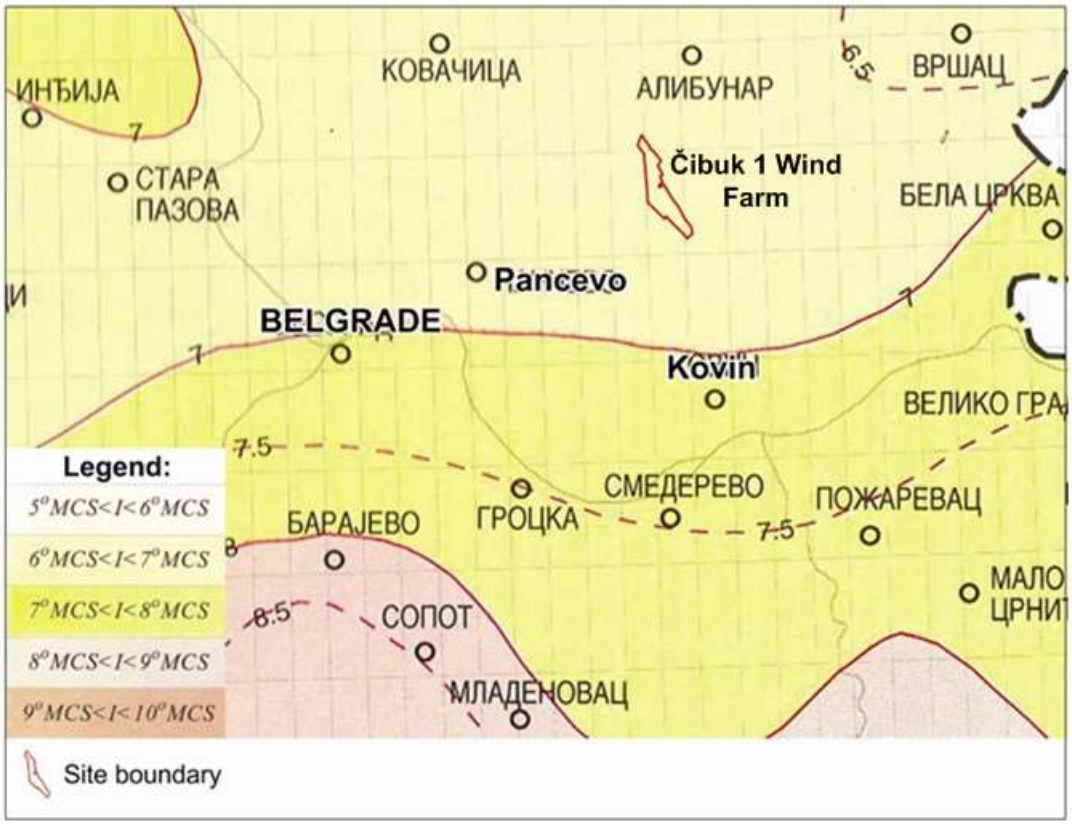


Figure C.4: Site Location on the Map of Seismic Hazard of Serbia (Geoput, 2011)

According to the technical rule Eurocode 8 (Eurocode, 1998), the ground characteristics at the project area can be classified as type C: "Deep deposits of dense or medium-dense sand, gravel or stiff clay with thickness from several tens to many hundreds of metres".

Turbine Design and the Seismic Environment

Wind-generators are devices which are designed, dimensioned and manufactured to be capable to withstand the assumed loads level with the predefined safety level. They also have certain degree of stiffness/strength that gives them stability and long life as well.

In terms of civil construction, wind-generators represent a dynamic loaded construction which consists of rotor, housing with aggregate at top of the steel pylon which is fixed to the basement via anchor block. The rotor and the housing with aggregate as well as the pylon with anchor block are delivered by the equipment supplier (i.e. General Electric). The manufacturer provides detailed instructions for instalment procedure both for pylon installation and for energetic assembly at the bottom of pylon including instructions for anchor block embedding.

Wind-generators belong to a type of low-cyclic rotating machine which leans on the foundation through the pylon and which transfers certain impacts onto the ground. Loads are managed through design in accordance with EN 61400-1 2005 and A1:2009 standards – Wind-generators – Requirements for designing. Within this standard loads taken into account in the design include gravity related and inertial loads (static and dynamic ones), aerodynamic loads – loads caused by

air flow and by interaction with stationary and movable wind-generator elements; operational loads – loads caused by regular operations and wind-turbine control; and, other loads (impulse related loads, ice related loads etc.). All major wind-generator assemblies (blades, gondola and pylon) are analysed together, as an assembly in view of the specific requirements for aerodynamic response, stability, durability (resistance to fatigue of material) and other requirements as well.

As part of the Čibuk 1 project, a geotechnical assessment has been undertaken to determine the ground conditions in the locations of the proposed turbines. Information concerning geotechnical ground conditions, together with the information available concerning seismic activity (and seismic risk) and the design of the turbines will allow for suitable foundation design and turbine siting.

Detailed design of the foundations has been completed in January 2013. The engineers working on the detailed design of the wind farm worked closely with General Electric to ensure that proper information is available to design foundations and turbine structures. Due to the nature of the structures (i.e. that seismic issues will not lead to releases of significant volumes of hazardous substances) and that the need for turbine structures to remain intact within their seismic environment is of paramount commercial importance to the business (i.e. it is a very strong commercial driver), Atkins considers that it is unnecessary to undertake any separate and detailed analysis as part of this ESIA.

C2.3 Climate and Meteorology

C2.3.1 Introduction

In order to understand the local climate conditions, the following section describes basic meteorological parameters of the project area. The information presented in this section is based on data recorded between 1961 and 2002 at Pančevo and Kovin weather stations.

C2.3.2 Regional Climate and Meteorology

The following information is taken from the Strategic Environmental Impact Assessment of the Detailed Regulation Plan for the Infrastructure of the Čibuk Wind Farm – the Municipality of Kovin (Josimovic et al, 2010) and the Spatial Plan of the Municipality of Kovin (Off. Gazette of Kovin, No. 4/08).

The South Banat area is characterised by moderate continental climate with variable seasons, and higher temperatures in the autumn than the spring. The temperature fluctuations between the seasons are significant and characterised by very cold winters and hot summers.

In the Kovin area, monthly mean temperatures for the hottest and coldest months range from 21.4°C (July, the hottest month) to -1.7°C (January, the coldest month). The difference between the coldest and hottest month is 23.1°C, confirming the continental properties of the regional climate.

The area is characterised by pronounced seasonality in precipitation. The average annual for the municipality of Kovin is 608 mm. During summer, precipitation is at its highest at 193 mm (31.7%), in spring 166 mm (27.3%), in autumn 120 mm (19.7%) and in winter 129 mm (21.3%). The average annual humidity is 77%. The average annual cloudiness is 53%.

The strongest winds blow from the south-east during winter. During the warmer seasons the wind blows from the south-east and although slightly weaker is still strong. According to the wind speed analysis in January 2012, the mean wind speed at 120 m is approximately 7.2 m/s.

A 120 m high wind monitoring mast (anemometer) has been installed at the site and used for monitoring of wind speed and direction and climate conditions at the site. Given that the wind speeds at the mast are recorded at 60 m height (and higher), they are not comparable with wind speed values from the official meteorological stations (Pančevo and Kovin). However, the data is useful to illustrate the predominant wind directions. Wind rose for the period August 2009 – December 2011 recorded at the site is shown in Figure C.5.

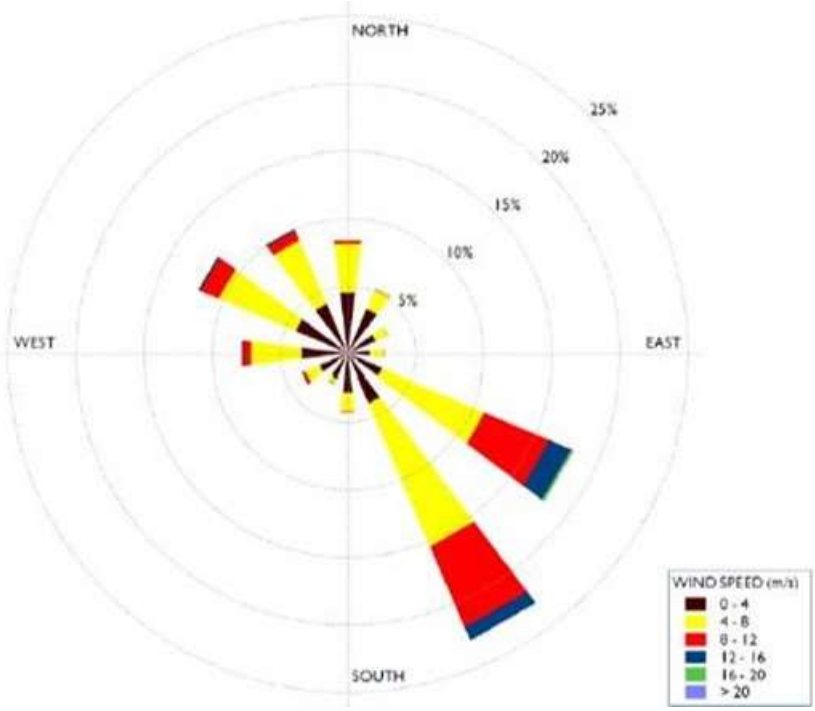


Figure C.5: Wind Rose at the Wind Farm Site

Trends of temperature and humidity, recorded on site between April 2010 and November 2011 are shown in Figure C.6.

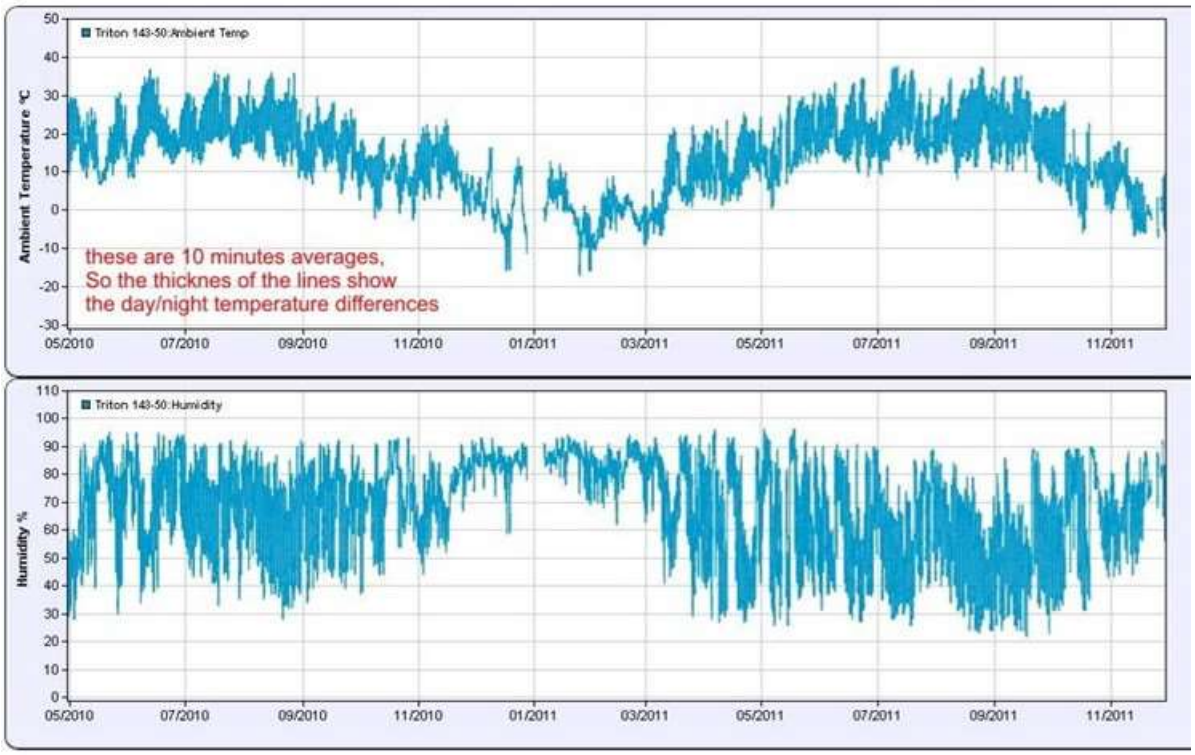


Figure C.6: Temperature and Humidity Trends at the Project Site

C2.3.3 Climate Change and Adaptation

Monitoring of climate change in Serbia has not been systematic and has been mainly performed by scientific and research institutions for their needs. The first official data on climate change analysis and projections were presented in 2010, in the First National Communication under the United Nations Framework Convention on Climate Change (adopted by Government in November 2010).

During the preparation of the National Communication, a variety of analyses of basic climate parameters were performed. The analyses included the following: (1) trends in mean annual air temperatures and precipitation for the period 1950–2004, (2) differences in the mean annual air temperatures and precipitation in the periods 1971–2000 and 1961–1990, and (3) the daily data for three cities (Novi Sad, Belgrade and Nis) for the period 1949–2009.

Available information indicates that both temperature and precipitation increased slightly between 1950 and 2004 in almost all parts of Serbia, including the region of the wind farm. Compared to the period 1961–1990, the period 1971–2000 was warmer in most of Serbia by 0.7°C and the mean annual precipitation was lower between 1971 and 2000 than in the period 1961–1990.

The First National Communication also presented results of climate change projections obtained using the regional climate model EBU-POM for Serbia. Presented results for two periods in the future (2001–2030 and 2071– 2100) are based on the A1B and A2 scenarios (defined by IPCC Special Report on Emission Scenarios – SRES).

According to the climate model projections for the period 2001–2030, the change in the mean annual temperature during the first 30 years of the 21st century, compared to the period 1961 – 1990 is positive over the entire territory of Serbia. Its intensity is +0.9°C in the region of the wind farm. The precipitation change is slightly positive (0–5%) over most parts of Serbia including the wind farm area.

The expected climate change issues are marginal in terms of the operation of the wind farm over its 25 year life period and are not expected to have a significant impact on the operation of the project.

C2.4 Landscape

C2.4.1 Introduction

This section describes the features of the landscape in and around the proposed project area which determine its character and evaluates existing views and their amenity value.

C2.4.2 Landscape Character

The key baseline landscape characteristic features of the site can be summarised as follows:

- The site is situated within a landscape which is sparsely developed in terms of the built environment, but highly developed in terms of agricultural activities. Where settlement occurs it comprises small to medium scale hamlets and villages with occasional isolated properties.
- The site occupies an area of open, large sized fields with a gently undulating plain.
- The site comprises arable fields with some grazing at the margins and in a limited number of grassy areas.
- There are a limited number of man-made or detracting features within the site. Overhead power and telecoms poles do not noticeably detract from the landscape's character due to their visual relationship with the surrounding village settlements and roads.
- There are roads in the near vicinity of the site, with a minor road running through the site from the village of Dolovo. The main E-70 road runs north east from Pančevo to Alibunar, approximately 3.5 km from the northern tip of the proposed project area at its closed point. Within the site area there are tracks linking agricultural fields.

Land Cover

The region is a predominantly agricultural in nature with arable crop, pastures and limited deciduous woodland areas. Narrow dirt roads cross the site, allowing access to the large fields for farming. The central part of the site comprises large areas of arable monoculture. The crops grown within the site and surrounding areas appear to be dominated by maize (corn), and sunflowers.

The site area comprises intensively managed arable farmland with limited semi-natural habitats. These include unmanaged field boundaries and road verges, areas of scrub and sparse deciduous woodland. The field boundaries appear generally species-poor with individual trees and shrubs present.

To the east of the proposed wind farm is the Deliblato Sands, an area of sand, steppe, forest and wetland vegetation. It is an isolated complex of sand masses and dune relief on an area of 380 km^2, surrounded by the cultivated steppe of the Panonnian plain. The dunes of yellow and grey sand with maximum elevations of around 200 metres above sea level extend from the south-east to north-west.

Settlement

The landscape surrounding the site is relatively sparsely populated; there are a number of small settlements which range in size and density. These are mainly nucleated settlements including Dolovo, Mramorak and Vladimirovac. The villages are in most cases serviced with at least one convenience store and school as well as religious buildings and community buildings. Pančevo is the largest settlement in the area with a population of approximately 128,000.

Agriculture is the dominant economic activity with no apparent industrial activity within the area in the immediate vicinity of the project site. Other economic activities are limited to shops, bars and restaurants. The nearest industrial development to the project site is situated at Pančevo.

The layout of the settlements surrounding the project site is generally with linear block pattern of residential properties and dwellings. The settlement form typically comprises common building styles including one/two storey block and plaster buildings. Most of the properties are configured around a closed private courtyard enclosed behind a gated and walled frontage set back from the adjacent lanes, separated by avenues of deciduous trees set within grassed frontages with open drainage ditches and swales.

Within the main villages there are regularly one to two religious buildings, belonging to the Serbian Orthodox Church and/or Romanian Orthodox Church. For example, the village of Dolovo has two Serbian Orthodox churches and one Roman Orthodox church. Each of these are of traditional design, including a tall spire and in instance of the orthodox churches; distinctive ornate embellishment to the spire. The architecture associated with the religious buildings creates occasional landmarks punctuating the open landscape.

Land Use and Pattern

The key influence on landscape pattern relates to intensive agricultural practices attributed to arable food production. Field boundaries are largely unmarked other than by a subtle transition in field use demarked by narrow tracts of occasional scrub or grass. As a result the pattern of the landscape can be defined as large scale agricultural fields set within the gently undulating topography.

Roads and Infrastructure

The road network through the surrounding area is based on a very simple hierarchy. There are a limited number of main regional roads in close proximity of the site. The E-70 passes through larger villages/ small towns linking with Belgrade to the west. Smaller inter-town routes such as the routes 24, 115 and 123 convey limited volumes of traffic are usually surfaced with asphalt.

Within the local villages and hamlets the local roads are predominantly un-surfaced and comprise cobbles and compacted earth. Traffic on these routes is limited to a relatively small number of vehicles including cars, scooters/motorcycles, local buses and occasional horse drawn carts. The most prominent infrastructure in the area comprise small to medium size overhead pylons and poles conveying electricity and telecoms serving the villages in the area.

Vehicle access and movement in and around the project site area are limited due to the narrow dirt tracks which lace across and bound the large fields.

Designated Landscapes

The project site area or area directly surrounding the site are not designated landscapes for their character, as regulated under Serbian law (e.g. Law on Nature Conservation, Official Journal of RS, No. 36/2009, 88/2010, 91/2010 in Article 33, concerning landscapes of exceptional characteristics).

The nearest designated site is the Deliblato Sands situated 1.3 km at its closest point from the boundary of the project area. The Deliblato Sands is designated site for its ecology as described in Section C3.

Landscape Character Summary

The quality of character of an area of landscape associated with a proposed project may be rated to five definable levels; these are **exceptional, good, ordinary, poor and damaged**, in terms of the wider character area. The local landscape of proposed project site area is in keeping to its wider landscape context in terms of scale, topography, visual balance of colour, interest and texture. As a result of this the proposed development site can be said to be **ordinary** and in keeping with the local and regional landscape character.

C2.4.3 Existing Views and Visual Amenity

The following table sets out the key locations and views throughout the area. The selection of these receptors has been led by the baseline review of maps and site survey work. In order to undertake a comprehensive yet concise assessment, visual receptors have been grouped by area, type and level of sensitivity.

Table C.1: Review of Existing Views and Visual Amenity

Receptor and Type of View	Receptor Locations	Sensitivity of Receptor	Nature of Views and Visual Amenity	Representative Viewpoints: Refer to Figures in Appendix C.I
Settlements:				
Receptors include people (residents and visitors) in locations where their attention is focused on the settlement and surrounding landscape.	Various receptors in settlements located throughout the area. Including but not limited to: • Banatsko Novo Selo • Bavaniste • Deliblato, • Dolovo • Gaj, • Mramorak • Vladimirovac	**High**	Settlement patterns are predominantly nucleated and based on a linear grid with one/two storey residential properties and a limited number of commercial buildings (convenience stores /barcafe/restaurant). Views tend to be obscured by the combination of landform and patchy mosaic of thickets and scrub as well as the orientation and enclosed 'courtyard' arrangements of the properties. Most properties have mature planting/ orchards within/to their boundary which provide localised screening. Long distance views to the site are available from localised areas however these occur mostly on the fringes of the village settlements.	VIEW A to K
Road users:				
Receptors include those travelling through or past the site and surrounding areas by road. In most cases the landscape setting can be important to the viewer but the attention would largely be focused along the route alignment.	**Main routes:** Route E-70 (running south west to north east north of the site between Banatsko Novo Selo and Vladimirovac)	**Low**	The road (E-70) is relatively straight and flat. The verges of the road are mostly formed by shallow ditches and occasional tree lined avenues. Traffic volumes are moderate, frequented by large HGV's and cars. Inter-visibility between the road and the site is limited by intervening vegetation/ orientation and built development, thus screening most views and restricting long distance views to vistas along the road corridor itself.	VIEW L VIEW M
	Settlement link routes: Routes 24, 115 and 123, Including Pančevo to Dolovo road and Dolovo to Deliblato Road via Mramorak (unnamed).	**Moderate**	These routes tend to serve as the main links between the villages and settlements with regional routes. The routes are relatively straight and gently undulating. The verges of the road are formed by shallow grassed ditches and occasional copses and mature tree lined avenues (i.e. poplar). Traffic volumes are light and frequented by cars and light goods vehicles servicing the villages and settlements. Inter-visibility between the road and the site is limited by intervening vegetation, undulating land form and built development. This has the effect of effectively screening short and middle distance views thereby restricting long distance views to vistas along the road corridor itself.	VIEW N VIEW O

Receptor and Type of View	Receptor Locations	Sensitivity of Receptor	Nature of Views and Visual Amenity	Representative Viewpoints: Refer to Figures in Appendix C.I
	Minor routes: Various; running throughout the area including minor roads, tracks and trails within and linking village settlements.	**Moderate to Low**	These routes tend to serve as the sole access to the smaller villages and, via dirt tracks, the surrounding agricultural landscape. Vegetation and built development associated with each settlement tends to line the routes; views are thereby either short or medium distance. In the majority of cases views of the site are restricted by orientation and built development.	VIEW J VIEW P
People in work (agricultural, infrastructure):				
Receptors are likely to be limited to agricultural workers where their attention is focussed on an activity and thus less susceptible to change.	Various; located throughout the area	**Moderate**	Agricultural workers will experience a wider scope of view given their work within open fields. Other people in work will largely be based in the surrounding villages where views to the wider area would be restricted due to the enclosed nature of the built settlement.	Representative; VIEW J VIEW P
Potential users of designated areas:				
Receptors are likely to include people where the interest or attention is focused on the immediate areas within the Deliblato Sands.	**Key site:** Deliblato Sands	**High**	Within the Deliblato Sands area development and agricultural pressure is significantly reduced and therefore the thickets of trees and scrub tend to be larger and denser. Properties are scattered and enclosed by dense vegetation. This coupled with the undulating topography of the area results in inter-visibility from properties and, roads/ tracks to the site is limited. As a result many low lying features such as buildings and roads become well screened.	Representative; VIEW Q

C3 Ecology

C3.1 Introduction

The site boundary can be viewed on the Site Location Plan in Appendix A1.1. The majority of the site is currently in agricultural use and is intensively farmed. Informal unsealed roads pass through the site, both to link nearby villages, and to provide access for farmers. The site is located within the southern portion of the Pannonian Plain of central Europe. This low-lying area was historically the location of the Pannonian Sea during the Miocene and Pliocene epochs. The deposition of marine sediments has left a fertile land which is now extensively used for agriculture.

To the east, the proposed wind farm borders the Deliblato Sands Special Nature Reserve (SNR) and the Deliblato Sands Important Bid Area (IBA). Special Nature Reserves (SNR) are areas of particular importance for the flora and/or fauna (in the case of Deliblato Sands designated for birds and other flora). They are protected under Serbian law by the Law on Nature Protection ("Official Gazette of RS", no. 36/2009, 88/2010 and 91/2010 – corr.). The boundaries of these sites can be viewed on the Phase 1 habitat map in Appendix CII.I.

Deliblato Sands SNR is an UNESCO Biosphere Reserve, and is on Serbia's tentative list for consideration as a UNESCO World Heritage Site. A UNESCO world heritage site is a place that is listed by UNESO as being of special cultural or physical significance. Under certain conditions, listed sites can obtain funds from the World Heritage Fund. The programme was founded with the Convention Concerning the Protection of World Cultural and Natural Heritage. The Deliblato Sands are on Serbia's tentative World Heritage Site list and was submitted as such on 18/03/2002 http://whc.unesco.org/en/tentativelists/1695/). A Tentative List is an inventory of those properties which each State Party intends to consider for nomination during the following years. States Parties are encouraged to submit in their Tentative Lists, properties which they consider to be cultural and/or natural heritage of outstanding universal value and therefore suitable for inscription on the World Heritage List.

The Deliblato Sands SNR extends over an area of 35,000 hectares and lies alongside the regional road between Belgrade and Timisoara (Romania) and between the Danube River and the lower slopes of the Carpathian Mountains. WEBG have already agreed with the Serbian Institute for Nature Protection that the turbines will be located at a minimum distance of 1 km from the border of the Important Bid Area (IBA)/SNR. (N.B. the site boundary lies within and immediately adjacent to the SNR and IBA, but the turbines will still be 1.3 km from these areas).

C3.2 Available Background Information

C3.2.1 Review of previous reports

A description of the site and nearby areas of conservation interest, including formally designated protected areas, was presented in the Strategic Environmental Impact Assessment (SEIA) report (Josimovic et al, 2010) for the Čibuk Wind Farm. The report lists details of bird and bat species found at and near to the site, but provides no details of other fauna (mammals, reptiles, amphibians and invertebrates) found or suspected to occur within the site – based on actual records or potential to occur because of the habitats present. A desk study (Paunovic, 2009), completed in September 2009, and was used to inform the SEIA.

Further information on the habitats within the site has been gathered from project-commissioned bat and bird survey reports produced to date and photographs taken within the site boundary. This is summarised below.

The following reports were reviewed for information on habitats within the site:

- Strategic environmental impact assessment of the detailed regulation plan for the infrastructure of the Čibuk wind farm – the municipality of Kovin, 'Eko Plan' (Josimovic et al, 2010).
- Monitoring Bat Fauna in the Area Envisaged for the Construction of the "Čibuk 1" and "Čibuk 2" Wind Farms March – November 2010 (MM Consulting (1), 2011).
- Monitoring the Condition of the Ornithofauna in the Area of the Potential "Čibuk 1" and "Čibuk 2" Wind Farms Period March – November 2010 (MM Consulting (2), 2011).

C3.2.2 Review of Information on Protected Nature Reserves

Information about this protected nature reserve which lies adjacent to the eastern border of the site was sourced from:

- The European Union Website (www.natreg.eu);
- the UNESCO website (whc.unesco.org); and
- Important Bird Areas in Europe: Priority Sites for Conservation (www.birdlife.org).

C3.2.3 Consultation

Ecoda Consulting, Germany, managed the initial bird and bat surveys at the site on behalf of WEBG, supported by ecology experts from Serbia. The surveys were commissioned to inform the ecological impact assessment for species groups. Atkins led supplementary survey work in 2012, again utilising in country expertise. Serbia does not have any NGO bird organisations but all local experts have a close working relationship with the regional and national regulatory organisations. Further, the Serbian EIA process did not result in any objections from regulators or any of the stakeholders during the public consultation process.

C3.3 Survey Work

C3.3.1 Field Survey

An ecological walk-over survey of the site was undertaken on 9th and 10th August 2011, broadly following the U.K.'s 'Extended Phase 1' methodology as set out in Guidelines for Baseline Ecological Assessment (Institute of Environmental Assessment, 1995). The extended Phase 1 habitat survey provides information on the habitats in the site and assesses the potential for protected/notable fauna and flora to occur in or adjacent to the site. The survey was undertaken by Atkins and Professor Zeljko Tomanovic (Belgrade University).

The main habitats within the site were mapped by hand on to base maps (provided by the client) in the field, with accompanying field notes, and were digitised for the Phase 1 Habitat Plan (see Appendix CII.I). Target notes (TN) were used to describe habitats, and species associated with these habitats, and to highlight features of ecological interest

A species list of the dominant and indicative plant species within each habitat was compiled during field survey. These are presented within Appendix CII.I. However, it should be noted that a detailed botanical survey was not undertaken and the species lists for each habitat type should not be considered exhaustive.

The following preliminary investigations were undertaken in respect of the presence of legally protected or notable species listed within the Annexes 1 and 2 of European Directive 92/43/EEC, Annex 1 Bird Directive 2009/147/EC and/or the Annexes of the Biological Diversity Act 2002. The guidelines indicate that the following tasks should be carried out to identify the actual or potential presence of protected or notable species:

- search for signs of potential roosting sites for bats, particularly in caves, and likely foraging and commuting areas;
- search for signs of mammal activity including burrows, tracks and latrines;
- identify habitats suitable for reptile species such as grassland areas;
- identify areas suitable for invertebrates e.g. butterflies such as species rich grassland and woodland edges;
- search for suitable habitat and evidence of otter activity such as the presence of holts, spraints along the banks of suitable watercourses;
- search for signs of birds breeding and potential for breeding birds particularly notable species, in suitable habitat;
- an assessment of water bodies within the site for their suitability to support amphibian species.

Unless a particular species was positively identified during the survey, the assemblage of species potentially present within the site (and each habitat) has been assessed using knowledge of the local specialist in relation to flora and fauna of the region.

C3.4 Limitations to Survey

Ecological surveys are limited by factors which affect the seasonal presence of plants and animals that aid in identification - such as the time of year, migration patterns and behaviour. Thus, though many species have been identified and recorded, the ecological survey of this site has not produced a complete list of plants and animals. Due to the size of the site (approximately 40 km^2) and the poor quality of the farm roads in the area, access was not possible to some areas of the site.

However due to the gently undulating topography of the site and the presence of some areas of high ground, even those areas that could not be directly accessed could be viewed from distance using binoculars, and the general habitat type recorded. Because of this, and the homogeneity of habitats throughout the area, it is considered that the survey is sufficient to record accurately the habitats present within the site, evaluate the nature conservation value, and assess potential impacts.

C3.5 Habitat Classification System

Although the U.K.'s Phase 1 Habitat Survey methodology was used to undertake the survey, the habitat classification system used within these guidelines do not cover habitat types thought likely to be present within the site. As such a habitat classification system which covers habitat types of the European continent was required.

The European Nature Information System (EUNIS) (European Environment Agency, 2004) habitat classification system has been used to describe and categorise all habitats recorded within the site. Although Serbia is not part of the European Union, this system of habitat classification describes many of the habitats of neighbouring countries, including Hungary and Romania, both of which contain the unique habitats found on the Pannonian Plain. As such, it was considered that the habitat categories within the EUNIS system would be suitable to describe the habitats likely to be encountered within the site. In addition, the lack of alternative habitat classification systems for countries outside the EU, and the possible future accession of Serbia into the EU, was further justification for using this habitat classification system.

The EUNIS Habitat classification system (devised by the European Environment Agency, 2004) is a comprehensive pan-European system to facilitate the harmonised description and collection of data across Europe through the use of criteria for habitat identification; it covers all types of habitats from natural to artificial, from terrestrial to freshwater and marine (http://eunis.eea.europa.eu/about.jsp).

The EUNIS Database (http://eunis.eea.europa.eu/index.jsp) is the European Nature Information System, developed and managed by the European Topic Centre on Biological Diversity (ETC/BD in Paris) for the European Environment Agency (EEA) and the European Environmental Information Observation Network (EIONET). This habitat classification system is inclusive and descriptive of the whole of Europe and includes habitat types found in the most recently joined member states.

Habitats present at the site that are included within Annex 1 of the European Habitats Directive 92/43/EEC have been noted. The European Union habitat types contained within Annex 1 have been used to establish a network of Special Areas of Conservation (SAC) – known as Natura 2000 sites. Annex 1 lists 218 European Natural habitats, including 71 priority habitats in danger of disappearance and whose natural range mainly falls within the territory of the European Union.

C3.6 Nature Conservation Evaluation

A number of criteria can be used to assess the nature conservation value of a defined area of land and these include diversity, rarity and naturalness. In the U.K., the nature conservation value or potential value of an ecological feature is usually determined within a defined geographic context. Guidelines for the U.K. have been prepared by the Institute of Ecology and Environmental Management (IEEM, 2006). The bullet points below set out a hierarchy of "importance" based on the IEEM guidelines, but with some adaptation to the Serbian situation:

- International importance: e.g. Special Areas of Conservation, candidate SACs/Sites of Community Importance, Special Protection Areas, UNESCO World Heritage Site/Biosphere Reserves, and Wetlands of International Importance (Ramsar sites).

- National importance: e.g. National Parks and equivalent Protected Areas.
- Regional/Provincial importance: e.g. Local or regional Nature Reserves.
- Local (Municipality level) importance: e.g. significant ecological features such as species-rich grassland, ancient woodlands and heathland.
- Important within the site and immediate environs: e.g. Habitat mosaic of grassland and scrub. Negligible importance: Usually applied to areas such as built development or areas of intensive agricultural land.

It should be noted that it is usual to consider habitats and species together when ascribing a value to a feature using this geographic context. However, there are circumstances where an ecologist may feel it necessary to assign a value to a particularly valuable species. In assigning value to species it is necessary to consider the species distribution and status, including a consideration of trends based on available historical records and to make use of any relevant published evaluation criteria. For instance, the presence of a significant population of European protected species such as bats and great crested newts may be worth separate consideration (IEEM, 2006).

C3.6.1 Identified Protected Habitats

Deliblato Sands Special Nature Reserve

The Deliblato Sands is one of the last and largest areas of sand, steppe, forest and wetland vegetation on the Pannonian Plain. The area covers a total area of 35,000 hectares, is made up of numerous ellipsoidal sandy masses and supports a wealth of biodiversity in comparison with the surrounding agricultural land.

The Deliblato Sands has been designated a Special Nature Reserve and lies along the eastern boundary of the proposed wind farm site. The area is recognised by Birdlife International as an Important Bid Area (IBA), a significant, but non-statutory, designation of the NGO Birdlife International; by Plantlife International as an International Plant Area (IPA) and one part of the Sands, the area of “Labudovo okno” is a Wetland of International Importance (otherwise known as a Ramsar site). It is also a Biosphere Reserve under the UNESCO-MAB programme (2001).

It is understood that the Deliblato Sands is due to be designated as a European Site (Special Protection Area and Special Area of Conservation) under the EC Directive on the conservation of natural habitats and of wild fauna and flora (92/42/EEC) and EC Directive on the conservation of wild birds (2009/147/EC).

Deliblato Sands is also part of Serbia’s “Tentative List” for inclusion in UNESCO’s list of World Heritage Sites and the listing describes it as follows:

> *There are 24 species of amphibians and reptiles recorded in the Deliblato Sands and approximately 171 bird species nest there. Some of these are threatened and listed in the IUCN Red book of threatened species. The most threatened fauna species in the Deliblato are birds of prey, including the Saker Falcon (Falco cherrug), the Imperial Eagle (Aquila heliaca) and the Lesser Spotted Eagle (Aquila pomarina). The Ramsar site “Labudovo okno” is used by wetland birds and forms the largest migratory area in this part of Europe.*

The dominant habitat types are Euro-Siberian steppe woods with *Quercus* spp. and Pannonic sand steppes. The natural potential vegetation is *Querco-Tilietum tomentosae* woodland. Eight specific plant associations are present in the Deliblato sand region. They are listed here according to the habitats they occupy: in sandy habitats, there is *Corispermo-Polygonetum arenariae* and *Festucetum vaginatae deliblaticum*. In steppe habitats, the three associations are: *Koelerio-Festucetum wagnerii*, *Chrysopogonetum pannonicum* and *Festuco-Potentilletum arenariae*. Nearer to the Danube River, in marshy habitats, *Salicetum rosmarinifoliae* and *Molinietum coeruleae* are present. In the forest habitats, a recent community is *Querco-Tilietum tomentosae*. With regard to vascular flora, 651 species have been recorded (http://www.habiprot.org.rs/03_dpescara.htm).

Bara Kraljevac

Bara Kraljevac (the Bog of Kraljevac) lies 7km to the south of the proposed wind farm site and is in the process of being awarded protected status due to its geomorphological and hydrological characteristics as well as habitats of rare species (Paunovic, 2009).

Crna Bara

Approximately 12km away from the south-eastern border of the proposed wind farm site is the bog Crna Bara. This wetland is not legally protected, although it significantly contributes to the preservation of biodiversity and is a habitat for many rare species, in particular birds (Josimovic et al, 2010).

River Danube

The Danube River lies approximately 25 kilometres from the site. The river is quite wide at this location and there are a number of long and wide shallows. This tract is characterised by exceptionally high biodiversity and is primarily the habitat of large flocks of wetland birds (numbering approximately 100,000) that spend the winter feeding and roosting in this area (Paunovic, 2009).

C3.6.2 Description of the Site and Surroundings

Habitats present within the site at the time of survey can be viewed on the Phase 1 habitat map in Appendix CII.I. Features of interest identified during the survey are marked on this map and referenced in the text below as Target Notes (e.g. TN 1). EUNIS and EU habitat descriptions can be found in Appendix CII.III (European Environment Agency, 2004).

General Description

The site of the proposed wind farm development comprises intensively managed, arable farmland with limited semi-natural habitats present; these include unmanaged field boundaries and road and rail verges often containing areas of semi-natural grassland, and areas of scrub and woodland. The crops grown within the site are primarily maize (*Zea mays*), sunflowers (*Helianthus annuus*), and alfalfa (*Medicago sativa*) (see photograph in Figure C.7).

The site is located within a gently undulating lowland area, the highest point being a shallow hill of 158 m elevation above the Serbian datum on the western boundary. A number of radio masts are present on small hills within the site.

Figure C.7: Photograph: Arable habitats present across the majority of the site.

No waterbodies or water courses were identified during the survey, although ditches and small valleys are present at the margins of the site which are likely to hold water ephemerally during the winter and periods of heavy rain.

No buildings were identified within the site boundary, either during the survey, or through analysis of aerial photography. However, it should be reiterated that due to its size, it was not possible to access all areas of the site during the Phase 1 habitat survey. The village of Dolovo is approximately 2 km west of the site, and Mramorak village is present within 800 m of the south of the site. The small settlement of Dolovo Station is immediately adjacent to the eastern boundary of the site.

Dirt roads cross the site, allowing access to the fields for farming. The central part of the site appears to have the least habitat diversity, comprising vast areas of arable monoculture. The northern and southern areas of the site are understood to have unmanaged, tussocky grassland corridors along the dirt roads.

Grasslands

Some areas of semi-natural steppe grassland typical of that which would have historically covered much of the Pannonian Plain, are present immediately adjacent to the eastern boundary of the site (see TN 1 on the Habitat Map in Appendix CII.I, and photograph in Figure C.8 below). This habitat would have once been common across this region, but the majority has now been lost to agriculture.

The location and characteristics of this grassland most closely resemble the EUNIS habitat type: E1.2 Perennial calcareous grassland and basic steppes. Further to this, the habitat most resembles EU Habitats Directive Annex 1 priority habitat[4]: 6250 Pannonic loess steppic grasslands. A full description of the EUNIS and EU Annex 1 habitat types can be found in Appendix C.II.III.

The habitat was dominated by a mixture of perennial grasses such as scented grass (*Chrysopogon gryllus*) and cock's-foot (*Dactylis glomerata)*, and forbs including lady's bedstraw (*Galium verum*) and rough hawk's-beard (*Crepis biennis*).

Small areas of steppic grassland of a similar species composition are also present at a number of locations within the site boundary (TN 2), usually as wayside vegetation adjacent to roads or the railway. These may be either relict fragments of semi-natural grassland, which would have dominated the area before agricultural intensification, or more likely areas of steppic grassland which have become re-established within unmanaged areas between arable blocks, roads and railways.

[4] In view of the threats to certain types of natural habitat, some of those listed in Annex 1 of the Habitats Directive are seen as priority.

Figure C.8: Photograph: Steppic Grassland Fragment Adjacent To Railway

Woodland and Scrub

Woodland is very scarce, with only one notable area present within the site (TN 3). Other small areas of woodland were present along the western and northern boundary of the site. Woodland areas were generally young in age, less than 5 m in height, and with little structural variation. The dominant species was generally false acacia (*Robinia psudoacacia*), a non-native invasive tree, with common elm (*Ulmus campestris*), cherry plum (*Prunus cerasifera*) and wild cherry (*Prunus avium*) also present.

The woodland fragments within and immediately adjacent to the site most closely resemble EUNIS habitat type: G5.6 Early-stage natural and semi-natural woodlands and regrowth. This category includes naturally-colonising non-native trees such as false acacia.

Scattered scrub is sparsely present across the site, and is usually present at waysides along the margins of roads or the railway (see photograph in Figure C.9 below). This is usually comprised of common hawthorn (*Crataegus monogyna*), with common dog rose (*Rosa canina*) and wild privet (*Ligustrum vulgare*) also present.

This habitat most closely resembles EUNIS habitat type: F3.1 Temperate thickets and scrub.

Figure C.9: Photograph: Scattered scrub and semi-natural woodland present along the margins of roads.

Arable Farmland

Arable farmland is by far the most dominant habitat across the site, covering at least 95% of the land area. Dominant crops present include maize (*Zea mays*), sunflowers (*Helianthus annuus*), and alfalfa (*Medicago sativa*). Johnsongrass (*Sorghum halepense*) is also present in some areas.

Over much of the site, the arable farmland is arranged in long parallel strips, with a different crop being cultivated in each neighbouring strip. This open strip farming method is typical of that adopted in some central and eastern European countries during the Soviet-era.

In some areas towards the centre of the site, this strip farming technique appears to have been abandoned for large scale arable monocultures.

The arable farmland at the site most closely resemble the EUNIS habitat type: I1.1 Intensive unmixed crops. However it should be noted that although the farmland does appear intensively managed, the characteristics of the strip farming present across much of the site, separate this habitat from true unmixed arable monocultures.

Ruderal Field Margins

Margins of the extensive areas of arable farmland and wayside vegetation along the roads, dirt tracks, and railways through the site are typical of that associated with disturbed ground. The vegetation is dominated by tall herbaceous fast growing species, in particular common ragweed (*Ambrosia artemisifolia*) is prevalent in these areas, and also seems to dominate arable fields after they are harvested. This is an invasive species from North America which has begun to become established in parts of central Europe since the 1990s (EUPHRESCO, 2009). Other plant species present include dwarf nettle (*Urtica urens*) and black elder (*Sambucus nigra*).

This habitat type most closely resembles: E5.1 Anthropogenic herb stands.

Power line route

No field survey of the power line route has been undertaken, however maps and photographs indicate that habitats present (and associated species) are the same or very similar to those identified within the wind farm site. Habitats appear to be predominantly intensive arable farmland with associated grassland and scrub.

C3.6.3 Protected Species (other than bats and birds)

Species that are legally protected by Serbian Law (Decree on the Protection of Natural Rarities – Official gazette of Serbia: No 50/93), have been identified in bold within the following sections (e.g. **badger**).

Mammals

Due to the large proportion of arable farmland present, species considered most likely to be present within the site are small seed eating rodents that are well adapted to cultivated areas. It is considered that the site could support populations of the following species, although this list should not be taken to be exhaustive: common hamster (*Cricetus cricetus*), common vole (*Microtus arvalis*), yellow-necked mouse (*Apodemus flavicollis*), wood mouse (*Apodemus sylvaticus*), striped field mouse (*Apodemus agrarius*), **bi-coloured white–toothed shrew** (*Crocidura leucodon*), **lesser white–toothed shrew** (Crocidura suaveolans), and steppe mouse (*Mus spicilegus*).

Brown hare (*Lepus europaeus*) were observed grazing in grassland adjacent to the site (TN 4), and were considered likely to use similar, suitable habitats within the site. Evidence of burrowing by either common mole (*Talpa europea*) or **lesser mole rat** (*Nannospalax leucodon*), was observed adjacent to the site (TN 5).

In the settlements adjacent to the site, species which can often be found in proximity to humans are likely to be present. These include brown rat (*Rattus norvegicus*) and **western house mouse** (*Mus domesticus*).

Carnivorous mammals thought likely to be present within the site are: red fox (*Vulpes vulpes*), **weasel** (*Mustela nivalis*), **stoat** (*Mustela erminea*), and **badger** (*Meles meles*).

It was considered that habitats within the site would be sub-optimal for the souslik or ground-squirrel (*Spermophilus citellus*). This species is endemic to eastern Europe, and is typical of grassland and steppes, feeding mainly on seeds, flowers, insects and roots (European Commission, 2009).

Details of bat species found at the site can be found in Section C3.7.

Birds

The arable farmland habitat which dominates the site has reduced significantly the suitability of the site for many species of bird which can be found in natural or semi-natural habitats in the local area. However, the site supports species which have adapted to agricultural intensification, species which remain in the small areas of semi-natural habitat around the site, as well as species which may use the site sporadically for feeding, or roosting.

Full details of bird species recorded within the site and surrounding area can be found in Section C3.8.

Reptiles

The arable farmland habitat which dominates the site is not especially suitable for many species of reptile. However some species were observed within grassland and wayside vegetation around the site during the survey. In particular, green lizard (*Lacerta agilis*) was abundant during the survey, and was often seen basking on paths or tracks through the site. In addition, it was considered that habitats present within the site are suitable to support populations of the following species: common wall lizard (*Lacerta viridis*), sand lizard (*Anguinus fragilis*), and slow worm (*Anguis fragilis*).

Other species possibly present in wooded areas around the periphery of the site include **smooth snake** (*Coronella austriaca*) and **Aesculapian snake** (*Elaphe longissima*)

Amphibians

Lack of permanent water habitats indicated that the site is unlikely to support a diverse range of amphibian species. However some species of amphibians spend much of their life cycle away from aquatic habitats only returning to breed, and so can be found in terrestrial habitats some distance from water.

Habitats within the site, in particular scrub and grassland, are considered to have potential to support some amphibian species, including: **common tree frog** (*Xyla arborea*), **green toad** (*Bufo viridis*), and **common toad** (*Bufo bufo*). The lack of waterbodies in the area would suggest that the site is unlikely to be of value to newt species.

Invertebrates

The assemblage of insect fauna at the site is considered to be limited by a poor diversity of habitats, as well as the structure of the habitats themselves (intensive arable habitats are dominant). The most abundant insect groups within the site are likely to be Coleoptera (beetles), Hymenoptera (wasps, bees and ants), Lepidoptera (butterflies and moths) and Diptera (true flies). During the survey, representatives from these groups of species were identified in arable farmland, most often as pests, and also in associated grassland and ruderal habitats. Terrestrial snails (e.g. Cepaea species & Helix species) are also very numerous on the vegetation.

C3.7 Bats

C3.7.1 Introduction

The construction and operation of wind turbines may have negative impacts upon bats in a number of ways:

- Through loss or degradation of habitats (construction);
- disturbance and displacement (construction and operation);
- through collision with moving rotor blades (operation); and
- barrier effects (operation).

Impacts can affect the bat population in the local area, and migratory populations passing through the area at specific times of year.

Internal conventions, laws and standards with regards to bats

Being an accession country looking to join the European Union, Serbia also has a duty to begin integrating its legal framework with that of the EU. In order to assess the impact of construction and operation of the proposed wind farm on bats and to conform to European standards, the following documents have been reviewed:

- Publication series No 3: Guidelines for consideration of bats in wind farm projects (Rodrigues et al, 2008);
- Bat mitigation guidelines (English Nature, 2004);
- Bats and onshore wind turbines (interim guidance) (Natural England, 2009);
- Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora (otherwise known as the ‘Habitats Directive’).

National Laws

All bats in Serbia are legally protected under The Law on Nature Protection ("Official Gazette of RS", no. 36/2009, 88/2010 and 91/2010 – corr.), along with other legal acts and bylaws such as the Decree on Conservation of Natural Rarities ("Official Gazette RS", No. 50/93, 93/93).

C3.7.2 Methodology

The boundary of the proposed wind farm, is illustrated in Appendix AI.I. The map also shows the locations of surveys described below. The layout of the wind farm is illustrated in Figure B.1.

To inform the environmental impact assessment, a programme of bat surveys has been undertaken at the site from September 2009 until November 2011. Bat surveys were designed to collect data on roosting, foraging, commuting, and migrating bats within the boundary of the proposed wind farm and the settlements in the adjacent areas, notably Dolovo, Mramorak, and Dolovo Station.

A number of different survey types have been undertaken, and a summary is provided below. Survey methodologies largely followed the Eurobats Guidelines (Rodrigues et al, 2008) for consideration of bats in wind farm projects.

- Expert opinion on the expected impact on bats – as part of the Environmental Impact Assessment for the proposed "Čibuk 1" wind farm located near the villages of Dolovo and Mramorak in the municipality of Kovin (Autonomous province of Vojvodina, Republic of Serbia) (Ecoda Consulting, 2011a).
- Monitoring Bat Fauna in the Area Envisaged for the Construction of the "Čibuk 1" and "Čibuk 2" Wind Farms March – November 2010 (Karapandža and Paunovic, 2011).

Two independent survey teams of Serbian bat specialists were used to undertake surveys. Team 1 included Jovor Rašajski and his assistants. Team 2 included Branko Karapandža, Milan Paunovic, and their assistants. The survey methodology, project management, and initial reporting and analysis on which this assessment is based were undertaken by Ecoda Consulting, Frankfurt, Germany.

2009 – Visual monitoring and Mist Netting

Counts of bats were performed at fixed vantage point locations. Counts were commenced when bats first became active and were continued for 2-3 hours. Night vision binoculars were used to increase visibility of bats during the hours of darkness.

The use of 'mist nets' was undertaken to catch bats in flight to enable identification to species level. EUROBATS (Rodrigues et al, 2008) guidance recommends this technique in forests or highly structured areas, and therefore this was largely undertaken in the vicinity of Dolovo Station where the habitat was suitable.

2010 – Vantage point counts (using hand held bat detectors), roost searches, and mist netting

A reconnaissance survey was undertaken at the site during early 2010 with the purpose of identifying suitable locations for bat vantage point survey. Vantage points 1-6 were selected based on this initial site survey, with vantage points 7 and 8 being added in May 2010.

Vantage point (VP) counts were undertaken from March to November 2010 at eight locations across the site. In total, 259 hours of survey were undertaken.

Between one and six vantage point surveys were undertaken at each VP per month, apart from March, April, when no surveys were undertaken at VP 7 and 8. Dates of survey can be viewed in Table 2 of the report Monitoring the Condition of the Ornithofauna in the Area of the Potential "Čibuk 1" and "Čibuk 2" Wind Farms Period March – November 2010 (Karapandža and Paunovic, 2011). In general, surveys lasted for 2 hours at each VP. The locations of the vantage points were selected to obtain the best overview of the diversity of habitats within the study area and in order to cover as much of the wind farm as possible.

In order to obtain a comprehensive picture of bat activity around the vantage points, the position of surveyors was occasionally changed during the survey to within an area up to 500m around the vantage point location.

Bat activity was monitored using a Petterson D240x ultrasound bat detector, and by visual detection using a hand held spot light. For each bat detected, as much information as possible was recorded including species, time, duration, minimum and maximum flight altitude and any other observations such as hunting behaviour.

To establish comparison between surveys and between vantage points, a time-standard measure was introduced – the average number of contacts per hour of survey. As a measure of the relative number of species in a given period, the percentage of bat flights/contacts is used for individuals identified as belonging to a specific species or species group (some groups of species such as the Myotid bats are difficult to separate in the field and so are often grouped together in species groups).

Bat roost searches were undertaken in the neighbouring settlements of Dolovo, Mramorak, Vladimirovac, the settlement around Dolovo train station, and within the area of the Deliblato Sands Special Nature Reserve through inspection of potentially suitable structures as well as through ultrasound and visual detection of bat activity and discussion with local people. Roost searches

have been undertaken up to 5 km from the wind farm site, and a more thorough roost surveys (including roosts in trees) have been undertaken within the site and up to 1 km from the boundary.

A total of 38.4 hours of bat roost inspection was undertaken. Occasionally surveys were undertaken on the same nights as vantage point surveys and mist netting surveys (during intervals between VP/mist netting surveys), and additionally on the following nights: 3rd and 8th March, 12th April, 7/8 June, 30 June/1 July, 5th and 10/11 August. Structures were categorised as confirmed roost or no roost, although most buildings within the adjacent settlements were identified as having potential to support roosting bats.

Mist netting was undertaken from dusk until dawn on the following nights: 10/11 May, 10/11 June, 19/20 and 29/30 August 2010. The use of 'mist nets' was undertaken to catch bats in flight to enable identification to species level. Eurobats guidance recommends this technique in forests or highly structured areas, and therefore this was largely undertaken in the vicinity of Dolovo Station where the habitat was suitable.

2011 – Walked Activity Transects

This survey was undertaken using hand held bat detectors, static automated bat detectors and thermal imaging. To monitor bat activity over a wider area, walked transects through the site were undertaken from June to November 2011. Five transect routes were established to cover the key parts of the study area, as well as covering the main habitat types within the site. Each transect was approximately 1.25 km long. All transects were surveyed on each visit, each transect was monitored for approximately 1.25 hours per night, resulting in 6.25 hours of survey per night. Transect surveys commenced 15-30 minutes before dusk.

The order in which each transect was surveyed in a night was changed to avoid recording bias. Dates and times of survey along with weather conditions can be viewed in (Ecoda Consulting, 2011a) Table 3.1. The transect routes can be viewed on Map 2.1 of the Ecoda report (Ecoda Consulting, 2011a).

Bat activity was monitored using a Petterson D240x ultrasound bat detector. Bat calls were recorded using a Zoom H2 digital recording device which allows subsequent analysis of sonograms using Batsound 4.03 (© Petterson Elecktronik AB) software.

To enhance survey effort and to vary the type of survey undertaken, static activity recorders (batboxes) were used to monitor bat activity at a number of locations across the site. Surveys were undertaken between April and November 2011. Ten batboxes were left in survey locations for a full night of survey. The detectors were then moved to an alternative 10 survey locations on the next night, and the following 10 survey locations the night after that. In this manner, all thirty survey locations were surveyed over three consecutive nights.

The detectors (bat-boxes) used were produced by Ciel-elequtronique, and were non-serial production detectors with frequency division functionality. The batboxes were left at the locations of thirty wind turbines across the site during 2011. The locations of the batbox survey can be viewed on Map 2.1 of the Ecoda report (Ecoda Consulting, 2011a).

Static automated detectors such as these do not distinguish between a single bat flying past ten times, and ten bats flying past once. As such the results do not represent a direct indication of the number of bats present during the survey, but more an indication of the relative levels of bat activity within an area.

In order to make it comparable with data collected in 2010, the activity recorded was analysed in contacts per hour.

The use of thermal imaging cameras to assist in bat activity surveys for wind farm sites has been recommended in two key documents:

- Eurobats publication No 3. Guidelines for consideration of bats in wind farm projects (Rodrigues et al, 2008).
- Assessing Impacts of Wind-Energy Development on Nocturnally Active Birds and Bats: A Guidance Document (Kunz et al, 2007)

Vantage Point bat surveys were undertaken using bat detectors, aided by the use of thermal imaging cameras on the 10th and 11th October 2011. Three surveyors were positioned in areas of known bat activity (based on previous surveys) within the site. Surveyors were positioned at Vantage Points 4, 5 and 8, which can be viewed on Map 2.1 of the Ecoda report (Ecoda Consulting, 2011a).

All surveyors were positioned at the vantage points for 2 hours at a time, or until the surveyors thought that temperatures were too low for bats to be active. The thermal imaging camera operators scanned the sky around the vantage point looking for bats overflying the site. An additional surveyor used a hand held bat detector and recording device to identify bats heard to species or species group. When bats were seen on the screen of the thermal imaging cameras, surveyors estimated the flight height of the bats and direction of travel. Flight height was categorised into two zones:

- Below rotor sweep area (0-60 m)
- Within rotor sweep area (60m +)

The range of the thermal imaging cameras varied during the surveys depending upon factors such as cloud cover, and the thermal gradient between bats and their surroundings. It was not generally possible to view bats above the rotor sweep area (up to 210m) using thermal imaging cameras. The surveyor using the hand held detector attempted to identify the species, or species group of the bats heard. Sound analysis was required after the survey to identify a small number of bats which were not identified on site. Some bats visible on the thermal imaging cameras but could not be heard on the detectors, and so it was not possible to discern the species or species group.

Survey Limitations

Due to the number of buildings/structures within the area surrounding the site, it is possible that all bat roosts have not been identified. Some roost surveys were undertaken between Vantage Point or mist netting surveys, which means that bats emerging from their roosts at dusk or returning to their roosts at dawn may have been missed. However, it is considered likely that the majority of roosts have been identified, and most importantly, that this includes the most significant roosts.

The use of a hand held spot light during the vantage point surveys in 2010 may have deterred some species of bat which are adverse to bright lights. However, the use of a torch would have provided additional information to the survey such as flight direction and numbers of bats recorded which may not have otherwise been possible.

At certain locations during some nights of bat-box survey, no bat recording could be obtained due to technical defects, excessive noise from insects or wind, or damage or theft of bat-boxes. In total 429 survey nights were fully recorded, and 28 survey nights were partially recorded during 2011, and so this is not considered to offer a constraint to the survey results.

Transect surveys were not undertaken across the whole site, and so areas of value to bats may not have been identified during the surveys. However, the large number of survey types undertaken at the site over the three years of survey, and the experience of the survey team, would indicate that survey effort is sufficient to identify all areas of the site of value to bats.

The range of the thermal imaging cameras was limited by environmental factors such as cloud cover and thermal gradient between bats and their surroundings. Because of this and the small size of some bat species it is possible that some bats were not recorded during the thermal imaging camera survey. It was the opinion of the surveyors on site that the majority (95% +) of bats within the range of the cameras were recorded using this survey method.

Low temperatures during the latter part of the thermal imaging camera survey on the 10th October 2011 may have reduced the activity of bats in the area. However, temperatures at the beginning of the survey were warmer, and reasonable levels of bat activity were recorded.

Surveys to establish the flight height of bats across the site (thermal imaging camera surveys) were not undertaken at a time of year when bats were most active (May-August), and so bat activity during the surveys was relatively low. However, bats were recorded commuting and foraging during the surveys, and it is considered that the results of the surveys are valuable in establishing the flight heights of bats using the site.

Although surveys were undertaken during bat migration periods (spring and autumn), migrating bats often fly at some height, and so surveys may not have identified some bat migration. However, it is considered that surveys were sufficient to record significant bat migration across the site, if it were present.

Ecological surveys are affected by a variety of factors which affect the presence of bats such as season, weather, climate, migration patterns, food availability, species behaviour and the presence of predators. Therefore bat surveys for this site may not have produced a complete list of species and the absence of evidence of any particular species should not be taken as conclusive proof that

the species is not present or that it will not be present in the future. Nevertheless, the results of these bat surveys thus far have given an indication of the use of the site by bat species during the survey period.

Nature Conservation Evaluation

Due to the limited knowledge of the status and distribution of bat species in Serbia, assigning nature conservation value in a geographical context has not been possible. The evaluation has therefore been based on the experience and views of the local specialist surveyors and the expert opinion of Ecoda.

Three levels of value (or significance) have been used: low, moderate, and high. These values have been applied to different areas of the site, based on the level of bat activity recorded.

The values given are an aggregation of the results from vantage point survey, walked transect survey and bat-box survey in the study area. The assigned levels are a combination of thresholds of activity and impressions in the field (e.g. habitat assemblage, flight paths, hunting areas). The categories of bat activity within each category are described below.

To compare and assess the activity of bats species during transects walks the median number of calls / h of all species in total is calculated (5.6 calls/h). In a second step the activity of a particular bat species is assessed as:

- low: the number of calls / h is lower than the 25 %-quartile: (< 3.2 calls/h);
- medium: the number of calls / h is between the 25 %-quartile and the median: (3.2 to 5.6 calls/h); and,
- high: the number of calls / h is more than the median: (> 5.6 calls/h)

C3.7.3 Survey Results

A total of 16 confirmed species of bat have been recorded at the site during survey work between 2009 and 2011. A further 5 species are considered likely to be present within the study area, but these could not be confirmed. The following sections provide a summary of the significant findings of the bat survey work undertaken in this period.

Table C.2: Confirmed and Unconfirmed Species in the Project Area

	English Name	Scientific Name
Confirmed Species	Greater Horseshoe Bat	*Rhinolophus ferrumequinum*
	Brown Long-eared Bat	*Plecotus auritus*
	Whiskered Bat	*M.mystacinus*
	Geoffroy's Bat	*Myotis emarginatus*
	Natterer's Bat	*Myotis nattereri*
	Lump-nosed bats	*Plecotus sp.*
	Barbastelle	*Barbastella barbastellus*
	Kuhl's Pipistrelle	*Pipistrellus kuhlii*
	Nathusius's Pipistrelle	*Pipistrellus nathusii*
	Common Pipistrelle	*Pipistrellus*
	Soprano Pipistrelle	*Pipistrellus pygmaeus*
	Savi's Pipistrelle	*Hypsugo savii*
	Lesser Noctule	*Nyctalus leisleri*
	Common Noctule	*Nyctalus noctula*
	Parti-coloured Bat	*Vespertilio murinus*
	Serotine Bat	*Eptesicus serotinus*
Unconfirmed species	Grey Long-eared Bat	*Plecotus austriacus*
	Alcathoe's Bat	*M.alcathoe*
	Brandt's Bat	*M.brandtii*
	Greater Mouse-eared Bat	*M.myotis*

	Lesser Mouse-eared Bat	*M.blythii*

A summary of the key findings from bat surveys undertaken at the site are given below, full details of survey results can be found in - *Expert opinion on the expected impact on bats – as part of the Environmental Impact Assessment for the proposed "Čibuk 1" wind farm located near the villages of Dolovo and Mramorak in the municipality of Kovin (Autonomous province of Vojvodina, Republic of Serbia)* (Ecoda Consulting, 2011a).

Bat Roosts

No bat roosts were identified within the boundary of the planned wind farm. Habitats of potential value to roosting bats such as buildings and mature trees are almost entirely absent from within the site boundary.

A number of positively identified bat roosts have been found in the area surrounding the proposed wind farm. In summary these are:

- A nursery roost of greater horseshoe bat and Geoffroy's bat in the forestry service house in Deliblato Sands Special Nature Reserve. This roost has been regularly surveyed since the 1980s and number of females varied between 350 and 1200 for greater horseshoe and 550-2100 for Geoffroy's bat. In 2010, 900 greater horseshoe and 1750 Geoffroy's bat were counted. A possible long-eared bat roost is also present here. This is over 1 km from the site;
- Khul's pipistrelle roosts are present in large numbers within the nearby settlements (Dolovo, Mramorak). Colonies vary in size from only a few bats to 300-400 individuals;
- In all the surrounding settlements, mating roosts of common noctule were found. These were identified by the social calls of bats in late August to November, both in hollow tree trunks and man-made structures;
- Mating roosts of Nathusius' pipistrelle are thought to be present within the settlement around Dolovo train station (near VP 8), although this was not confirmed;
- A possible whiskered bat roost of 10-12 individuals is present within a house near VP 3.

Bat Activity

At least 16 species of bat were recorded during the vantage point counts undertaken in 2010, although it is thought that 21 species of bat may have been present within the site.

The species which made up the majority of confirmed registrations were Khul's pipistrelle (23.3%), Nathusius' pipistrelle (13.7%), serotine bat (13.2%), and common noctule (9.9%). Furthermore, another 14.6% of registrations were recorded which could not be identified to species level, but were thought to be one of these species.

The number of contacts per hour recorded at each Vantage Point can be viewed in Table 5 in (Karapandža and Paunovic, 2011).

The highest level of bat activity was recorded at Vantage Point 8, to the east of the site, with an average of 26 contacts / h. This activity was generally twice as high as the activity recorded at Vantage Point 5 which had the second highest number of contacts / hour (13.65) followed by VP 3 and VP 4 with 9.85 and 7.10 contacts / h, respectively. At the other VPs between 3.5 and 5.3 contacts / h were counted.

Most contacts were recorded in June and August with an overall number of 12.6 and 10.0 contacts / h, respectively. In September, May and June 9.59, 8.08 and 6.48 calls / h were detected, respectively. November, March, April and October had the lowest numbers of contacts / h. Detailed results are presented by (Karapandža and Paunovic, 2011).

Detailed results of the point count surveys can be found in (Karapandža and Paunovic, 2011).

Bat Activity – Walked Activity Transects

During the investigation, 737 spatially separated contacts were recorded yielding an average of about 67 contacts per night and 10.7 contacts / hour. Most of the contacts derived from the night 12 July 2011, where a total of 183 contacts (29.2 contacts/h) were registered. The majority of

contacts during this night of survey were of serotine bat, and the high number recorded was not repeated during subsequent surveys.

The lowest number of contacts was detected on 30th September 30, when a total of 18 different contacts were registered (about 3 contacts/h). Overall bat activity was highest at transects 1, 3 and 5, while it was comparatively low at transects 4 and 2.

The most common species was serotine bat with a total of approximately 32% of all contacts. In particular at transects 1 and 2 its activity was very high with about 61 % and 57 % of all recorded contacts. Kuhl's pipistrelle and common noctule had a total share of about 19 % and 17% of all registered contacts. Kuhl's pipistrelle was most common at transect 3, common noctule at transect 4 and 5. Nathusius' pipistrelle and unidentified pipistrelle species were represented with 6.5 % and 10%, respectively. In total, 621 contacts (about 84% of all contacts) were from the species mentioned above.

Detailed results of the walked activity transect surveys can be found in (Ecoda Consulting, 2011a).

Bat Activity – Bat-box Survey (static automated bat detectors)

Over the seven months of survey during 2011, the bat-boxes recorded a total of 14,260 bat calls. Consequently, considering all nights and all locations the average activity was 3.2 calls / h.

The level of bat activity (measured in contacts / h) at each bat-box location can be viewed on Maps 4.1 and 4.2 (Ecoda Consulting, 2011a). At eight locations this average activity was exceeded substantially. Activity was highest at Wind Turbine/Power Plant (WPP) 48 and Vantage Point (VP) 8 with about 20 and 24 calls / h, respectively. Except for WPP 48, WPP 2 and VP 8, no other location yielded recordings of more than 1,000 calls in total. At 19 locations less than 400 calls were recorded during all nights combined.

Locations with the highest levels of bat activity are predominantly located at the borders of the study area (north: VP 1, WPP 1 and WPP 2; east: VP 8 and WPP 48; south: VP 5, WPP 37 and WPP 39; see Map 4.1 (Ecoda Consulting, 2011a)), while activity in the centre was generally low. On occasion, high levels of activity were recorded in the centre of the study area. This is likely to result from single bats continuously hunting around a batbox giving a large number of registrations. This theory is supported by the fact that in most instances of high activity recorded by a bat box, calls were recorded during a small and distinctive period of time, indicating that the activity probably refers to one or two individuals hunting close to the bat-box (many sequences with feeding buzzes). In total, the overall bat activity (using the categories outlined above) in was moderate from mid-May to mid-June and increased to a high level from mid-June to mid-July. From the start of August the activity decreased and was low to moderate in August and low in September.

Detailed results of the bat-box surveys can be found in (Ecoda Consulting, 2011a).

Bat Activity – Thermal Imaging Camera Survey

In total 30 contacts of at least three species were recorded in the two nights of thermal imaging. Most recorded species were of the genus Pipistrellus (*P. kuhlii* or *nathusii*). Furthermore, one common noctule and five not identified bats were observed. All bats which seen on the screens of the thermal cameras were flying lower than 30 m and, thus, below the rotor swept area of the planned wind turbines.

Detailed results of the thermal imaging camera surveys can be found in (Ecoda Consulting, 2011a).

C3.7.4 Summary of Findings

Kuhl's Pipistrelle

According to the results of (Karapandža and Paunovic, 2011) Kuhl's pipistrelle is the most common species present within the study area. There were numerous colonies and roosts found in settlements in the vicinity of the study area. The highest levels of activity of this species were measured along the road from Dolovo to Dolovo Station, and in the south of the site (VP 4, 5 and 8). The areas around these vantage points acted as hunting areas for this species (at least occasionally). Observations along the asphalt road from Dolovo to Deliblato Sands lead to the assumption that this road is used as a flight path from potential colonies / roosts in Dolovo to

hunting areas near VP 8 or in Deliblato Sands. The results of the transect walks show that Kuhl's Pipistrelle was most frequent at transect 3 (the assumed flight path from Dolovo to Deliblato Sands) and transect 5 in the south, while activity at the remaining transects was low (judged on existing data not including upcoming observations extending until November 2011).

Bat-box data analysed lead to very similar results. The intensively used agricultural areas without features of value to bats like hedgerows, ruderal vegetation or tree-lines alongside agricultural areas were used only occasionally, while the areas at VP 8 and VP 5 were used frequently.

Nathusius' Pipistrelle

According to the results of (Karapandža and Paunovic, 2011) Nathusius' pipistrelle was the second-most common species. Activity was concentrated at VP 8. The results clearly indicate that there were mating roosts in the vicinity of VP 8. Hunting behaviour was recorded at all VPs - at least occasionally. Connecting flights from Dolovo to VP 8 and / or Deliblato Sands along the asphalt road were recorded, and it is considered likely that a flight path is present along this road. The results of the transect walks done so far show the highest activity of Nathusius' pipistrelle at transect 3 (the assumed flight path from Dolovo to Deliblato Sands), while activity at all other transects is rather low. Bat-box data are not completely interpretable because calls of Nathusius' and Khul's pipistrelle bats could not always be distinguished reliably as they echolocate at similar frequency. The results show, however, that intensively used agricultural areas without structures like hedgerows, diverse ruderal vegetation or tree-lines are used only occasionally, while the areas at VP 8 and VP 5 are generally and frequently used by pipistrelle bats.

The results obtained so far give no indication that the study area is of importance for migrating Nathusius's pipistrelle.

Serotine

According to (Karapandža and Paunovic, 2011) Serotine bat was the third most common species. Roosts existed in the settlements surrounding the study area and in Deliblato Sands. No roosts were found within the study area. Serotine bats occurred most numerously and frequently at VP 8 and to a lower extent at VP 5 and 4, but were recorded at every VP. During the transect walks serotine bat was most numerous at transects 1 and 2, though records in this location may be skewed from a very high count of this species during one night in July. Bat-box data analysed until now lead to very similar conclusions. Serotine Bat was most numerous at VP 1, WPP 1, WPP 2, WPP 24 (all in the north near transect 1) and at VP 8 and WPP 48 (in the east).

Common Noctule

According to the results of (Karapandža and Paunovic, 2011) common noctule was the fourth most common species. Mating roosts existed in the settlement and tree trunks in the vicinity of the study area, although no roosts were identified within the study area. Individuals of this species were recorded at every VP, most frequently at VP 5 where even hunting behaviour was recorded. In contrast, hunting behaviour occurred rarely at all other VPs. Bat-box data indicates very similar conclusions. Common noctules were most active at transect 5 though detectable in lower numbers at each transect. According to bat-box results, the main activity of Noctules started in week 20 (18th to 21st May 2011). This species was most frequent at VP 5 as well as at WPP 48, 37, 39 and to a lesser extent at WPP 64 near VP 8. At VP 1, WPP 1 and WPP 2 in the northern part of the study area, a number of calls could not reliably be separated from calls of the serotine bat that was the most frequent species at transect 1 near to the locations of the mentioned bat-boxes.

The results obtained so far give no indication that the study area is of importance for migrating common noctules.

C3.7.5 Nature Conservation Evaluation of Bats

A summary of the nature conservation value of the four species commonly recorded at the site is given in Table C.3 below. Further details of the evaluation of bat populations can be found in (Karapandža and Paunovic, 2011).

The table below presents a nature conservation evaluation of the four species of bat commonly recorded in the study area. Areas of the site assessed as being of importance for each species can be viewed on Maps 5.1 – 5.4 (Ecoda Consulting, 2011a).

Table C.3: Nature conservation evaluation of the four species of bat commonly recorded within the study area.

Species	Assessment of the Significance of the Study Site
Kuhl's pipistrelle	• In general, the site is considered to be of low value for this species • A hunting area considered to be of high value is present at VP 8 • The asphalt road from Dolovo to Deliblato Sands is regularly used as a flight path by this species and is considered to be of high value • The hunting area at VP 5 with moderate recorded activity is considered to be of moderate value.
Nathusius' pipistrelle	• In general, the study area is considered to be of low value for this species • A hunting area considered to be of high value is present at VP 8 • The asphalt road from Dolovo to Deliblato Sands is regularly used as a flight path by this species and is considered to be of high value
Serotine bat	• In general, the study area is considered to be of low value for this species • A hunting area considered to be of high value is present at VP 8 • The asphalt road from Dolovo to Deliblato Sands is regularly used as a flight path by this species and is considered to be of high value • An occasionally used flight path at transect 1 and 2 is considered to have moderate value • The hunting area at VP 5 is considered to be of high value for this species.
Common noctule	• In general, the study area is considered to be of low to moderate value for this species • A hunting area considered to be of high value is present at VP 8 • The hunting area at VP 5 is considered to be of moderate to high value for this species. • The results obtained so far give no indication that the study area is of importance for migrating common noctules.

All other species were recorded infrequently at the site. The significance of the study area for all other species is low, or low to moderate (Ecoda Consulting, 2011a).

Bat Migration

There is no indication that bat migration, in particular species which migrate long-distances (e.g. common noctule or Nathusius' pipistrelle), occurs within the site (Karapandža and Paunovic, 2011). These species were present in the study area as residents but migratory movements were not recorded.

C3.8 Birds

C3.8.1 Introduction

This section describes and evaluates the current ornithological interest within the survey area. The survey area includes the area that will be taken by the proposed turbines and a 1.3 km buffer between the proposed turbines and the Deliblato Sands IBA. Atkins was not involved in the design or execution of these surveys, nor the validation and analysis of the data. The conclusions presented on impacts are based on the expert opinion of Ecoda Ltd and their analysis and interpretation of this data.

The chapter describes the potential impact of the proposed wind farm on birds, presents the mitigation measures incorporated into the scheme design, and assesses the predicted residual effects of the proposed development in respect of birds.

The proposed wind turbine development has the potential to impact on birds through a range of factors including:

- collision mortality;
- displacement due to disturbance;

- habitat loss or habitat degradation;
- barrier to movement

Impacts during the operational life of a turbine are the primary concern; however impacts can also come through both construction and decommissioning phases.

C3.8.2 Methodology

To inform the environmental impact assessment, a programme of bird surveys was undertaken at the site between September 2009 and February 2011. These bird surveys were designed to collect data on the use of the survey area by breeding, resting and wintering bird species, as well as to record the flight activity of birds through the survey area. Two independent teams of surveyors were used to collect the data.

Further bird surveys were conducted between November 2011 and July 2012 to supplement the original survey work. The findings of the additional survey were consistent with the original baseline data collected between September 2009 and February 2011 and the interpretation of that data.

The survey area covers the site of the proposed wind farm, and a 1.3 km wide buffer zone between the proposed wind farm and Deliblato Sands.

A summary of the survey methodologies undertaken is provided below. Full details of survey methodologies can be found in the following documents:

- Study of the state and conservation of ornithofauna and cheripterofauna at the site of the potential “Čibuk” wind farm (Rasajski, 2011).
- Monitoring the condition of the ornithofauna in the area of the potential “Čibuk 1” and “Čibuk 2” wind farms (Karapandža and Paunovic, 2011).
- Expert opinion on the expected impact on birds (Ecoda Consulting, 2011b).
- Additional bird survey report (Nov 2011 to July 2012) (Atkins Limited, 2012)

As stated in the Detailed Regulation Plan of the proposed 400 kV OHL, monitoring of bird or bat fauna in the area of proposed overhead power line has not been required by the Institute for Nature Protection. However, the OHL is to be located in the same locality as the wind farm, starting within 5 km of the wind farm and extending approximately 11 km west/south west, and across similar habitat. Therefore, due to the similar habitats, it is considered that sufficient information has been provided by the survey work undertaken to date and on-going at the time of writing in order to determine the presence of species and flight paths. Therefore, the results presented in the following sections can be extrapolated to the route of the OHL from its start point to the west of the proposed wind farm to the main grid connection situated approximately 11 km away north of Bavanište. The route is illustrated in Figure B.2., the design of the proposed OHL pillars is illustrated in Appendix B.I. and the power line is described in Section B.5.

Field Survey

Bird surveys were carried out of the wind farm site plus the 1.3 km buffer zone between the wind farm site (the area taken up by the proposed wind turbines, thought to approximate 3,716 ha) and Deliblato sands IBA, between September 2009 and February 2011 by two teams of independent ornithological surveyors. The area surveyed (wind farm site and buffer zone) is referred to as the survey area. Both teams worked individually of each other and were managed by Ecoda Ltd. The methodologies followed are summarised below and reported in further detail in Team 1’s report (Rasajski, 2011) and Team 2’s report (Karapandža and Paunovic, 2011).

Team 1

Team 1 carried out monitoring of the survey area between September 2009 and the end of October 2010.

Monitoring involved two different field methods: transect surveys and vantage point surveys. Initially only transect surveys were carried out. In January 2010 vantage point surveys were included and were conducted during transect walks; the surveyor would stop and carry out a vantage point survey at certain points along the transect. The transect route and vantage point locations can be found in Team 1’s report (Rasajski, 2011).

The time spent for each vantage point survey was not reported in detail. This means that quantitative analysis and interpretation of the data is not possible, and this data is only appropriate for establishing the species present and their flight behaviours.

In total, Team 1 spent 626 hours surveying the survey area. The survey effort varied between different months.

Team 2

Team 2 carried out monitoring of the survey area between March 2010 and February 2011.

Monitoring only involved vantage point surveys. Full survey details, including time, date and length of survey were recorded. Team 2 spent a total of 653 hours surveying the survey area, although the survey effort varied between months.

Further details can found in Team 2's report (Karapandža and Paunovic, 2011).

Transect Surveys

Team 1 conducted transect surveys between September 2009 and October 2010. A fixed route was walked and all species of special interest were recorded (see *Species of special interest and target species* section below).

Further details can be found in Team 1's report (Rasajski, 2011).

Vantage Point Surveys

Vantage point (VP) surveys were carried out by Team 1 from January 2010 to October 2010 and by Team 2 between March 2010 and February 2011.

Team 1 carried out VP surveys as part of their transect surveys. Five VP locations were chosen. Team 2 only carried out VP surveys. Six VP locations were chosen that were considered to provide accurate coverage of the survey area (wind farm site and the 1.3 km buffer zone between the wind farm site and Deliblato Sands IBA).

All surveys were carried out between dawn and dusk, in a variety of weather conditions, as long as ground visibility was suitable to survey birds (visibility >3km).

Data was recorded in two ways:

- All species and their numbers were recorded during each VP survey
- For target species the following details were recorded:
    - The number, time, height of target species
    - The length of flight, direction of flight, and distance from the VP location
    - The minimum, maximum and average height of the flight (classified in 5 height ranges: <50m, 50-100m, 100-150m, 150-200m, > 200m)
    - All flight paths were recorded on a map

The amount of time spent surveying varied between surveys, as did the amount of time spent surveying each month and the amount of time spent at each VP location. This variation in data collection prevented direct comparisons of the data.

Species of special interest and target species

For this study, these were considered to be species that occur within the local region (based on scoping surveys and local expert knowledge) and fulfil one of the following criteria:

- Listed in Appendix I or II of the Bonn Convention
- Listed in Appendix I of the EU Birds Directive
- Listed as endangered, vulnerable or at least near threatened by IUCN criteria. The International Union for Conservation of Nature (IUCN) Red List reports on the status of internationally threatened species (www.iucnredlist.org)
- Considered as a 'Species of European Conservation Concern' (Birdlife International, 2004). The International Union for Conservation of Nature (IUCN) Red List reports on the status of internationally threatened species (www.iucnredlist.org).

A total of 64 species fulfilled the criteria and were therefore considered to be species of special interest (see below).

Target species are a subset of species of special interest, considered to be vulnerable to impacts from wind turbines. Thus target species includes groups such as raptors, whose flight behaviour makes them prone to collision. Ecoda also included other large, long-living birds (such as owls) and species that are considered to be common in the study area or its surrounds (e.g. Deliblato Sands IBA) and for which a significant adverse impact caused by the proposed wind farm cannot be excluded (Ecoda Consulting, 2011b).

During the initial scoping process, 35 target species were identified for the survey area. This list was later reduced to 32 species as it was determined that black-headed gull, Caspian gull and common raven should not be target species as these species are not considered to be vulnerable or endangered, nor to be potentially vulnerable to wind farms (Ecoda Consulting, 2011b). A full list can be found in the table C.4 below, target species are highlighted in blue and an explanatory list of the qualifying criteria can be found at the end of the table.

Table C.4: Full list of species of special interest and their qualifying criteria

Species	Bern	Bonn	Bird Directive	Birdlife International (2004)	IUCN
Great cormorant	III				
Pygmy cormorant	II		I	SPEC 1	
Black-crowned night heron	II		I	SPEC 3	
Purple heron	II		I	SPEC 3	
White stork	II	II	I	SPEC 2	
Bean goose	II		IIa		
White-fronted goose	II/III		IIb, IIIb		
Greylag goose	II/III		IIa, IIIb		
European honey buzzard	II	II	I		
White-tailed eagle	II	I	I	SPEC 1	
Western marsh harrier	II	II	I		
Hen harrier	II	II	I	SPEC 3	
Montagu's harrier	II	II	I		
Northern goshawk	II	II			
Eurasian sparrowhawk	II	II			
Common buzzard	II	II			
Rough-legged buzzard	II	II			
Booted eagle	II	II	I	SPEC 3	
Common kestrel	II	II	I	SPEC 3	
Red-footed falcon	II	II	I	SPEC 3	NT
Merlin	II	II	I	SPEC 3	
Hobby	II	II	I		
Saker falcon	II	II	I	SPEC 1	VU
Peregrine falcon	II	II	I		
Grey partridge	III		IIa, IIIa	SPEC 3	
Common quail	III	II	IIb	SPEC 3	
Common crane	II	II	I	SPEC 2	
Woodcock	III	II	IIa, IIIb	SPEC 3	
Whiskered tern	II		I	SPEC 3	

Eurasian turtle dove	III	II	IIb	SPEC 3	
Common cuckoo	III				
Long-eared owl	II				
Eurasian scops owl	II			SPEC 2	
Little owl	II			SPEC 3	
Barn owl	II			SPEC 3	
Tawny owl	II				
European nightjar	II		I	SPEC 2	
Alpine swift	II				
Common kingfisher	II		I	SPEC 3	
European bee-eater	II	II		SPEC 3	
European roller	II	II	I	SPEC 2	NT
Hoopoe	II			SPEC 3	
Wryneck	II			SPEC 3	
Green woodpecker	II			SPEC 2	
Crested lark	III			SPEC 3	
Woodlark	III		I	SPEC 2	
Common skylark	III		IIb	SPEC 3	
Barn swallow	II			SPEC 3	
House martin	II			SPEC 3	
Tawny pipit	II		I	SPEC 3	
Northern wheatear	II			SPEC 3	
Barred warbler	II		I		
Spotted flycatcher	II			SPEC 3	
Red-backed shrike	II		I	SPEC 3	
Lesser grey shrike	II		I	SPEC 2	
Great grey shrike	II			SPEC 3	
Common starling			IIb	SPEC 3	
House sparrow				SPEC 3	
Eurasian tree sparrow	III			SPEC 3	
Linnet	II			SPEC 2	
Yellowhammer	II				
Ortolan bunting	II		I	SPEC 2	
Black-headed bunting	II			SPEC 2	
Corn bunting	II			SPEC 2	
Note: Target (vulnerable) species are highlighted in blue.					
Explanatory Text for Qualifying Criteria *Bern: Bern Convention on the Conservation of European Wildlife and Natural Habitats* *II: strictly protected fauna species* *III: protected fauna species* *Bonn: Bonn Convention on the Conservation of Migratory Species of Wild Animals, CMS* *I: Endangered migratory species* *II: Migratory species conserved by agreements*					

Birds Directive: Directive 2009/147/EC of The European Parliament and of the Council Of 30 November 2009 on the conservation of wild birds

I: The species mentioned in Annex I shall be the subject of special conservation measures concerning their habitat in order to ensure their survival and reproduction in their area of distribution.

IIa: The species referred to in Annex II, Part A may be hunted in the geographical sea and land area where this Directive applies.

IIb: The species referred to in Annex II, Part B may be hunted only in the Member States in respect of which they are indicated.

IIIa: The activities referred to in paragraph 1 shall not be prohibited in respect of the species referred to in Annex III, Part A, provided that the birds have been legally killed or captured or otherwise legally acquired.

IIIb: Member States may, for the species listed in Annex III, Part B, allow within their territory the activities referred to in paragraph 1, making provision for certain restrictions, provided that the birds have been legally killed or captured or otherwise legally acquired.

Birdlife International (2004): (Bird) Species of European Conservation Concern:

SPEC 1: Species of global conservation concern, i.e. classified as globally threatened, near threatened or data deficient (BIRDLIFE INTERNATIONAL 2004a).

SPEC 2: Concentrated in Europe and with an unfavourable conservational status.

SPEC 3: Not concentrated in Europe but with an unfavourable conservational status.

IUCN: European IUCN Red List Category:

VU: vulnerable

NT: near threatened

Limitations to the Original Survey

A full year of transect surveys were carried out between September 2009 and October 2010 and all bird species were recorded. This has been used to produce a full list of species recorded within the survey area during the surveys, but cannot be used to produce accurate population estimates. Survey area population estimates for this report have been based on local expert opinion of the surveyors and Ecoda team (Ecoda Consulting, 2011b).

The vantage point surveys received a large amount of effort from both teams. Team 1 did not record the amount of time spent carrying out vantage point surveys, as they were carried out during the transect surveys. Team 2 carried out 653 hours of vantage point surveys; however the survey effort varied between vantage point locations and between months of the year. Due to these inconsistencies it is not possible to carry out formal collision risk analysis on this data.

Collision Risk Analysis is required in U.K. guidance (Scottish Natural Heritage, 2005) (Natural England, 2010) and is becoming internationally accepted as a requirement for wind farm impact assessments. It is considered that data collected between September 2009 and February 2011 should be sufficient to determine those species at risk of collision and make a qualitative assessment of the significance of any risks. Additional monitoring was carried out by Atkins between November 2011 and July 2012 to enable collision risk analysis to be carried out and the results are presented in a supplementary report (see Appendix C.III).

C3.8.3 Additional monitoring

Although it is considered that the potential impacts have been accurately assessed, it is noted that; (i) the breeding bird territories within the survey area have been estimated based on expert local knowledge rather than factual survey estimates; and (ii) the collision risk for target species has been based on available research not on detailed analysis of the flight data within the wind farm (due to variations in survey effort preventing collision risk analysis). Therefore additional breeding bird and vantage point surveys were carried out between November 2011 and July 2012, to inform a supplementary report to this environmental statement. The Additional Bird Survey Report was produced in August 2012. Details of the methodology of these additional surveys can be found in Appendix C.III. A summary of the results of the additional monitoring together with a summary of the collision risk assessment is presented in Section D3.2.3 of this document.

C3.8.4 Original Survey Results

Overall a total of 117 bird species were recorded within or flying over the survey area during the walkover and VP surveys carried out between September 2009 and February 2011.

An additional species, the white-tailed eagle, was recorded outside of the survey area, deep within the Deliblato Sands IBA where a pair is known to nest, although nesting was not

successful during the survey period. This nesting location is over 9km from the wind farm site and no white-tailed eagles were recorded over the survey area.

Species of Special Interest

A total of 62 species considered to be species of special interest were recorded within the survey area. An additional species of special interest, the white-tailed eagle, was recorded outside of the survey area.

Target Species

A total of 31 species of the 32 considered to be target species were recorded within the survey area. The other target species, the white-tailed eagle, was recorded outside of the survey area.

Of these, 22 species were recorded during the breeding season. Nineteen target species were believed to have bred or foraged within the survey area. Breeding was confirmed for a species if a nest was found, or breeding behaviour (such as singing) was observed and suitable nesting habitat was considered to be present.

Seventeen of the target species were believed to use the survey area during the non-breeding season, including 9 species that were not recorded during the breeding season: bean goose, white-fronted goose, greylag goose, hen harrier, Montagu's harrier, rough-legged buzzard, merlin, peregrine falcon and common crane.

The status of the target species within the survey area are shown in Table C.5 below.

Table C.5: List of Species of Special Interest: Recorded Within the Survey Area and Their Status within the Survey Area

Species	Status within the survey area
Great cormorant	flyover
Pygmy cormorant	flyover, migrating
Black-crowned night heron	flyover
Purple heron	probably foraging, migrating
White stork	probably foraging, migrating
Bean goose	resting, predominantly migrating
White-fronted goose	resting, predominantly migrating
Greylag goose	resting, predominantly migrating
European honey buzzard	probably foraging, migrating
White-tailed eagle	not recorded within survey area
Marsh harrier	hunting
Hen harrier	probably foraging, migrating
Montagu's harrier	migrating, probably wintering
Northern goshawk	hunting, migrating, resting
Eurasian sparrowhawk	hunting, migrating, resting
Common buzzard	Breeding, migrating, resting
Rough-legged buzzard	Wintering
Booted eagle	hunting
Common kestrel	breeding, migrating, resting
Red-footed falcon	probably hunting
Merlin	migrating, wintering
Hobby	breeding just outside survey area, migrating, resting
Saker falcon	hunting
Peregrine falcon	migrating
Grey partridge	breeding
Common quail	breeding, migrating, resting

Common crane	migrating
Woodcock	probably foraging
Whiskered tern	flyover
Turtle dove	breeding
Common cuckoo	breeding
Long-eared owl	foraging
Eurasian scops owl	foraging
Little owl	probably breeding just outside survey area
Barn owl	probably breeding just outside survey area
Tawny owl	foraging
European nightjar	probably foraging
Alpine swift	flyover
Common kingfisher	unknown
European bee-eater	foraging
European roller	probably foraging
Hoopoe	foraging
Wryneck	probably foraging
Green woodpecker	probably foraging
Crested lark	breeding
Woodlark	probably foraging
Skylark	breeding, migrating
Barn swallow	foraging
House martin	foraging
Tawny pipit	probably breeding, migrating
Northern wheatear	probably breeding, migrating
Barred warbler	probably breeding just outside survey area
Spotted flycatcher	probably breeding just outside survey area
Red-backed shrike	breeding, migrating
Lesser grey shrike	probably foraging
Great grey shrike	probably foraging
Common starling	probably breeding outside survey area, migrating, resting
House sparrow	probably breeding
Tree sparrow	probably breeding
Linnet	unknown
Yellowhammer	unknown
Ortolan bunting	unknown
Black-headed bunting	unknown
Corn bunting	breeding
Note: Target (vulnerable) species are highlighted in blue	

Breeding Birds

Sixteen species were considered to have bred within the survey area: common buzzard, common kestrel, grey partridge, common quail, common pheasant, turtle dove, common cuckoo, crested lark, Eurasian skylark, yellow wagtail, red-backed shrike, European magpie, hooded crow, whinchat, African stonechat and corn bunting.

Two of these breeding species, common kestrel and common buzzard, are target species and a further 10 are species of special interest: grey partridge, common quail, turtle dove, common cuckoo, crested lark, Eurasian skylark, red-backed shrike, house sparrow, Eurasian tree sparrow and corn bunting.

A further two species of special interest are considered to have probably bred in the survey area: house sparrow and Eurasian tree sparrow.

Another target species, the Eurasian hobby, bred just outside the survey area and was regularly observed hunting within the survey area (See Appendix CIII.V).

Vantage point survey results

Team 1 Results

Between January 2010 and October 2010, 2,206 individuals of target species were registered in 432 flight recordings. A flight can consist of one bird or a flock of birds. The number of birds is recorded with each flight. The total amount of time spent surveying was not recorded.

The four most observed target species were:

- greylag goose (a total of 834 individuals recorded);
- common buzzard (a total of 593 individuals recorded);
- European bee-eater (a total of 283 individuals recorded);
- common kestrel (a total of 276 individuals recorded).

These 4 species made up approximately 90% of all observed individuals, with all other target species registering less than 50 individuals. See Table C.6 for details of the total number of flights and individuals for each target species recorded by Team 1.

Table C.6: Summary of target species flights recorded by Team 1 between January 2010 and October 2010

Species	Total Number of Flights Recorded	Total Number of Individuals Recorded	Total Flight Time (Minutes)	Total Flight Time at Collision Risk Height (Minutes)	Proportion of Flight Time Spent at Collision Risk Height
Greylag goose	13	834	125	90	72
Common crane	1	30	320	0	0
Common kestrel	100	276	117	0	0
Common buzzard	96	593	354	0	0
European bee-eater	32	283	112	0	0
Northern goshawk	38	43	10	10	100
Little owl	25	25	61	0	0
Barn owl	14	19	39	0	0
European sparrowhawk	18	21	50	0	0
Hoopoe	20	23	54	0	0
Long-eared owl	10	11	37	0	0
European scops owl	13	17	38	0	0
European nightjar	30	6	24	0	0
Saker falcon	4	4	13	0	0
European honey buzzard	5	6	15	0	0
Western marsh harrier	6	6	5	0	0
Eurasian hobby	3	3	16	0	0
Montagu's harrier	3	5	12	0	0

European roller	1	1	3	0	0

Team 2 Results

Between March 2010 and February 2011, 2,930 individuals of target species were registered in 640 flight recordings during 653 hours of vantage point surveys.

The five most observed target species were:

- white-fronted goose (a total of 1,122 individuals recorded);
- common buzzard (a total of 555 individuals recorded);
- great cormorant (a total of 381 individuals recorded);
- greylag goose (a total of 364 individuals recorded);
- common kestrel (a total of 232 individuals recorded).

These 5 species made up approximately 90% of all observed individuals recorded, with all other target species registering less than 50 individuals (with the exception of bean goose, with 97 individuals recorded). See Table C.7 for details of the total number of flights and individuals for each target species recorded by Team 2.

Table C.7: Summary of target species flights recorded by Team 2 between March 2010 and February 2011

Species	Total Number of Flights Recorded	Total Number of Individuals Recorded	Total Flight Time (Minutes)	Total Flight Time at Collision Risk Height (Minutes)	Proportion of Flight Time Spent at Collision Risk Height
Common buzzard	304	555	3245	1507	46.4
Common kestrel	147	232	3043	221	7.3
Eurasian hobby	30	38	1369	157	11.5
White-fronted goose	20	1122	124	89	71.8
Hen harrier	31	32	255	65	25.5
Northern goshawk	13	16	67	46	68.7
Montagu's harrier	9	10	146	39	26.7
Booted eagle	3	4	39	33	84.6
Great cormorant	8	381	62	32	51.6
Greylag goose	5	364	43	31	72.1
Saker falcon	5	5	24	18	75.0
Bean goose	3	97	16	13	81.3
Rough-legged buzzard	1	1	13	13	100
Western marsh harrier	38	40	332	7	2.1
European sparrowhawk	15	15	89	5	5.6
Merlin	2	2	19	4	21.1
Peregrine falcon	1	1	180	0	0
White stork	1	1	20	0	0
Common crane	1	10	9	0	0
Unidentified eagle spec.	1	1	6	0	0
European roller	1	1	5	0	0
Red-footed falcon	1	2	4	0	0

C3.8.5 Evaluation of baseline data

Collision risk of target species

The proposed wind turbines will have a rotor sweep range of between 50m and 170m above ground. All target bird flight heights were recorded within 50m height categories. Therefore all birds recorded between the heights of 50m and 200m were considered to be at collision risk height.

Of the species recorded by Team 1, only greylag goose is considered to have been of significant collision risk during the survey period of January 2010 to October 2010. Greylag geese spent by far the most amount of time within a collision risk height of any target species, having been recorded at collision risk height for 90 minutes over the whole survey period and recorded in large flocks up to 200 birds.

All northern goshawk flight records were at collision risk height, however a total of 10 minutes of flight was recorded over the whole survey period, with all but five of the flights involving single birds (five flights involved two birds). Therefore the small amount of time combined with the low numbers of birds involved, means that northern goshawks are considered to be at low risk of collision within the survey area.

Team 1 carried out 626 hours of surveys between September 2009 and October 2010. The total amount of time spent carrying out vantage point surveys is unknown. However, 289 vantage point surveys were carried out. On this basis, the recorded time of 90 minutes spent by greylag geese at collision risk height can be considered to be a small proportion of the total vantage point survey time. Team 2 recorded 31 minutes of greylag goose flight at collision risk height over 653 minutes of survey. Therefore collision risk for greylag goose was considered to be of low significance.

The five most observed target species by Team 2 during the survey period of March 2010 and February 2011 were:

- white-fronted goose (1,122 individuals);
- common buzzard (555 individuals);
- great cormorant (381 individuals);
- greylag goose (364 individuals);
- common kestrel (232 individuals).

These five species made up approximately 90% of all observed individuals. However, great cormorant and greylag goose only spent a short amount of time at collision risk height (great cormorant 32 minutes and greylag goose 31 minutes out of a total of 653 hours of survey) and are not considered to be at significant collision risk.

Common buzzard and common kestrel spent a large amount of time at collision risk height (1,507 minutes and 221 minutes respectively). White-fronted geese spent much less time within collision risk height (89 minutes out of 653 hours), but were recorded in large flocks of up to 300 birds.

This flight data has been considered when assessing the significance (or nature conservation value) of the survey area for each species of special significance (and therefore target species as well). These assessments are taken from pages 62-97 of the expert opinion on the expected impact on birds (Ecoda Consulting, 2011b) and are summarised in Table C.8 below.

No clear bird flight lines were recorded through the survey area. With regards to the route of the power line, available information at the time of writing indicates that due to the sparse spread of flights recorded during the vantage point surveys, the proposed power lines will not dissect any significant flight routes used by birds.

Breeding species of special interest

Twelve species of special interest were recorded breeding or considered to have bred within the survey area;

- common quail (up to 20 pairs);
- turtle dove (regular breeder);

- crested lark (regular breeder);
- Eurasian skylark (regular breeder);
- corn bunting (regular breeder);
- common buzzard (two territories on eastern edge of buffer zone, approximately 1km from the proposed turbines – See Appendix CIII.V);
- common kestrel (one territory within buffer zone, over 500m from turbines and one just north of the survey area, approximately 500m from turbines - See Appendix CIII.V);
- grey partridge (up to 5 pairs);
- red-backed shrike (up to 15 pairs);
- house sparrow (thought to have bred within survey area);
- Eurasian tree sparrow (thought to have bred within survey area); and
- common cuckoo (rare breeder).

An Eurasian hobby territory was also recorded just to the north of survey area (approx.. 250m from turbines) and a saker falcon breeding site was recorded over 2km to the west of the survey area. See Appendix CIII.V for a map of raptor breeding locations.

It is estimated that approximately 11.12 hectares of agricultural habitat will be permanently lost due to the turbine locations and access roads. An additional 6.84 hectares will be temporarily lost during construction. This equates to approximately 0.30% of the total wind farm site (estimated to be approximately 3,716 hectares) being permanently lost and a further 0.18% being temporarily lost during construction.

This habitat loss is only a very small proportion of the whole wind farm site. However, the loss of habitat could have an impact on widespread breeding species within the site, including common quail, turtle dove, crested lark, common skylark, corn bunting, grey partridge, red-backed shrike and common cuckoo.

Qualifying species of the Deliblato Sands Important Bird Area (IBA)

The Deliblato Sands IBA was assessed By Birdlife International in 2000 and qualified for its breeding populations of:

- Eurasian nightjar 200-300 pairs (based on 1995 data)
- Eurasian wryneck 100-150 pairs (based on 1995 data)
- Grey-faced woodpecker 50-80 pairs (based on 1996 data)
- Red-backed shrike 1000-1500 pairs (based on 1996 data)
- Woodlark 400-700 pairs (based on 1996 data)
- Eurasian skylark 2000-2500 pairs (based on 1996 data)
- Barred warbler 800-1000 pairs (year of assessment not known)
- Common nightingale 3000-6000 pairs (based on 1996 data)
- Whinchat 150-250 pairs (based on 1996 data)

Of these species, red-backed shrike and Eurasian skylark breed within the survey area. Skylark are widespread breeders throughout the survey area and up to 15 pairs of red-backed shrike are believed to breed within the wind farm site itself.

The amount of land predicted to be permanently and temporarily lost is approximately 0.48% of the entire wind farm site. This loss of land is expected to have a negligible effect on the populations of red-backed shrike and Eurasian skylark within the wind farm site, and have no impact on the neighbouring Deliblato Sands IBA populations.

Deliblato Sands IBA is also currently under consideration for designation as a Special Protection Area (SPA). Further details on the potential impacts on the Deliblato Sands IBA and pSPA (i.e. ‘proposed’ SPA) can be found in the Habitat Regulations Assessment Screening Report (WS Atkins International Limited, 2012).

Overall nature conservation value of survey area for birds

The significance (or nature conservation value) of the survey area for each species of special significance (and therefore target species as well) has been assessed. The three levels of significance (high, moderate, low) are based on the abundance of a species within the survey area (from transect survey and vantage point surveys), the regional abundance of the species and the flight activity within the survey area (recorded during the vantage point surveys). These assessments are taken from pages 62-97 of the expert opinion on the expected impact on birds (Ecoda Consulting, 2011b) and are summarised in Table C.8.

Table C.8 Significance (nature conservation value) of the Survey Area for Species of Special Interest Based on Abundance (locally and regionally) and/or Flight Activity.

Species	Recorded	Status	Significance of Survey Area	Habitat Preference Within The Survey Area
Common quail	Regularly recorded during breeding season	Common breeding bird, 20 territories estimated	**High significance**	Open agricultural land as breeding and foraging areas
European turtle dove	Regularly recorded within fields (up to 150 birds) during breeding season	Common breeding bird	**High significance**	Agriculture land and bushes/trees for breeding and foraging
Crested lark	Regularly recorded in survey area throughout the year	Regular breeding bird	**High significance**	Open land for breeding and foraging
Common skylark	Regularly recorded in survey area throughout the year	Regular breeding bird	**High significance**	Open land for breeding and foraging
Corn bunting	Regularly recorded in survey area	Common breeding bird	**High significance**	Open land for breeding and foraging
Common buzzard	Regularly recorded throughout the year	Two breeding pairs, common hunting visitor	**Moderate to high significance**	Edge of forests as breeding areas, open land as hunting areas
Saker falcon	Occasionally recorded during the breeding season	Occasional hunting visitor	**Moderate to high significance**	Margins of the survey area as hunting areas
Eurasian hobby	Regularly recorded during breeding season	One breeding pair (and two more pairs nearby in Deliblato Sands), regular hunting visitor	**Moderate to high significance**	Pylon as breeding site, margins of the survey area as hunting areas
Common kestrel	Regularly recorded throughout the year	Two breeding pairs near survey area, common hunting visitor	**Moderate to high significance**	Pylons and solitary trees for breeding, open land as hunting areas
Grey partridge	Occasionally recorded during the breeding season	Up to five breeding pairs	**Moderate to high significance**	Open land as breeding and foraging areas
European bee-eater	Regularly recorded during the breeding season	Common foraging bird	**Moderate significance**	Insect-rich open land
White-fronted goose	Regularly recorded during migration and winter (20 flocks of up to 300 birds)	Regular flyover during migration and winter, occasional roosting	**Moderate significance**	
Hen harrier	Single birds regularly recorded during migration and winter	Regular hunting visitor during migration and winter	**Moderate significance**	Open land as hunting areas
Montagu's harrier	Single birds occasionally recorded during migration	Regular hunting visitor during migration	**Moderate significance**	Open land as hunting areas
Booted eagle	Rarely recorded at the southern end of the survey area	Occasional hunting visitor	**Moderate significance**	Margins of the survey area for hunting (habitats of ground squirrels)

Tawny pipit	Regularly observed during breeding season	Probably breeding in Deliblato Sands, regular foraging visitor	**Moderate significance**	Open land for breeding and foraging
Red-backed shrike	Regularly observed during breeding season	Common breeding bird (up to 15 pairs in survey area)	**Moderate significance**	Open land with bushes/trees at the margins of the survey area for breeding and foraging
Great grey shrike	Regularly observed in small numbers	Regular autumn migrant	**Moderate significance**	Open land with bushes/trees
Common starling	Regularly recorded throughout the year	Regular foraging visitor	**Moderate significance**	Open land for foraging
House sparrow	Regularly recorded throughout the year	Regular foraging visitor, probable breeding	**Moderate significance**	Open land for foraging
Eurasian tree sparrow	Regularly recorded throughout the year	Regular foraging visitor, probable breeding	**Moderate significance**	Open land for foraging
Western marsh harrier	Single birds regularly recorded	Regular hunting visitor	**Moderate significance for hunting, no significance for breeding**	Open land as hunting areas
Common cuckoo	Regularly recorded within survey area	Rare breeding bird	Low to moderate significance	
Long-eared owl	Regularly heard during night visits	Foraging visitor, bred near to survey area	Low to moderate significance	
Little owl	Rarely recorded at the edge of survey area	One breeding pair near to survey area	Low to moderate significance	
Barn owl	Regularly heard during night visits	Common breeding bird in settlements near the survey area	Low to moderate significance	
Northern wheatear	Rarely recorded within survey area during breeding season and migration	Up to five breeding pairs near survey area, rare foraging visitor	Low to moderate significance	
Purple heron	Single birds rarely recorded flying over	Possible foraging visitor	Low significance	
White stork	Single birds rarely recorded flying over	Possible foraging visitor	Low significance	
Bean goose	Rarely recorded during migration and winter (only 3 flocks, but up to 50 birds)	Rare flyover	Low significance	
Honey buzzard	Single birds recorded on three occasions	Possible foraging visitor	Low significance	
Northern goshawk	Occasionally recorded throughout the year	Occasional hunting visitor	Low significance	
Eurasian sparrowhawk	Occasionally recorded throughout the year	Occasional hunting visitor	Low significance	
Rough-legged buzzard	A single bird was recorded on one occasion during migration	Rare migrant	Low significance	
Peregrine falcon	A single bird was recorded on two occasions during migration	Rare migrant	Low significance	

Red-footed falcon	Single bird recorded on one occasion	Probable hunting visitor	Low significance	
Merlin	Single birds recorded on three occasions during migration/winter	Occasional hunting visitor on migration	Low significance	
Common crane	One record of a flock of 10 birds over survey area	Only recorded once flying through survey area	Low significance	
Greylag goose	Occasionally recorded during migration and winter (several flocks were recorded of up to 200 birds)	Occasional flyover during migration and winter, occasional roosting	Low significance	
Eurasian woodcock	Not recorded	Possible foraging visitor	Low significance	
Eurasian scops owl	Regularly heard during night visits	Possible foraging visitor, bred near the study area	Low significance	
Tawny owl	Rarely recorded in the survey area	Possible foraging visitor	Low significance	
European nightjar	Occasionally recorded at edge of survey area during breeding season	Breeding bird outside survey area	Low significance	
European roller	Single birds recorded on two occasions	Possible foraging visitor	Low significance	Insect-rich open land
Hoopoe	Occasionally seen foraging in ploughed fields	Occasional foraging	Low significance	
Eurasian wryneck	Rarely recorded	Possible foraging visitor	Low significance	
Green woodpecker	Occasionally recorded at edge of survey area	Possible foraging visitor	Low significance	
Barn swallow	Regularly recorded within survey area during breeding season	Regular foraging visitor	Low significance	
House martin	Regularly recorded within survey area during breeding season	Regular foraging visitor, nests in nearby settlements	Low significance	
Woodlark	Rarely observed at the edge of the survey area during breeding season	Possible foraging visitor	Low significance	
Barred warbler	Rarely recorded within survey area	Possible foraging visitor	Low significance	
Spotted flycatcher	Rarely recorded within survey area	Possible foraging visitor	Low significance	
Lesser grey shrike	Rarely recorded within survey area during breeding season	Possible foraging visitor	Low significance	
Linnet	Rarely observed in small flocks in autumn/winter	Rare autumn and winter visitor	Low significance	
Yellowhammer	Rarely recorded in survey area	Possible foraging visitor	Low significance	
Ortolan bunting	Rarely recorded in survey area	Possible foraging visitor	Low significance	
Black-headed bunting	Rarely recorded in survey area	Possible foraging visitor	Low significance	
Great cormorant	Small flocks and single individuals rarely flying over	Rare flyover	No significance	
Pygmy cormorant	Single birds rarely recorded flying over	Rare flyover	No significance	

Black-crowned night heron	Single birds recorded twice	Rare flyover	No significance	
White-tailed eagle	Not recorded	Not observed / distance to nearest breeding site >10km	No significance	
Whiskered tern	Single birds rarely recorded flying over	Rare flyover	No significance	
Alpine swift	Very rare passage migrant	Rare flyover	No significance	
Common kingfisher	Very rarely observed	Rare flyover	No significance	
Note: Target species highlighted in blue				

Of the species of special interest recorded, the survey area was considered to be of moderate (or greater) significance for 22 species:

- **High significance**; common quail, turtle dove, crested lark, Eurasian skylark, corn bunting
- **Moderate to high significance**; common buzzard, saker falcon, hobby, common kestrel, grey partridge
- **Moderate significance**; European bee-eater, white-fronted goose, hen harrier, Montagu's harrier, booted eagle, tawny pipit, red-backed shrike, great grey shrike, common starling, house sparrow, tree sparrow, western marsh harrier

Assessment of significance based on recent research

Analysis of existing research by Ecoda has enabled 11 of the 22 species of special interest, for which the survey area is considered to be of moderate significance or greater, to be excluded from further impact assessment (see Table C.9 for a list of these species). This is because recent studies show that wind turbines have no adverse effects or insignificant effects on these species of bird as a result of disturbance, displacement or collision during construction or operation (pages 98-114, Ecoda Consulting, 2011b).

Table C.9: Species for which likely adverse effects can largely be excluded

Species Of Special Interest	Significance of the Survey Area	Expected Impact of the Proposed Turbines
Grey partridge	Moderate to high significance	No significant impact
Eurasian turtle dove	High significance	No indications for significant impact in recent literature
Crested lark	High significance	No indications for significant impact in recent literature
Common skylark	High significance	No significant impact
Tawny pipit	Moderate significance	No indications for significant impact in recent literature
Red-backed shrike	Moderate significance	No significant impact
Common starling	Moderate significance	Almost no significant impact
House sparrow	Moderate significance	No indications for significant impact in recent literature
Eurasian tree sparrow	Moderate significance	No significant impact
Corn bunting	High significance	No significant impact
Great grey shrike	Moderate significance	No significant impact

There are 11 species for which likely adverse impacts are possible from the wind farm (see Table C.10). The potential impacts of construction, operation and decommissioning on these species are described in Sections D2.2.6, D3.3, and D4.6.1 consecutively.

Table C.10: Species for which likely adverse impacts from the proposed wind farm cannot be excluded

Species	Significance of the survey area
Common quail	High significance
Western marsh harrier	Moderate significance as a hunting area
Common buzzard	Moderate to high significance
Booted eagle	Moderate significance
Common kestrel	Moderate to high significance
Eurasian hobby	Moderate to high significance
Saker falcon	Moderate to high significance
European bee-eater	Moderate significance
White-fronted goose	Moderate significance for migrating
Hen harrier	Moderate significance
Montagu's harrier	Moderate significance

C4 Human Geography

C4.1 Socio-Economic Environment

C4.1.1 Area of influence

The primary area of influence is the focus of the impact assessment and it encompasses all project impacts on local resources and receptors. It includes the areas within the boundaries of the local communities surrounding the Project site – Mramorak, Dolovo and Vladimirovac. The local community Bavanište which is expected to be impacted only by the construction and operation of the overhead line is also within this primary area of influence (see Figure C.11).

The secondary area of influence is a wider, regional level study area and includes larger scale economic and infrastructure impacts. This area comprises Kovin Municipality, Pančevo City and Alibunar Municipality (see Figure C.10).

The tertiary area of influence considers the wider, national and international scale impacts of the Project.

C4.1.2 Local context

The Project is located about 30 km to the north east of Belgrade, on the territory of the Kovin Municipality in the northern Serbian Province of Vojvodina (see Figure C.10). It covers an area of about 37 km^2 between several small local communities – Mramorak to the south (located on the territory of the Kovin Municipality), Dolovo to the south west (located on the territory of Pančevo City) and Vladimirovac to the north (located on the territory of the Alibunar Municipality). Devojački bunar, territorially belonging to Alibunar Municipality[5] is a small weekend home settlement to the north east of the Project site, on the edge of the Deliblato Sands SNR. An overhead line connecting the wind farm with an existing transmission line extends to the local community Bavanište to the south (located on the territory of Kovin Municipality). See Figure C.11 below.

The project area belongs to one of the economically least developed areas of Vojvodina province. The key reasons for the lack of development are lack of infrastructure (especially road infrastructure, but also communal, social and educational infrastructure), human resources (lack of educated workforce), lack of qualified staff in public administration and public enterprises who can work on investment attraction and support local start-ups and development of small and medium-sized enterprises (SMEs), non-existence of new technologies caused by general lack of investments in research and development and heavy reliance on old and outdated industries (Regional Center for Socio-Economic Development of Banat, 2009).

Issues regarding the territorial organisation of the Republic of Serbia and governance are explained in detail in Section A4.5.1.

[5] Local community Banatski Karlovac.

Figure C.10: Location of the Project Site in the Republic of Serbia

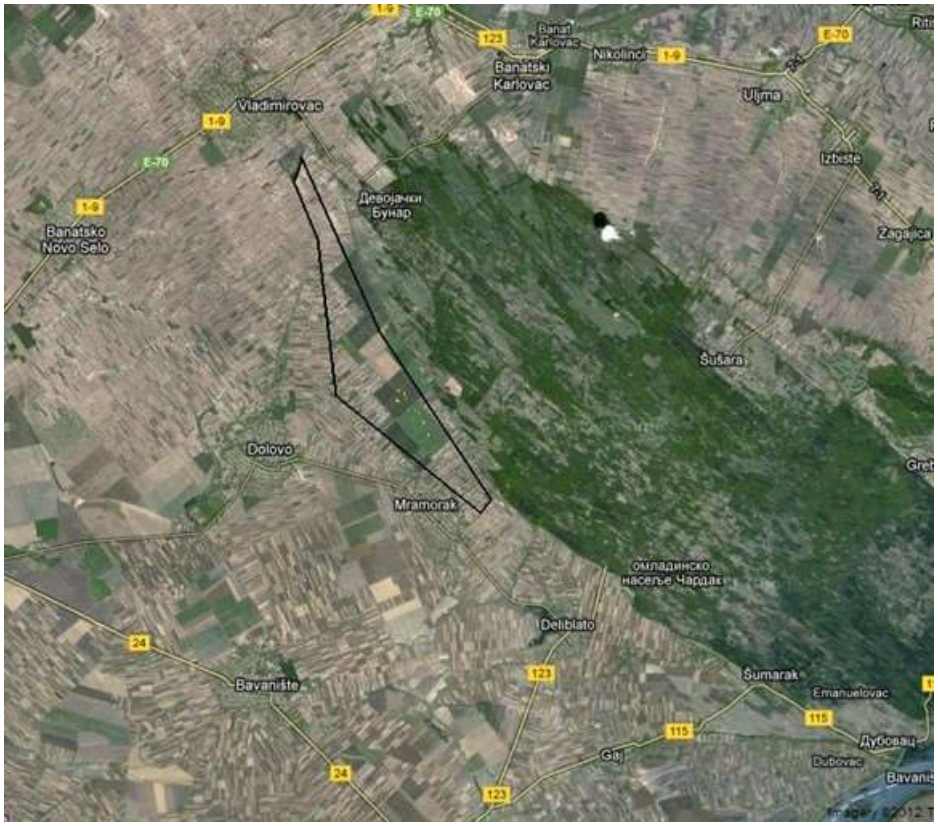


Figure C.11: Local communities surrounding the Project Site

C4.1.3 Demography

Kovin Municipality has a population of 33,725. Pančevo City has a population of 122,252 while Alibunar Municipality has a population of 19,780 (Statistical Office of the Republic of Serbia, 2011).

With regards to local communities, Mramorak has a population of 2,689 (976 households), Dolovo has a population of 6,132 (1,807 households) and Vladimirovac has a population of 3,828 (1,228 households) (Statistical Office of the Republic of Serbia, 2011). The total population of all three local communities is 12,649 (4,011 households).

The majority of the population in the affected municipalities is Serbian. Romanians, Hungarians, Slovaks and other nationalities are also present.

Table C.11: Nationalities in the Affected Areas (Statistical Office of the Republic of Serbia, 2002)[6]

Kovin Municipality	Pančevo City	Alibunar Municipality
81% Serbian	76% Serbian	60% Serbian
6% Hungarian	4% Hungarian	27% Romanian
3% Romanian	4% Macedonian	5% Slovak
2% Roma	3% Romanian	3% Roma
8% other	13% other	5% other

In the local communities, the situation slightly differs to the municipal/city level, with the fact that Romanian population is more present. In Mramorak (Kovin Municipality), 80% of the population is Serbian, 10% Romanian and 10% other. In Dolovo (Pančevo City), 75% of the population is Serbian and 25% Romanian. In Vladimirovac (Alibunar Municipality), the population is evenly split between Serbian and Romanian. (Local Community Council Chairmen, 2011).

The population in all three municipalities is evenly split between men (49%) and women (51%) (Jančić et al., 2010).

C4.1.4 Religion

The majority of the population in the affected municipalities is Orthodox (approx. 80 to 85%), Catholic (approx. 6 to 7%) and Muslim (approx. 3%), with the rest undeclared (Statistical Office of the Republic of Serbia, 2002)[7].

C4.1.5 Languages

The official language spoken across the country and also in the Project area is Serbian. The official alphabet is Cyrillic, while the Latin alphabet is also widely used.

Vojvodina Province is a multi-ethnic region and is known for the variety of official languages used. Citizens have the right to demand communication with authorities in 6 official languages – Serbian, Hungarian, Slovak, Romanian, Ruthenian and Croatian.

C4.1.6 Housing

Local communities in the Project area display a predominance of one / two storey houses, built of compacted dirt or bricks. They are surrounded by high walls, connected from house to house, with doors and gates for vehicles to enter and exit courtyards. In front of the houses there are usually small lawns separating them from the streets. Behind the gates, each house has an internal courtyard, with animal shelters, storage space, garages for agricultural machines, cars, etc. Houses also have gardens (mainly orchards and flowers and in some cases small vegetable gardens). The majority of housing originates from mid-20th century and most of it seems to be well maintained. See Figure C.12 below for a photo of a typical house in the Project area.

[6] Data from the 2011 census is not yet available.
[7] Data from the 2011 census is not yet available.

Figure C.12: Photograph: Typical house in local communities surrounding the Project site.

C4.1.7 Infrastructure

The main roads in the municipality Kovin are regional road no. 24 Pančevo – Kovin – Smederevo, local road no. 123 Alibunar – Deliblato – Kovin and local road no. 115 Kovin – Bela Crkva. There are also 42.8 km of small local routes within the municipality (Stojanović et al., 2008).

The City Pančevo has approximately 147 km of roads infrastructure, of which 39.5% are regional roads, 11% are local and 49.7% are small local routes. The river Danube is an extremely important segment of Pančevo's transport infrastructure, insufficiently exploited at present due to the fact that most existing ports are either small or in poor condition (Municipality Pančevo, 2005).

Alibunar Municipality has 82 km of roads infrastructure of which 24 are primary roads, 48 are regional and 10 km are local. An international railway line passes through the municipality, connecting Belgrade with Timisoara (Vujnović et al., 2009).

The main road to be used for transportation to and from the Project site will be the E-70 (Belgrade-Pančevo-Vršac-Romania). The E-70 is part of the national road network (regional road) but is not classed as a major road. It has a single lane and runs north east from Pančevo to Vladimirovac, situated on the north western edge of the Project Site.

The electricity, gas supply and telecommunications networks are developed in each village; however there is no sewage network and no wastewater treatment is undertaken. Drinking water is supplied by local groundwater wells, whose capacity is insufficient during periods of increased water consumption. The water supply infrastructure in the villages is old and in need of repairs.

C4.1.8 Education

In Kovin Municipality, there are currently approximately 30% of people with no education or incomplete primary education, 28.5% have basic primary education, 35.2% have secondary education and 2.7% have college or university level education (Stojanović et al., 2008).

In Pančevo City, approximately 4.9% of the population have no education, 35.1% have primary education, 48.8% have secondary education and 10.1% have college or university level education. However, the situation differs significantly between urban and rural population. Among the rural population, 8.6% have no education, 47.3% have primary education, 39.5% have secondary education and 3.9% have college or university level education. In urban areas, less

people have either no education or primary level education, while more people have completed secondary and college or university level education. (Zarić et al., 2005)

In Alibunar Municipality, 32% of the population have no education or incomplete primary education, 29.3 % have primary level education, 31.4% have secondary education and 5.4% have college or university level education (Vujnović et al., 2009).

The main education facilities are located in Pančevo and Kovin and tertiary education in Belgrade. In Mramorak, there is a kindergarten, in Dolovo a primary school and in Vladimirovac there are both.

C4.1.9 Employment and unemployment

Employment and unemployment statistics are only available at the municipal level (see Table C.12 below). Attempts were made to collect information at the local community level from members of Local Community Councils, however no precise data could be obtained. The overall conclusion is that all villages appear to be economically disadvantaged. Agriculture is the dominant economic activity in all three communities, while other economic activity is limited to retail and services (i.e. shops, restaurants) (Local Community Council Chairmen, 2011).

Table C.12: Employment and unemployment statistics per municipality (Statistical Office of the Republic of Serbia, 2011)

	Employed		Unemployed			
	Total	Women	Total	Applying for first job	No qualifications	Women
Kovin Municipality	5190	43 %	3240	43 %	41 %	52 %
Pančevo City	31891	43 %	11431	34 %	34 %	57 %
Alibunar Municipality	2481	45 %	2952	46 %	51 %	53 %

Information regarding employment by sectors suggests that approximately one quarter of the population in all three municipalities is self-employed, as entrepreneurs. The rest are employed by other legal entities. Of these, the majority are employed in manufacturing or services such as education, health and social work. Employment in agriculture is also quite important, more so for the population of Alibunar Municipality (14.3%) and Kovin Municipality (10%) and less for Pančevo City (4.3%). A relatively small percentage of employees are engaged in the construction sector – 2.3% in Kovin, 3% in Pančevo and 0.7% in Alibunar. A detailed overview of employment by sectors in each municipality is provided in Table C.13 below.

At the end of 2010, the average net monthly salary in Kovin Municipality was 268 EUR, in Pančevo City, 339 EUR and in Alibunar Municipality, 207 EUR. As a comparison, at the end of 2013, the average net monthly salary in Kovin Municipality was 344 EUR, in Pančevo City 368 EUR and in Alibunar Municipality 231 EUR (CWP, 2014).

C4.1.10 Health

Within the Kovin Municipality, life expectancy is 71.96 years. The key causes of mortality in 2010 were the following: cardiovascular diseases (65%), cancer (22%), respiratory diseases (6%), gastrointestinal diseases (4%) and gland disease (3%).

In Pančevo City the average life expectancy is 73.27 years. The most significant causes of death in 2010 were cardiovascular disease (55%), cancer (24%), respiratory disease (4%), gastrointestinal diseases (3%) and gland diseases (3%).

Within the Alibunar Municipality, life expectancy is 70.06 years. The most significant causes of death in 2010 included cardiovascular diseases (62%), cancer (30%), respiratory diseases (2%), urinal diseases (3%) and gland diseases (3%). (Statistical Office of the Republic of Serbia, 2002)

There are two hospitals in the region, one in Pančevo and one in Vršac with a combined capacity of 950 beds. The hospital in Pančevo administers to an area with a population of 206,981 and the hospital in Vršac administers to an area with a population of 106,956. Each municipality has a primary health care centre. Each local community surrounding the Project site has one small health clinic and one pharmacy.

Table C.13: Employment by sectors per municipality (Statistical Office of the Republic of Serbia, 2011)

in %	Entrepreneurs	Employees of legal entities							
	Total	Agriculture, forestry and water management	Fishing	Extraction of ore and stone	Manufacturing	Production of electricity, gas and water	Construction	Wholesale, retail and repairs	Hotels and restaurants
Kovin	25.4	10	0	2.5	17.9	3.6	2.3	4.4	0.5
Pančevo	31.1	4.3	0	0	23.8	2.1	3	6.3	0.2
Alibunar	20.9	14.3	0	0.1	22.5	2.7	0.7	4.6	0.1
		Transport, storage and communication	Financial intermediati on	Real estate	Government and social insurance	Education	Health and social work	Community, social and personal services	Total
Kovin		4.1	0.5	0.8	3.2	9.1	14.3	1.4	74.6
Pančevo		5	1.8	1.9	3.4	6	8.7	2.4	68.9
Alibunar		3.1	0.7	0.5	5.2	15.5	8.5	0.5	79.1

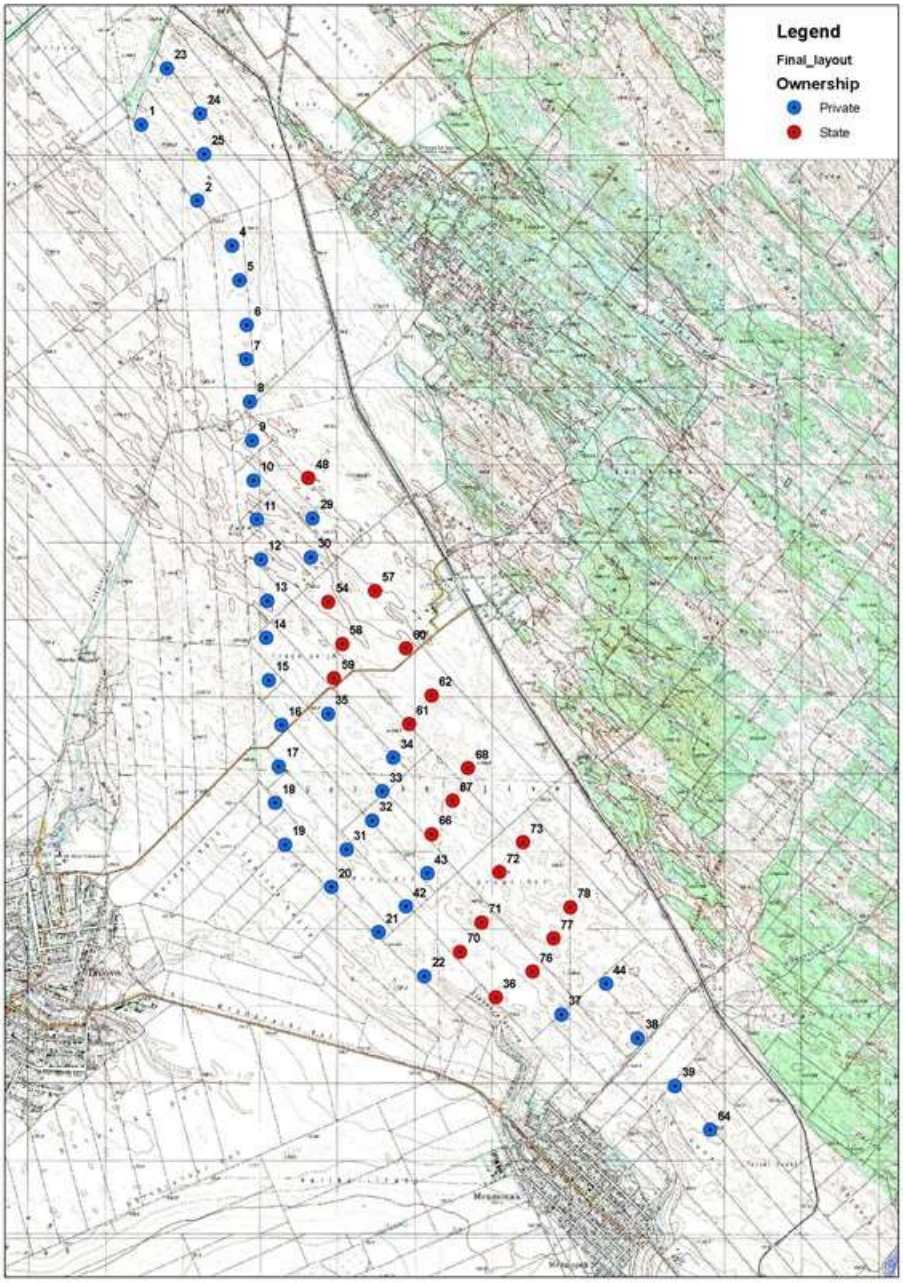


Figure C.13: Layout of WTGs on private and state owned land

C4.2 Land Use and Property

The Project site under the scope of this assessment is 3.700 ha (37km^2). The Detailed Regulation Plan specifies that all of the affected land is agricultural land. The land is predominantly arable land, used for growing maize, sunflowers and wheat (over 95%), while a small percentage is used for grazing.

The land acquired for the Project amounts to a total of 97 ha, approximately 2.6% of the Project site.

The project requires acquisition of land[8] for the following components:

- 57 wind turbine generators (WTG)

[8] The term land acquisition refers to both outright purchases of property and purchases of property rights (i.e. rights of way), as defined in the EBRD 2008 Environmental and Social Policy, PR5.

- Hardstanding areas
- Access tracks, passing places on site roads for large scale vehicles and temporary platforms for vehicle parking and manoeuvring
- Underground cables for onsite electrical infrastructure
- Control building and substation
- Construction compound
- Transmission lines to the main grid connection (33 OHL towers and supporting infrastructure)

By the end of 2012, all the land has been acquired for the above components.

All land is still available to users of land, who will continue to use it until construction begins, planned for Q1/Q2 2015. The layout of WTGs on private and government owned land is presented in Figure C.13 below.

Most of the land that has been acquired (over 99%) is located on the territory of the Cadastral Municipality Mramorak[9]; the remaining 1 %, acquired only for the OHL, is located on the territories of the Cadastral Municipality Dolovo[10] and Cadastral Municipality Bavanište[11].

All land has been acquired either through sale purchase contracts or permanent easement contracts, without resorting to expropriation or other compulsory purchase procedures[12], in the following way:

- Sale purchase contracts were concluded for the construction and operation of WTGs (61.7 ha), for the construction and operation of the control building and substation (6.9 ha), some of the access tracks (3.4 ha).
- Permanent easement contracts have been concluded for 33 OHL towers, widening of access tracks and installation of underground cables (1.6 ha) below the access tracks13.
- State-owned land for 19 turbines (22ha) has been acquired from the Municipality of Kovin through open tender procedure.

At the same time when WEBG and private landowners concluded sale purchase agreements for the construction of WTGs, they also concluded lease contracts, giving the right to landowners to continue using or sub-letting the same plots of land for a period of 99 years, or until decommissioning, ***free of charge***. Their obligations are to pay annual taxes for the part of the land that they are farming, as well as to refrain from undertaking activities which could in any way harm the WTGs and associated facilities or prevent WEBG from constructing or accessing the WTGs and associated facilities for maintenance and repairs. The landowners are using the full plots of land until construction begins. During construction they may not be able to use the plots (or a part of the plots) for a period of 2 to 3 months, *but they will be compensated for any crop losses resulting from construction*. After construction, throughout operation, they will not be able to use parts of the plots on which WTGs and associated facilities are located (average of 0.3 ha). Again, they will be compensated for any lost crops or damages incurred as a result of repairs or maintenance of the WTGs. After decommissioning, they (or their heirs) have the right to repurchase the land for a price of 1 EUR.

Owners of affected land were identified from the cadastre (cadastral municipality Mramorak). None of the affected land was registered in the cadastre as being leased or used under any formal arrangement with the owner[14].

[9] Kovin Municipality
[10] Pančevo City
[11] Kovin Municipality
[12] If farmers were unwilling to sell their plots of land, farmers who owned the adjacent plots were approached to sell their plots of land thus necessitating a slight alteration to the project design.
[13] One person signed an easement contract only for the installation of an underground cable and so a part of his plot will be disturbed only in a short time during construction.
[14] At the time when contracts were signed with landowners, WEBG was not aware if any of the land was used by individuals other than the landowners, under informal arrangements or without the knowledge of the landowners. A sample of landowners were subsequently interviewed by the consultant team preparing the ESIA and all of them reported that they use the land themselves or that it is used by immediate family members. They also stated that renting of privately owned land is very rare in the area and therefore the

Although land was largely acquired through voluntary land transactions, and therefore EBRD policy requirements in relation to involuntary resettlement do not apply, the main principles for land acquisition required by this policy were adhered to by WEBG, including avoidance and minimisation of economic displacement, provision of information and consultations, provision of compensation at full replacement value, offers of in kind compensation, provision of legal assistance, as well as the establishment and implementation of a grievance mechanism involving the local community.

The local communities played an important role in managing grievances in relation to land acquisition. Representatives from the three local communities were in direct contact with WEBG representatives, aiming to respond to and resolve any issues or concerns from the landowners.

C4.3 Archaeology and Cultural Heritage

The Institute for Protection of Cultural Monuments from Pančevo completed the detailed analysis of the territory of the wind farm (in July 2012) and OHL (in October 2012) and concluded that there are certain assumptions that traces of settlements from the Bronze Age and the medieval period exist in the area of the wind farm site.

Based on the Institute's documentation, an archaeological site "Potes Velika Njiva" situated north-east of Mramorak village may contain individual archaeological findings from the Bronze Age. The site has a status of "preliminary protected" archaeological locality. Other preliminary Institute' information indicate that along the site boundaries, in the area of local roads (Mramorak – Dolovo, Dolovo – Vladimirovac), a sporadic occurrence of movable archaeological material from the Late Middle Ages had been identified.

Based on the available information and according to the Law on Cultural Heritage (Off. Journal of RS, No. 71/94), the Institute determined conditions for the project developer to fulfil, once the construction works are started. Conditions comprise the following obligations:

1. Wind farm: in 22 places (22 turbines) establish permanent oversight during the work on the foundations.
2. OHL: in 14 places (14 OHL towers) establish permanent oversight during the work on foundations. In 4 places (4 OHL towers), preliminary digging prior to commencement of earthworks needed. The preliminary excavations at the location of OHL pylons No. 10, 23, 24 and 25 started in July 2013 and ended in October 2013. Sporadic movable objects were found as well as one grave all dating from antic period (3rd and 4th century BC). All the findings were recorded and removed. In October 2013, WEBG obtained the decision from the Institute for Protection of Cultural Monuments from Pančevo that there are no additional conditions which would prevent start of construction.
3. Project developer is obliged to promptly inform the Institute for Protection of Cultural Monuments from Pančevo about the commencement of earthworks.
4. In case of chance finds, all works have to be immediately halted until the representatives of the Institute for Cultural Heritage from Pančevo secure the findings.

Figure C.14 shows the areas of concern in respect to cultural (archaeological) heritage identified by the local department of the Institute in Pančevo.

likelihood of the existence of users of land, who are not owners, is very small. The existence of individuals using the land without the knowledge of the owners is even less possible as all land is intensely farmed. If any users of land (who are not owners) are subsequently identified, they will be considered as involuntarily resettled in accordance with the EBRD 2008 Environmental and Social Policy (PR5).

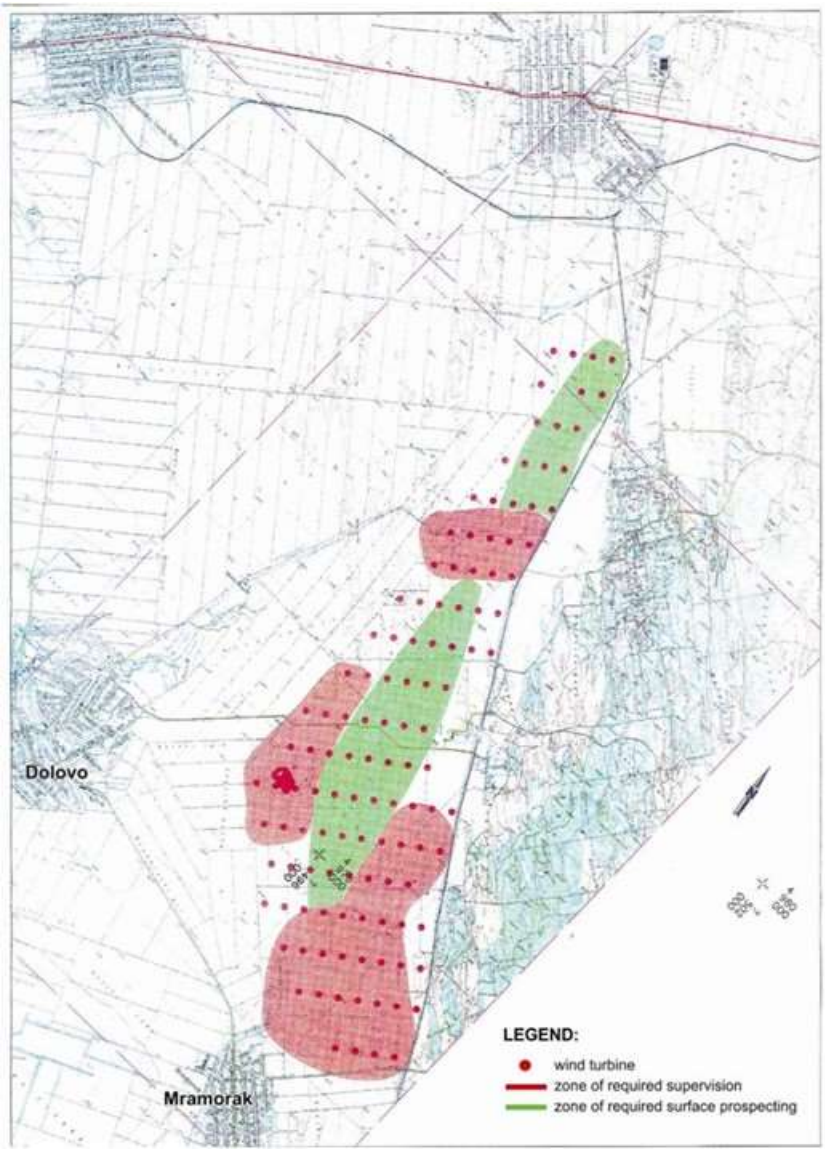


Figure C.14: Areas of concern related to cultural heritage (Institute for Protection of Cultural Monuments, 2009)

C4.4 Transport

C4.4.1 Project Requirements

The main transport requirements for the project are described in Section B4.3. In brief the transport infrastructure required for the project must be capable carrying slow, over-sized vehicles to the site as well as capable of absorbing a large number of aggregate and other material carrying vehicles. In order to determine the feasibility of transporting the main turbine components to the site, GE Energy have undertaken a survey of the available facilities (GE Energy, 2011). The GE Energy report is used as key source of information for this section and the transport impact assessment sections in this Statement, with the exception of references to Site Access scenario No.3, which was not included in the scope of the GE Energy assessment.

The responsibility of all transport lies with the supplier until the point of handover at the entrance to the site. However, despite this, it is necessary for the purpose of impact assessment to incorporate all potential impacts associated with the project. Therefore, the scope of this section includes all regional transport which may have an impact. In order to transfer components to the region, there are two options:

- Transport the components by ship to Constanta port in Romania, unload the components onto river barges and ship via the Danube to Pančevo.

- Transport the components by river barges directly to the port of Pančevo. This option is applicable if the components are sourced from Germany.

At the time of writing, both of the above options remain open. Whichever of the two options is chosen, there is sufficient infrastructure in place *before* the port of Pančevo to manage the transport of the wind farm components so as not cause disruption or a need for development of transport infrastructure. Therefore, transport before the port of Pančevo is not considered in this Statement.

Construction worker numbers will be relatively low (under 400) and will not lead to any pressure on the transport infrastructure. Therefore, transport of construction workers is scoped out of the assessment and will not be considered any further, with the exception that it is expected that the Transport Management Plan, to be developed, will encompass the setting of appropriate standards for vehicle and driver safety.

C4.4.2 The Port of Pančevo

The port of Pančevo is situated directly on the River Danube to the west of Pančevo City and is a key element in the supply chain of components and materials into and out of the region. The port is used for transfer of freight and scrap metal but has not previously been used for transfer of any wind farm components. The port facilities at Pančevo are moderate in scale and do not allow for deep water shipping. The maximum depth at the harbour wall is 2.5 m and the quay side length is 250 m. Therefore, the port is ideally suited to transfer of materials on and off river barges.

GE Energy found the port to be “relatively small but fully capable of accepting and handling all the turbines being proposed for the Dolovo project”. However, the port does not presently have the lifting infrastructure in place to lift all wind farm components from barges. The present cranes have a lifting capacity of 25 tonnes each, and therefore, could only be used for lifting lighter components such as the tandem for rotor blades. In order for the port to be used for the transfer of all the wind farm components it will be necessary to employ the use of mobile cranes with a high lifting capacity.

Within the port facility there are areas for the storage of turbine components and GE Energy have concluded that these are appropriate for purpose. As part of the vendor package, it will be necessary for the vendor to supply appropriate vehicles for use within the port to transfer components from the harbour side to the port storage area. No information has been presented for the purpose of this Statement which indicates that port site storage is any way limited in terms of the requirements of this project. Therefore, we expect that ‘just in time’ operations are not necessary for this project and transfer from the port onto the road system can be flexible so as to avoid disruption of the normal port activities and also avoid transport of large scale wind farm components during peak traffic hours.

C4.4.3 Main Road Network

The main road from the port to the locality of the site is the E-70. The E-70 is part of the national road network but is not classed as a major road. It has a single lane and runs north east from Pančevo to Vladimirovac, situated on the north western edge of the project site. The route of E-70 from the port to the local site area is illustrated in Figure B.5 of this Statement. The road is black topped and on average over 6.0 m in width.

The road runs through 3 built up areas:

- Pančevo: The road runs through the western side of Pančevo, including areas which are built up. Traffic flows in this section of the E-70 route are the highest along the length of the road to the project site. Heavy traffic flows will be experienced during peak hours when people are travelling to their place of work or education.
- Banatsko Novo Selo: This is a village situated 20 km north east of Pančevo, along the route of the E-70, with the road running centrally through the village. The village has a population of approximately 7000 people. Significant traffic build up is not expected in the village.
- Vladimirovac: The town is situated approximately 35 km north east of Pančevo, along the route of the E-70 and adjacent to the north western point of the proposed project site.

The results of the GE survey indicate that the transport route provides appropriate transport conditions for the wind turbine components. There are some areas where the road crossed railway bridges such as in the city of Pančevo as illustrated in Figure C.15, below. However,

these are not seen as significant logistical obstacles.

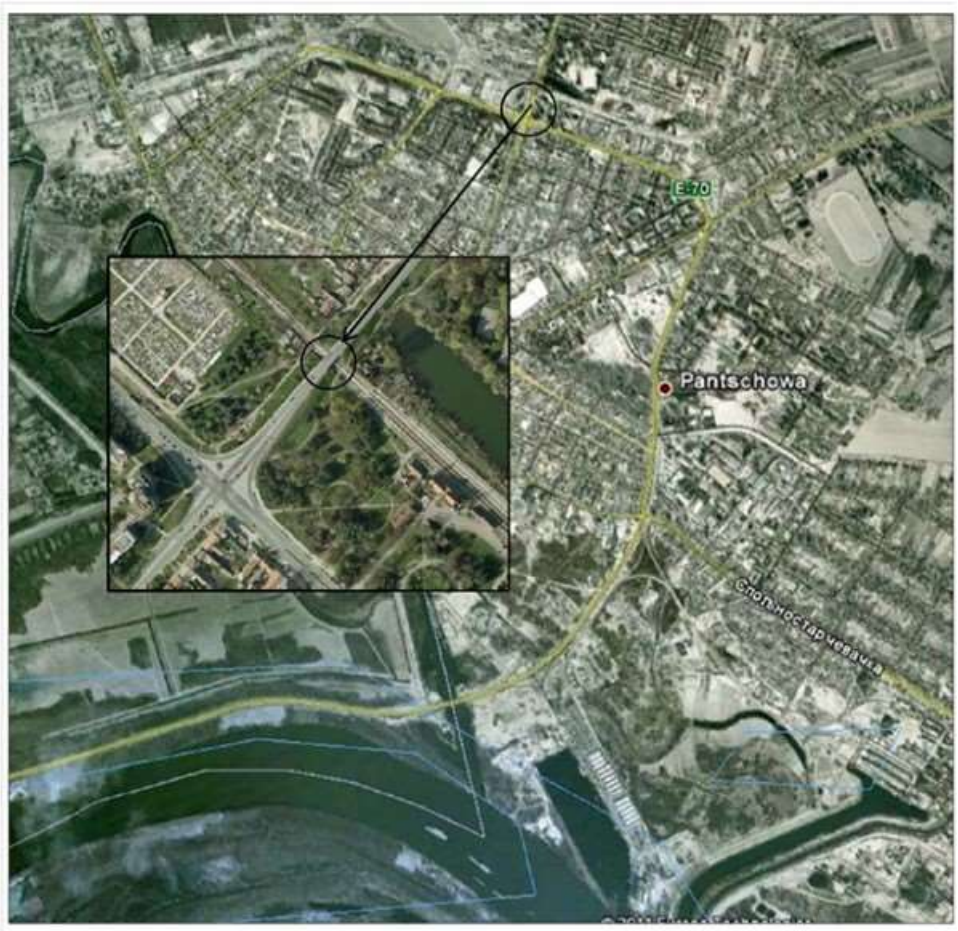


Figure C.15: Road-Railway Crossing (adapted from GE Energy, 2011)

C4.4.4 Local Road Network

The local road network which may be impacted upon by the project is situated in the town of Vladimirovac. Here the transport of wind farm components and all other plant and materials associated with the project may be transferred from the main road network onto local roads. Typically the roads are narrow but asphalt covered. As described in Section B4.3, WEBG considered 3 options for transfer to the project site area. Option 1, will access the site to the north of Vladimirovac. If this option is chosen the components and construction materials will be transported through the town of Vladimirovac without the need to use local roads in the centre of the town before transfer to local roads to the north of the town to the access point to the site. This option is illustrated in Figure C.16.

Figure C.16: Site Access Option 1 (adapted from GE Energy Report (adapated from GE Energy, 2011))

In general the road network is capable of carrying the construction traffic. There will be a requirement for minor medications to the road as illustrated in Figure C.17. The area for improvement is situated to the north of Vladimirovac.

Figure C.17: Road Widening Requirement: Site Access Option 1 (GE Energy, 2011)

Options 2 and 3 are slight variations of one another and require limited use of local roads in Vladimirovac to transport components and construction materials to the project site area. Option 3 has since been discarded as an option. The access 'road' to the site is through centre of the Vladimirovac. These options prevent the need for construction traffic to travel through much of the town on the E-70. Option 2 is illustrated in Figure C.18. There are some modifications required for this option, specifically associated with the improvement of the road surface to the site. The route requires crossing over a railway crossing, as illustrated in Figure C18. WEBG

obtained technical conditions from the railway operator, public enterprise “Serbian Railways”, regarding needed improvements to the railway crossing in order to avoid damage to the lines and easy transport. The permitting for the construction works on railway crossing is now almost done as WEBG has completed Detailed Design, which was approved by all relevant institutions, and the request for construction permit has been submitted to the Ministry of Construction, Traffic and Infrastructure.

Figure C.18: Site Access Option 2 (adapted from (GE Energy, 2011))

Option 3 involves accessing the site at the same point as Option 2. However, the turn off the E-70 is slightly before that of Option 2. The turn off is illustrated in Figure C.19, below. This turn off is located in a relatively open area and before any built up area in Vladimirovac. This was initially the preferred option until WEBG was asked by the local community representatives to change it in order to go through the village so that the central road which is widely used by local population gets repaired. This option will require development of a present track system and local road before joining the Option 2 route before the railway crossing, discussed above.

Figure C.19: Site Access Option 3

Although WEBG initially preferred Option 3, at the request of the local community slightly modified Option 1 was selected as the final choice which is currently being permitted.

C4.4.5 On Site Transport

The existing farm service roads are dirt roads. They are presently used for access to agricultural plots. The area is characterised by small scale farming and such there are many stakeholders to the agricultural plots.

The on-site roads will need some improvement in order to cope with the transport requirements of the installation, operation and maintenance of the wind farm. In particular it is proposed to develop an existing track so as to provide a main connecting road through the length of the project site. The track location is illustrated in Figure B.5 and the present status of the track is illustrated in Figure C.20, below. The improvement of this road will largely benefit the local communities as they will be able to use this road to directly commute to Vršac, which is economic, social and cultural centre of the region. They currently have to go through Pančevo, meaning that traffic density in Pančevo will also be reduced. Other roads will also be created to each of the turbine plots to ensure appropriate access through construction and operations.

Figure C.20: Gravel Track Access to be Developed

C4.5 Noise

C4.5.1 Introduction

There are a number of noise sensitive locations in the vicinity of the proposed wind farm, and the potential impacts need to be assessed at these locations. This section describes the noise sensitive locations and reports a baseline noise survey which establishes the existing noise levels.

C4.5.2 Noise Sensitive Receptors

The nearest noise sensitive receptors to the wind farm are shown in the following table. These have been grouped into 8 locations, and for each location details are given of the distance to the wind farm, which is the typical distance to the nearest turbine, and each of the noise sensitive receptors has been given reference numbers, which is used later in the noise modelling. The locations are shown in the figure following the table below.

Table C.14: Noise Sensitive Locations

No.	Location	Description	Number of properties	Number of properties	Distance to wind farm	Reference Numbers (day)
1	Mramorak	Village to south of wind farm	>100	>100	1km	1678, 1684
2	Devojački bunar	Village to north east of wind farm	12	12	1.5km	1656 - 1668
3	Dolovo	Village to south west of wind farm	>100	>100	2km	1683
4	Vladimirovac	Village to north of wind farm	>100	>100	2km	1705, 1706
5	Vladimirovac to Devojački bunar	Properties between villages	2	2	1 km	1652 - 1655, 1677, 1679, 1680
6	Devojački bunar to Mramorak (north)	Properties between villages	6	6	1km	1669 - 1674, 1676, 1681, 1682
7	Devojački bunar to Mramorak (mid)	Properties between villages	2	2	1.25km	1675
8	Devojački bunar to Mramorak (south)	Properties between villages	2	2	1.25km	1685, 1686
9	Devojački bunar to Dolovo	Property between villages	1	1	1 km	1688

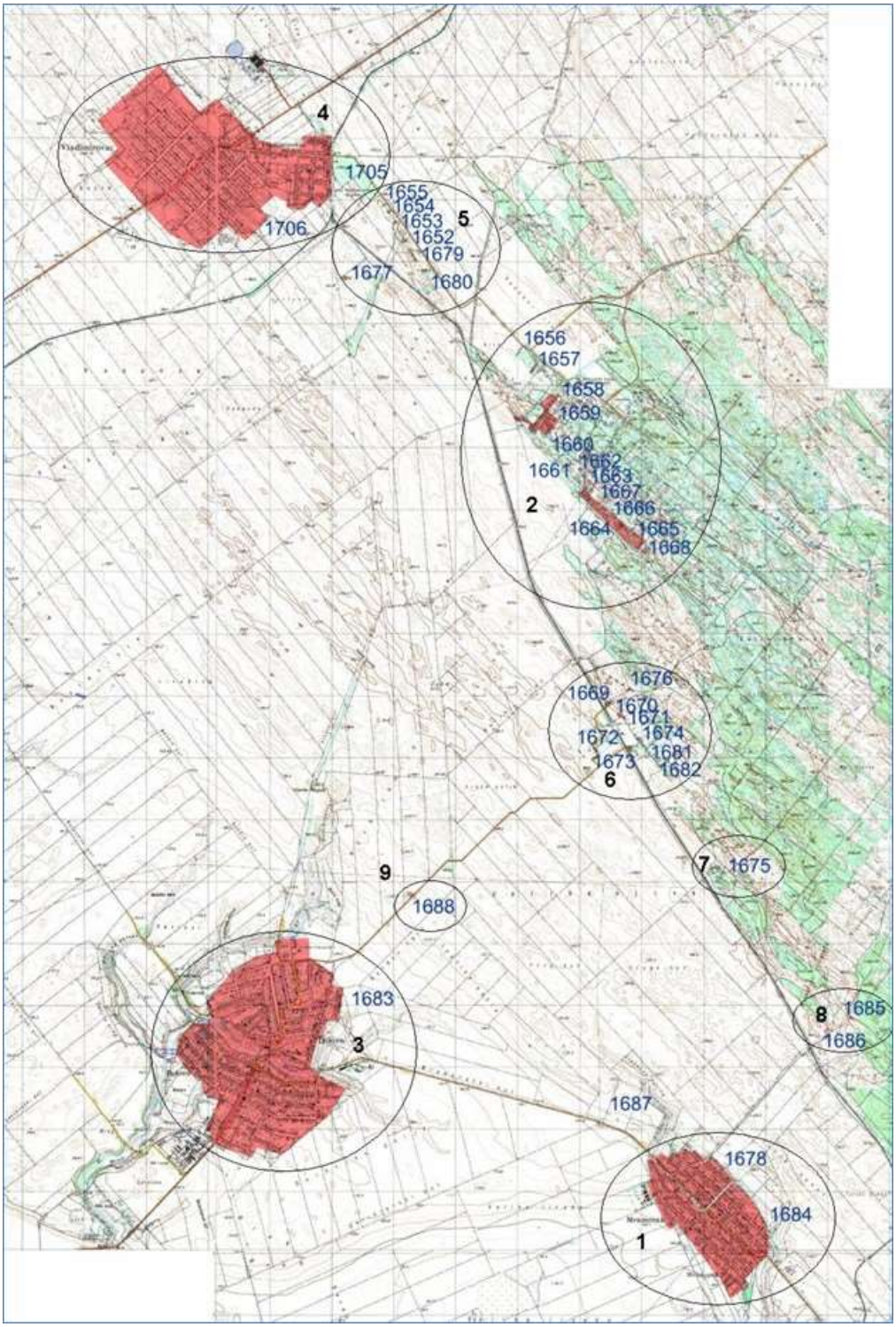


Figure C.21: Noise Sensitive Locations

C4.5.3 Noise Survey Methodology

The permitted levels are described separately for the day, evening and night time periods, and noise measurements were undertaken to be representative of these three periods. As an initial study, four locations were selected, being representative of the areas where noise sensitive receptors are closest to the turbine locations. Two 10 minute noise measurements were taken during each of the day, evening and night periods.

The operating characteristics of the wind turbines indicate that higher noise levels are generated with higher wind speeds. Noise measurements were planned to coincide with wind speeds at hub height being high enough that the turbines would generate their highest noise levels. WEBG

currently have a Sonic Detection and Ranging (SODAR) measuring system on site, and this was used to identify the wind speeds at hub height during the noise survey. Noise measurements were planned with wind speeds at hub height between 8 and 12 m/s.

Both ambient noise levels and noise from the wind turbines would be lower at lower wind speeds, so this measurement approach represents a worst case assessment. A local contractor was selected to undertake the noise measurements.

C4.5.4 Baseline Noise Conditions

Noise measurements were taken between the 7th and 10th December 2011. Noise measurements were taken using a Bruel & Kjaer Type 2270 Integrating Sound Level Meter, which meets International Standards for noise measurement equipment. The sound level meter was calibrated before each set of noise measurements using a Bruel & Kjaer Type 4230 calibrator, which is the standard type of calibrator for this sound level meter.

The four sites selected for the noise measurements are as follows:

- **Measuring Point 1 (MP1)**: Area of village Mramorak. At curve of dirt road (in the fields), near the Nursing Home. Measurements approximately 1.3 m above the ground. The nearest inhabited houses are more than 150 m far away. A gravel processing plant was some 70m from the monitoring location, but this was not operational during the noise survey.
- **Measuring Point 2 (MP2)**: Area of village Dolovo. In the field, nearby local road Dolovo the old railway (i.e. Deliblato sands). Measurements taken approximately 8 m from the road and 1.3 m above the ground. An abandoned house was approximately 50 m away, otherwise the nearest inhabited houses are in the village of Dolovo, approx. 2 km away.
- **Measuring Point 3 (MP3)**: Area of village Dolovo. In the field, nearby local road Dolovo-the old railway, across the entrance of farm. Measurements were taken approximately 6 m from the road and 1.3 m above the ground. The nearest inhabited houses are approx. 500 m far away, near the old railway.
- **Measuring Point 4 (MP4)**: Area of village Devojački bunar. Measurements were taken in the field, near the local road Vladimirovac (approx. 6 km from Devojački bunar). Measurements were approximately 40 m from the road and 1.3 m above the ground. The nearest inhabited houses were approx. 150-200 m away.

These locations are shown in the following figure and the measured noise levels are presented in Table C.15.

Figure C.22: Noise Measurement Point Locations

Table C.15: Measured Noise Levels

Location	Measured Noise Levels, LAeq		Measured Noise Levels, LA90		Hub Height Wind Speed (m/s)	Wind Speed Near Microphone (m/s)
	Measured Values	Average	Measured Values	Average		
Day Measurements						
MP1	53, 45	51	45, 39	42	10	2-10
MP2	50, 34	47	44, 29	37	9-10	2-5
MP3	52, 33	49	45, 29	37	9	2-6
MP4	41, 30	38	36, 25	31	9-12	1-5
Evening Measurements						
MP1	41, 28	38	36, 23	30	9-12	2-6
MP2	37, 28	35	27, 22	25	9-11	2-7
MP3	35, 30	33	31, 25	28	8-11	2-7
MP4	33, 31	32	29, 28	29	8	2-5
Night Measurements						
MP1	35, 29	33	24, 22	23	10	2-7
MP2	30, 28	29	22, 22	22	11-12	2-6
MP3	28, 26	27	24, 19	22	10-12	2-6
MP4	33, 30	32	26, 27	27	10	1-5

At Measuring Point 1 the dominant noise sources were noise from the wind, activities in the village of Mramorak and from traffic on the local roads.

At Measuring Points 2 and 3 the dominant noise sources were noise from the wind and traffic on the local roads.

At Measuring Point 4 the dominant noise sources were noise from the wind, activities in village of Devojački bunar and from traffic on the local roads.

C4.5.5 Summary

The Noise measurement survey allows us to estimate the baseline noise conditions at all of the noise sensitive receptors near the proposed wind farm.

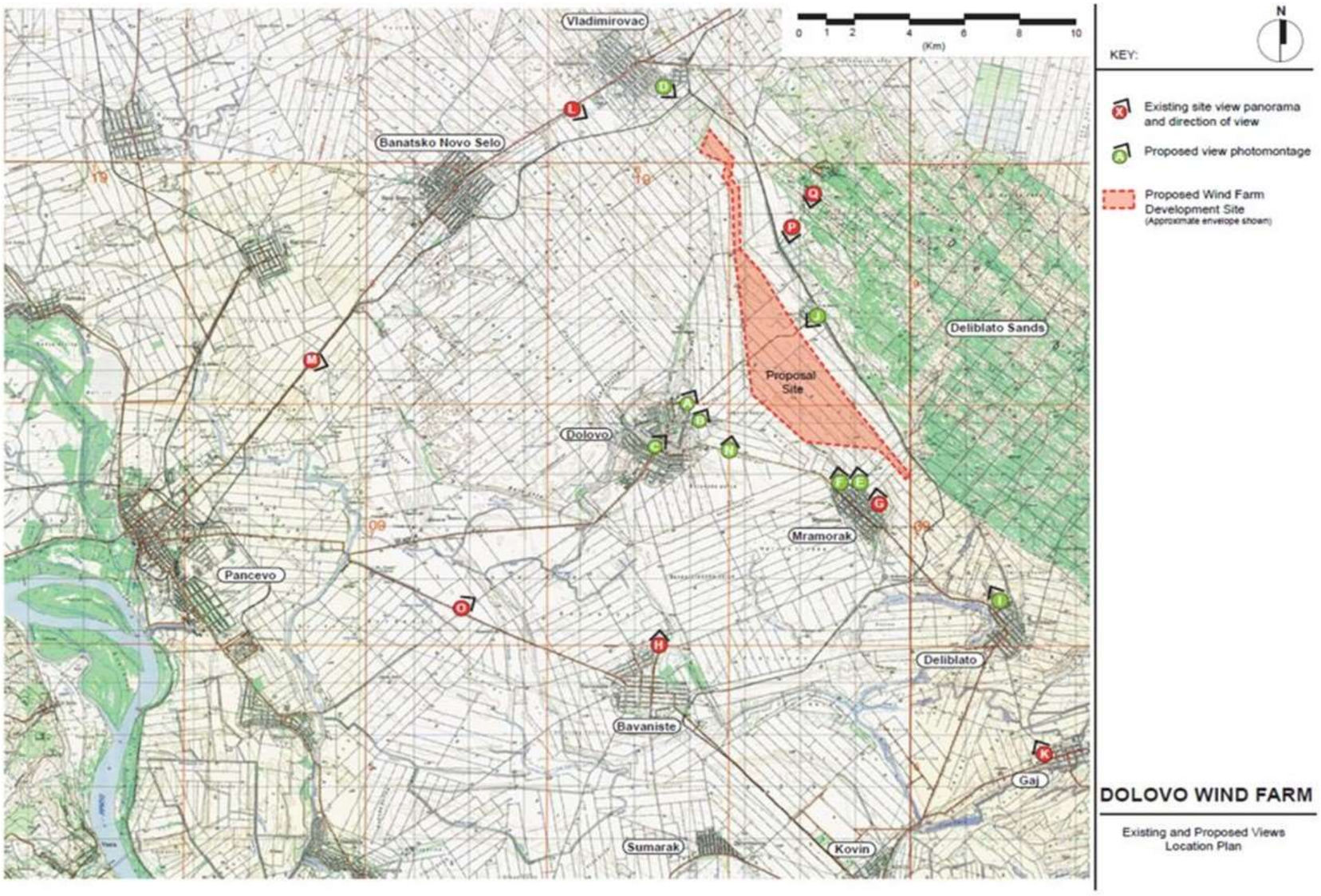
Table C.16: Noise Survey Summary

No.	Location	Day/Evening		Night	
		L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}
1	Mramorak	49	38	33	23
2	Devojački bunar	37	30	32	27
3	Dolovo	46	33	29	22
4	Vladimirovac	37	30	32	27
5	Vladimirovac to Devojački bunar	37	30	32	27
6	Devojački bunar to Mramorak (north)	47	34	27	22
7	Devojački bunar to Mramorak (mid)	47	34	27	22
8	Devojački bunar to Mramorak (south)	49	38	33	23
9	Devojački bunar to Dolovo	46	33	29	22

The measured noise levels are all locations were significantly lower than the permitted values according to regulatory requirements.

CI Panoramas

CI.I Panorama View Points

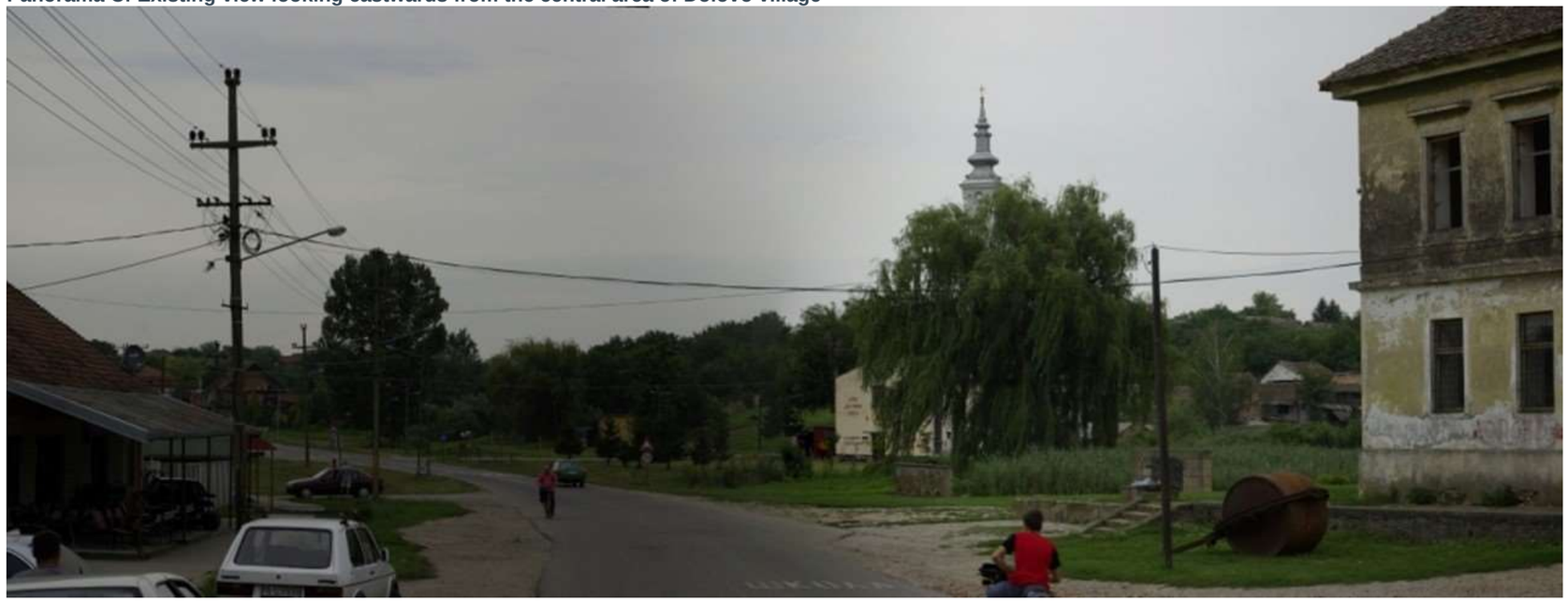


CI.II Panoramas

Panorama A: Existing view looking north to north eastwards from the fringe of Dolovo village settlement towards the proposed development site

Panorama B: Existing view looking eastwards from the fringe of Dolovo village settlement towards the proposed development site

Panorama C: Existing view looking eastwards from the central area of Dolovo village



Panorama D: Existing view looking south from the fringe of Vladimirovac village towards the proposed development site

Panorama E: Existing view looking north east from the fringe of Mramorak village settlement towards the proposed development site

Panorama F: Existing view looking north from the fringe of Mramorak village settlement towards the proposed development site

Panorama G: Existing view looking east from the fringe of Mramorak village settlement towards the proposed development site

Panorama H: Existing view looking north from the fringe of Bavanište village settlement towards the proposed development site

Panorama I: Existing view looking northwest from the fringe of Deliblato village towards the development site

Panorama J: Existing view looking west from residential properties and track road located east of the development site

Panorama K: Existing view looking north from the fringe of Gaj village settlement

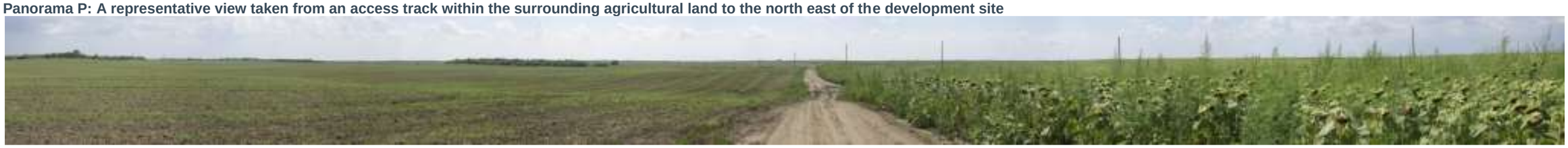
Panorama L: Existing view looking south east from the main road linking Pančevo with Vladimirovac

Panorama M: Existing view looking south east from the main road linking Pančevo with Banatsko Novo Selo

Panorama N: Existing view taken from the road linking Dolovo and Mramorak villages

Panorama O: Existing view taken from the main road linking Bavanište and Pančevo

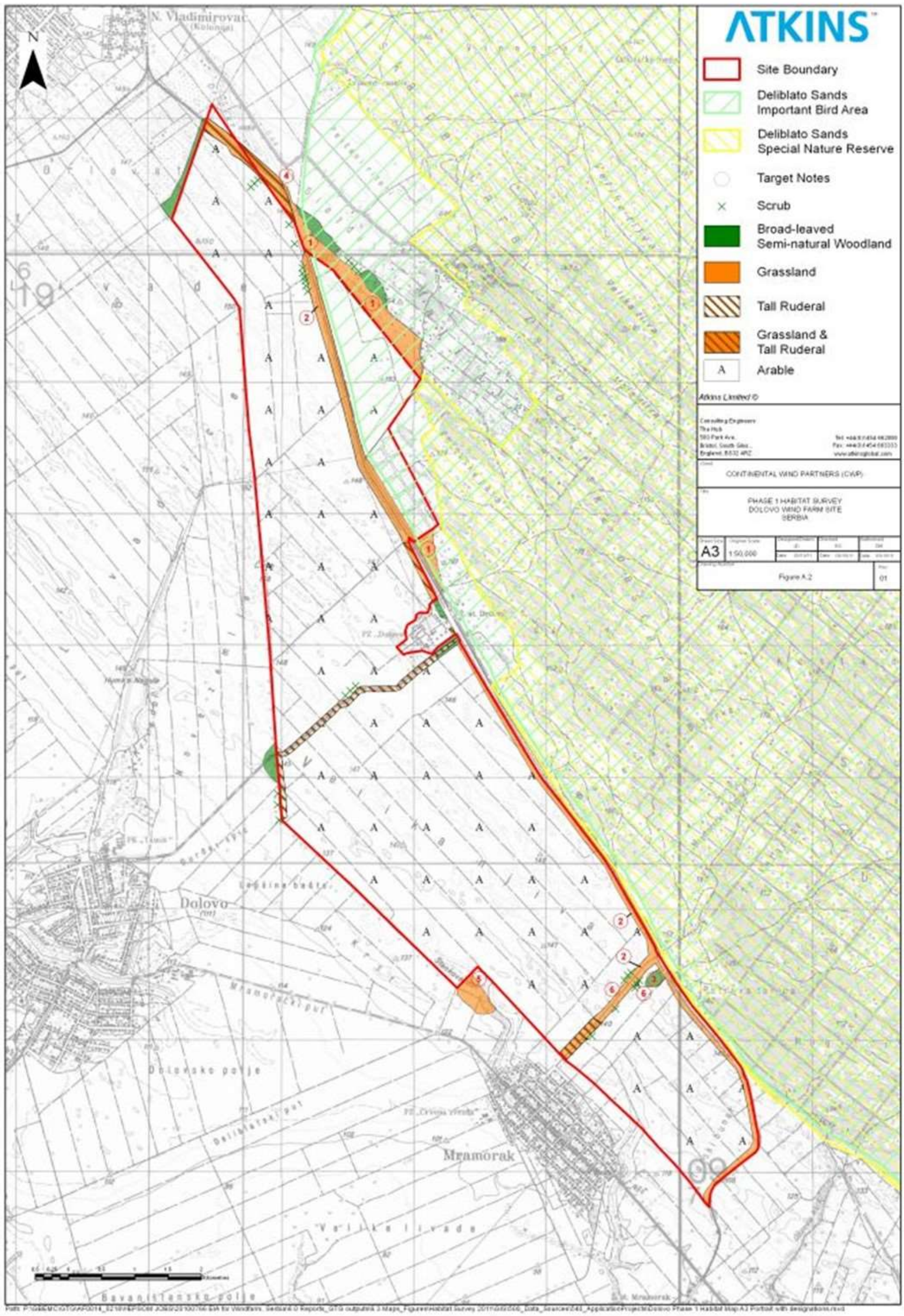
Panorama P: A representative view taken from an access track within the surrounding agricultural land to the north east of the development site



Panorama Q: A representative view taken from within the Deliblato Sands area east of the development site

CII Habitats Data

CII.I Habitat Map with Designations



CII.II Plant Species Lists

Table 1. Typical wayside grassland and ruderal vegetation

Scientific name	Common Name
Carduus acanthoides	Spiny plumeless thistle
Cichorium intybus	Common chicory
Chenopodium album	Fat-hen
Vicia incana	
Ambrosia artemisifolia	Common ragweed
Urtica urens	Dwarf nettle
Sambucus ebulus	Danewort
Sambucus nigra	Black elder
Ailanthus altissima	Tree of heaven
Populus nigra	Black poplar
Robinia pseudoacacia	False acacia
Juglans regia	Common walnut
Silene alba	White campion
Clematis vitalba	Traveller's joy
Fraxinus nigra	Black ash
Craetegus monogyna	Common hawthorn
Rosa canina	Common dog rose
Morus alba	White mulberry
Clinopodium vulgare	Wild basil
Andropogon ischaemum	
Centaurea arenaria	
Ligustrum vulgare	Wild privet
Falcaria vulgaris	Sickleweed
Daucus carota	Wild carrot
Melilotus officinalis	Common melilot
Koeleria gracilis	

Calamagrostis epigejos	Wood small-reed
Canabis sativa	Cannabis

Table 2. Semi-natural steppic grassland

Scientific name	Common Name
Chrysopogon gryllus	Scented grass
Dactylis glomerata	Cock's-foot
Senecio vulgaris	Common groundsel
Galium verum	Lady's bedstraw
Chenopodium album	Fat-hen
Sambucus ebulus	Danewort
Crepis biennis	Rough hawk's-beard
Salvia nemorosa	Woodland sage
Crataegus monogyna	Hawthorn
Centaurea arenaria	
Scabiosa ochroleuca	Cream scabious
Andropogon ischaemum	
Asparagus officinale	
Celtis occidentalis	Common hackberry
Artemisia vulgaris	Mugwort
Plantago media	Hoary plantain
Ambrosia artemisifolia	Common ragweed
Stenactis annua	
Cichorium intybus	Common chicory
Verbascum sp.	Mullion sp.
Carduus acanthoides	Spiny plumeless thistle
Calamagrostis epigejos	Wood small-reed
Cynodon dactylon	Dūrvā Grass
Marrubium peregrinum	
Melilotus officinalis	Common melliot
Daucus carota	Wild carrot

Xanthium italicum	Italian cocklebur

Table 3. Woodland

Scientific name	Common Name
Robinia pseudoacacia	False acacia
Ulmus campestris	Common elm
Sambucus nigra	Black elder
Prunus cerasifera	Cherry plum
Clematis vitalba	Traveller's joy
Prunus avium	Wild cherry

CII.III EUNIS and EU Habitat Descriptions

EUNIS Habitat Type: E1.2 Perennial calcareous grassland and basic steppes.

EUNIS habitat **code and names** E1.2 Perennial calcareous grassland and basic steppes

Description

Perennial grasslands, often nutrient-poor and species-rich, on calcareous and other basic soils of the nemoral and steppe zones and of adjacent parts of the subboreal and submediterranean zones. Includes the calcareous grasslands of central and western Europe, alvar grasslands of the Baltic region, and basic grasslands of the steppe zone.

Source Hill, M.O., Moss, D. & Davies, C.E. (2004b)

Legal instruments

Legal instrument	Legally designated habitat	Code
EU Habitats Directive Annex I	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	6210
	Sub-Pannonic steppic grasslands	6240
	Pannonic loess steppic grasslands	6250
	Pannonic sand steppes	6260
	Nordic alvar and precambrian calcareous flatrocks	6280
Council of Europe Bern Convention Res. No. 4 1996	Dense perennial grasslands and middle European steppes	34.3
	Continental steppes	34.9
	Sand steppes	34.A

Descriptive or diagnostic parameters

Parameter	Value(s)
Altitude zones (terrestrial and marine):	Planar; Collinar; Montane (sensu lato); Submontane
Dominant life forms:	Herbs; Low-growing herbs; Forbs; Grasses
Cover characteristics (when used as criteria):	Vegetation >30%
Characteristics of wetness or dryness:	Dry
Chemical attributes:	Base-rich; Calcareous
Substrate types:	Immature soil
Related phytosociological units:	*Agropyrion pectinati; Agropyro-Kochion; Alyssion bertolonii; Alysso alyssoidis-Sedion albi; Alysso saxatilis-Festucion pallentis; Amygdalion nanae; Asplenio septentrionali-Festucion pallentis; Asplenion serpentini; Avenulo adsurgentis-Festucion pallentis; Brachypodion phoenicoidis; Bromion erecti; Bromion tectorum; Bromo pannonici-Festucion pallentis; Centaurion sumensis; Chrysopogoni-Saturejon; Chrysopogono-Danthonion; Chrysopogono-Festucion dalmaticae; Cirsio-Brachypodion pinnati; Cynodonto-Teucrion polii; Danthonio-Brachypodion; Danthonio-Stipion tirsae; Diantho lumnitzeri-Seslerion albicantis; Diplachnion; Festucetalia valesiacae; Festucion beckeri; Festucion vaginatae; Festucion valesiacae; Galio campanulatae-Poion versicoloris; Halacsyetalia sendtneri; Helianthemo cani-Festucion pallentis; Helianthemo-Globularion; Helictotricho desertori-Stipion rubentis; Helictotricho-Stipetalia; Koelerion arenariae; Koelerion glaucae; Koelerio-Phleion phleoidis; Orostachyion spinosae; Pimpinello-Thymion zygoidi; Plantagini-Festucion ovinae; Potentillo montanae-Brachypodion rupestris; Salsolion ruthenicae; Scabiosion ucranicae; Scorzonero austriacae-Koelerion sclerophyllae; Sedo-Cerastion; Sedo-Scleranthetalia; Seslerion rigidae; Seslerio-Xerobromion; Stipion lessingianae; Stipo pulcherrimae-Festucetalia pallentis; Stipo-Poion carniolicae; Stipo-Poion xerophilae; Thymo cretacei-Hyssopetalia cretacei; Verbascion pinnatifidii; Xerobromion*

EU Habitats Directive Annex 1 Habitat: 6250 Pannonic loess steppic grasslands

1) Grassland communities rich in perennial grasses and herbs on loess deposits. Originally covering large areas, nowadays restricted to specific land forms like loess ridges formed by fluviatile erosion and accumulation.

2) Plants: Artyemisia pontica, Astragalus vesicarius, A. austriacus, A. onobrychis, Crambe tataria, Nonea pulla, Salvia nemorosa, Ornithogalum pannonicum, Agropyron pectinatum, Phlomis tuberosa, Bromus inermis, Festuca rupicola, Falcaria vulgaris, Peucedanum alsaticum, Elymus hispidus, Chamaecytisus supinus, Achillea pannonica.

3) Geographical distribution: Austria.

Syntaxa for Austria: Astragalo excapi-Crambetum tatarici.

EUNIS habitat type G5.6 Early-stage natural and semi-natural woodlands and regrowth

EUNIS habitat code and names G5.6 Early-stage natural and semi-natural woodlands and regrowth

Description

Early stages of woodland regrowth or newly-colonizing woodland composed predominantly of young individuals of high-forest species that are still less than 5 m in height. Includes young native woodland replanted with indigenous trees and naturally-colonizing stands of non-native trees.

Source Hill, M.O., Moss, D. & Davies, C.E. (2004b)

Legal instruments

Legal instrument	Legally designated habitat	Code
EU Habitats Directive Annex I	Active raised bogs	7110

Descriptive or diagnostic parameters

Parameter	Value(s)
Human activities and impacts:	Whole plant harvesting
Levels of habitat usage (when used in criteria):	No human use
Dominant life forms:	Trees < =5m / low trees
Cover characteristics (when used as criteria):	Trees >10%
Related phytosociological units:	*Betulion pubescentis; Ledo-Pinion; Quercetea pubescentis; Querco-Fagetea; Rhamno-Prunetea; Vaccinio-Piceetea*

EUNIS habitat type F3.1 Temperate thickets and scrub

EUNIS habitat **code and names** F3.1 Temperate thickets and scrub

Description

Successional and plagioclimax scrub, mostly deciduous, of Atlantic, sub-Atlantic or subcontinental affinities, characteristic of the nemoral zone, but also colonizing cool, moist or disturbed stations of the mediterranean evergreen forest zone. Included are thickets of *Buxus sempervirens*, *Corylus avellana*, *Cytisus scoparius*, *Juniperus communis*, *Prunus spinosa*, *Rubus fruticosus* and *Ulex europaeus*.

Source Hill, M.O., Moss, D. & Davies, C.E. (2004a)

Legal instruments

Legal instrument	Legally designated habitat	Code
EU Habitats Directive Annex I	Stable xerothermophilous formations with Buxus sempervirens on rock slopes (Berberidion pp)	5110
	Juniperus communis formations on heaths or calcareous grasslands	5130

Descriptive or diagnostic parameters

Parameter	Value(s)
Climate zones:	Temperate
Dominant life forms:	Shrubs; Mixed deciduous and evergreen shrubs; Broadleaved deciduous shrubs
Related phytosociological units:	*Adenocarpion decorticantis; Berberidion vulgaris; Carpinion betuli; Carpinion orientalis; Carpino-Prunion; Dicrano-Pinion; Frangulo alni-Pyrion cordatae; Genistion floridae; Genistion polygaliphyllae; Prunetalia spinosae; Pruno-Rubion radulae; Rhamno-Prunetea; Sambucetalia racemosae; Tilio-Acerion; Ulicetalia minoris*

EUNIS habitat type: I1.1 Intensive unmixed crops.

EUNIS habitat **code and names** I1.1 Intensive unmixed crops

Description

Cereal and other crops grown on large, unbroken surfaces in open field landscapes.

Source Devillers, P., Devillers-Terschuren, J. and Vander Linden, C. (2001)

Descriptive or diagnostic parameters

Parameter	Value(s)
Human activities and impacts:	Agriculture/Horticulture; Agricultural use; Large-scale, high intensity agricultural use; Arable practices; Large-scale, high intensity horticultural use; Fertilisation; Use of pesticides ; Anthropogenic impacts
Levels of habitat usage (when used in criteria):	Active use; Intensive use / disturbance; Active management
Dominant life forms:	Herbs
Species richness (when used in criteria):	Monospecific

EUNIS habitat type: E5.1 Anthropogenic herb stands

EUNIS habitat **code and names** E5.1 Anthropogenic herb stands

Description

Stands of herbs developing on abandoned urban or agricultural land, on land that has been reclaimed, on transport networks, or on land used for waste disposal.

Source Hill, M.O., Moss, D. & Davies, C.E. (2004b)

Descriptive or diagnostic parameters

Parameter	Value(s)
Human activities and impacts:	Fertilisation; Anthropogenic impacts
Dominant life forms:	Forbs
Chemical attributes:	Nitrate-enriched

CIII Additional Bird Survey Methodology

CIII.I Introduction and overview

WEBG intend to develop a 158.46 MW wind farm project in Serbia. The proposed site is located about 30 km to the north east of Belgrade (in Vojvodina province) and covers an area of about 37 km^2.

Bird surveys were undertaken between 2009 and 2010 by two teams of local specialists, managed by Ecoda Ltd, Germany.

In May 2011 Atkins were instructed to assess the work conducted by Ecoda and produce an Environmental Statement (WS Atkins International Limited, 2012). As part of the process, an EIA scoping report for the WEBG Čibuk 1 wind farm in Serbia was produced by Atkins in June 2011. During this process a number of limitations within the existing survey methodology were identified, including the bird data. Some disparity between the survey methodologies of the two teams has been noted, and flight data, although thorough, was unfortunately not suitable for undertaking collision risk analysis (an increasingly used technique which identifies bird species most at risk of collision with wind turbines). In addition, breeding bird estimates within the wind farm site rely on local expert knowledge rather than accurate measures of population density.

Additional baseline survey data is currently being collected to bring the baseline data collected in line with the current U.K. guidance on carrying out an ornithological Ecological Impact Assessment for a proposed wind farm (surveys started in November 2011 and ended in July 2012). This data collection enabled collision risk analysis and breeding bird population analysis to be conducted. This additional data were recorded in a supplementary report to the Environmental Statement, produced in August 2012.

CIII.II Methodology

There is no European survey guidance for wind farm assessments, therefore standard guidance documents for U.K. wind farm assessments are used for the additional bird surveys. Several U.K. guidance documents were reviewed by an Atkins ecologist in September 2011 when devising the ornithological survey and assessment methodology for the project:

- *Guidelines for Baseline Ecological Assessment* (Institute of Environmental Assessment, 1995)
- *Technical Information Note TIN069: Assessing the effects of onshore windfarms on birds* (Natural England, 2010).
- *Survey Methods for use in Assessing the Impacts of Onshore Windfarms on Bird Communities* (Scottish Natural Heritage, 2005)
- *Assessing Significance of Impacts from Onshore Windfarms on Birds Outwith Designated Areas* (Scottish Natural Heritage, 2006);
- *Windfarms and Birds: Calculating a Theoretical Collision Risk Assuming no Avoiding Action* (Scottish Natural Hertitage, 2000)*;* and,
- *Bird Monitoring Methods* (Gilbert et al, 1998).

CIII.III Field Survey

Surveys are being carried out by two local expert surveyors, under the management and assistance of an Atkins ornithologist. The following survey protocol has been designed to bring the baseline data collected in line with the current U.K. guidance on carrying out an ornithological Ecological Impact Assessment for a proposed wind farm:

- 36 hours of Vantage Point (VP) survey work at six Vantage Point locations (total of 216 hours) during the 2009-2010 winter season (November 2011 to early March 2012);
- 36 hours of Vantage Point survey work at six Vantage Point locations (total of 216 hours) during the 2012 breeding bird season (mid-March 2012 to July 2012);

- Nine breeding bird surveys during the breeding season (mid-March 2012 to July 2012).

This approach ensures that the survey work covers a full winter and breeding season, in accordance with Natural England and Scottish Natural Heritage guidance. The site is not considered to be significant for migrating birds during spring and autumn (Ecoda Consulting, 2011b) and therefore does not require additional survey effort during these periods.

Vantage Point (VP) surveys

For the original baseline data collection, managed by Ecoda, 5 VP locations were used by Team 1 and 6 VP locations were used by Team 2 (Ecoda Consulting, 2011b). The 6 VP locations used by Team 2 are considered to give sufficient coverage of the wind farm site to gain an understanding of its use by flying birds. All VPs are located at the outer edge of the wind farm site and 1km buffer between the wind farm and Deliblato Sands IBA, in order to avoid disturbance to birds within the survey area. These VPs were used for the additional surveys, with the exception of VP5, which was originally located on the edge of Deliblato Sands (1.3 km from the wind farm site) and has been moved to the edge of the wind farm site to allow better coverage. See Appendix CIII.V for a map of the VP locations.

Winter VP surveys

Thirty-six hours of survey were conducted at each VP during the winter season (November 2011 to early March 2012), following NE guidance (Natural England, 2010) and SNH survey guidance (Scottish Natural Heritage, 2005).

In accordance with guidelines, surveys lasted two hours per VP, with a gap of at least 15 minutes between each survey.

Surveys were undertaken in a range of weather conditions as birds will alter their behaviour and flight patterns. Start times varied, ensuring that surveys were undertaken throughout the day, between dawn and dusk for each VP over the winter season.

Breeding season VP surveys

Thirty-six hours of survey has been conducted at each VP during the breeding season (mid-March 2012 to July 2012), following NE guidance (Natural England, 2010) and SNH survey guidance (Scottish Natural Hertitage, 2000).

In accordance with guidelines, surveys last two hours per VP, with a gap of at least 15 minutes between each survey.

Surveys were undertaken in a range of weather conditions as birds will alter their behaviour and flight patterns. Start times varied, ensuring that surveys are undertaken throughout the day, between dawn and dusk for each VP over the breeding season.

Target Species

A list of 32 target species considered to be particularly vulnerable to wind farms has been taken from the Environmental Statement (WS Atkins International Limited, 2012). These species are target species due to their national and international significance as well as due to their specific biometrics, flight behaviour and potential sensitivity to the alteration of their habitats by the construction of wind farm infrastructures. Table 4 shows a list of the target species, along with their international conservation status.

Table 4: List of target species and their protected status (taken from Ecoda, 2011b)

Species	Bern	Bonn	Bird Directive	Birdlife International (2004)	IUCN
Great cormorant	III				
Pygmy cormorant	II		I	SPEC 1	
Black-crowned night heron	II		I	SPEC 3	
Purple heron	II		I	SPEC 3	
White stork	II	II	I	SPEC 2	

Bean goose	II		IIa		
White-fronted goose	II/III		IIb, IIIb		
Greylag goose	II/III		IIa, IIIb		
European honey buzzard	II	II	I		
White-tailed eagle	II	I	I	SPEC 1	
Western marsh harrier	II	II	I		
Hen harrier	II	II	I	SPEC 3	
Montagu's harrier	II	II	I		
Northern goshawk	II	II			
Eurasian sparrowhawk	II	II			
Common buzzard	II	II			
Rough-legged buzzard	II	II			
Booted eagle	II	II	I	SPEC 3	
Common kestrel	II	II	I	SPEC 3	
Red-footed falcon	II	II	I	SPEC 3	NT
Merlin	II	II	I	SPEC 3	
Eurasian hobby	II	II	I		
Saker falcon	II	II	I	SPEC 1	VU
Peregrine falcon	II	II	I		
Common crane	II	II	I	SPEC 2	
Long-eared owl	II				
Eurasian scops owl	II			SPEC 2	
Little owl	II			SPEC 3	
Barn owl	II			SPEC 3	
Tawny owl	II				
European bee-eater	II	II		SPEC 3	
European roller	II	II	I	SPEC 2	NT

Explanatory Text for Qualifying Criteria

Bern: Bern Convention on the Conservation of European Wildlife and Natural Habitats

II: strictly protected fauna species

III: protected fauna species

Bonn: Bonn Convention on the Conservation of Migratory Species of Wild Animals, CMS

I: Endangered migratory species

II: Migratory species conserved by agreements

Birds Directive: Directive 2009/147/EC of The European Parliament and of the Council Of 30 November 2009 on the conservation of wild birds

I: The species mentioned in Annex I shall be the subject of special conservation measures concerning their habitat in order to ensure their survival and reproduction in their area of distribution.

IIa: The species referred to in Annex II, Part A may be hunted in the geographical sea and land area where this Directive applies.

IIb: The species referred to in Annex II, Part B may be hunted only in the Member States in respect of which they are indicated.

IIIa: The activities referred to in paragraph 1 shall not be prohibited in respect of the species referred to in Annex III, Part A, provided that the birds have been legally killed or captured or otherwise legally acquired.

IIIb: Member States may, for the species listed in Annex III, Part B, allow within their territory the activities referred to in paragraph 1, making provision for certain restrictions, provided that the birds have been legally killed or captured or otherwise legally acquired.

Birdlife International (2004): (Bird) Species of European Conservation Concern:

SPEC 1: Species of global conservation concern, i.e. classified as globally threatened, near threatened or data deficient (BIRDLIFE INTERNATIONAL 2004a).

SPEC 2: Concentrated in Europe and with an unfavourable conservational status.

SPEC 3: Not concentrated in Europe but with an unfavourable conservational status.

IUCN: European IUCN Red List Category:
VU: vulnerable
NT: near threatened

During the initial scoping process, 35 target species were identified for the site. This list was later reduced to 32 species when it was determined that black-headed gull, Caspian gull and common raven should not be target species as these species are not considered to be vulnerable or endangered, nor to be potentially vulnerable to wind farms (Ecoda Consulting, 2011b).

The target species for the additional bird surveys includes all 32 target species listed above, but also includes black-headed gull, Caspian gull and common raven, on a precautionary basis.

Data collection

During the vantage point surveys, details of all target species seen or heard are recorded. Information recorded includes: species, sex (where possible), number, flight direction, location, flight duration and flight height for every 15 second period of height.

During the previous studies outlined in Ecoda (Ecoda Consulting, 2011b), flight height has been recorded at 5 different height categories (<50m, 50m-100m, 100m-150m, 150m-200m, >200m), with the minimum, maximum and average height recorded. Additional surveys are continuing to record the same height categories as the proposed turbines are expected to sweep the height of between approximately 60-80m up to 210m.

For the duration of a target species flight, the flight height is recorded every 15 seconds. This is important as this enables an amount of time spent within the potential collision risk height (approximately 60m-200m) to be established for each target species: an essential statistic for collision risk analysis.

All target species flights are also hand drawn on a map. A different map is used for each survey, and a clear target notes allow each hand drawn flight to be associated with the correct flight details.

During the survey, whilst no target species are present within the survey envelope, information on secondary species is collected, and summarised. Secondary species are those not included on the 'target species' list, but due to their flight patterns and behaviour are still thought to be of some risk from a wind turbine development. Due to their relatively un-manoeuvrable flight behaviour, secondary species includes all raptors, waders, herons and wildfowl not already included as target species.

For these secondary species, the number of individuals, flight direction and general flight height was recorded during the VP surveys. Recording of secondary species is subsidiary to recording of target species.

Breeding Bird Surveys

Because of the gaps in the knowledge of breeding bird populations within the wind farm site, preventing robust conclusions to be drawn on the impacts of the proposed wind farm on breeding birds, further breeding bird surveys were carried out to allow an assessment of impacts to be established.

In line with the latest U.K. guidance (Natural England, 2010), nine surveys were carried out, approximately every 2 weeks between mid-March 2012 and July 2012.

The wind farm site consists of intensive arable land, therefore it is considered that a detailed assessment of a proportion of the site, will allow an accurate extrapolated estimate of the breeding populations within the wind farm site.

Six squares, each 1km^2, have been selected. These squares have been chosen so that they are spread across the wind farm site and contain sufficient tracks to allow survey access within 200m of every point within the survey area; this should be sufficient to allow all vocal birds within the survey area to be recorded due to the open habitats present. Tracks were adhered to as it was not possible to penetrate the crops at later stages of the breeding season. The survey squares are shown in Appendix C.IV.

Each survey visit consisted of two surveyors, each covering 3 x 1km^2 squares.

Surveys start at sunrise, when birds are the most active and the starting point and direction of the survey route varied each time to ensure that there is no tendency for any part of the survey area to be visited earlier or later in the day. Surveys were undertaken in fair weather conditions (i.e. not in heavy rain, poor visibility or wind greater than Beaufort 4[15]).

Maps of the survey route and boundary were provided for every survey. All birds observed and any behavioural activity that they are displaying (such as singing, carrying food) was recorded on a map for each survey. The map also included details of date, start and finish time, sunrise time and weather.

After several visits, the information obtained for each species can be transferred onto a separate map, the species map. Registrations on the species maps should fall more or less neatly into clusters and the maps can be analysed to establish the number of territories present with the survey area (Gilbert et al, 1998).

CIII.IVData Analysis

Vantage point surveys

Collision risk analysis was carried out on the target species flight data. The analysis used the data collected to estimate the total amount of time that each target species spends within the site at collision risk height over the period of a year. This can then be used to estimate the number of passes through a wind turbine that each target species will make per year, which can then be converted into an estimation of number of collisions per year for each target species, based on their known avoidance rates.

Breeding bird surveys

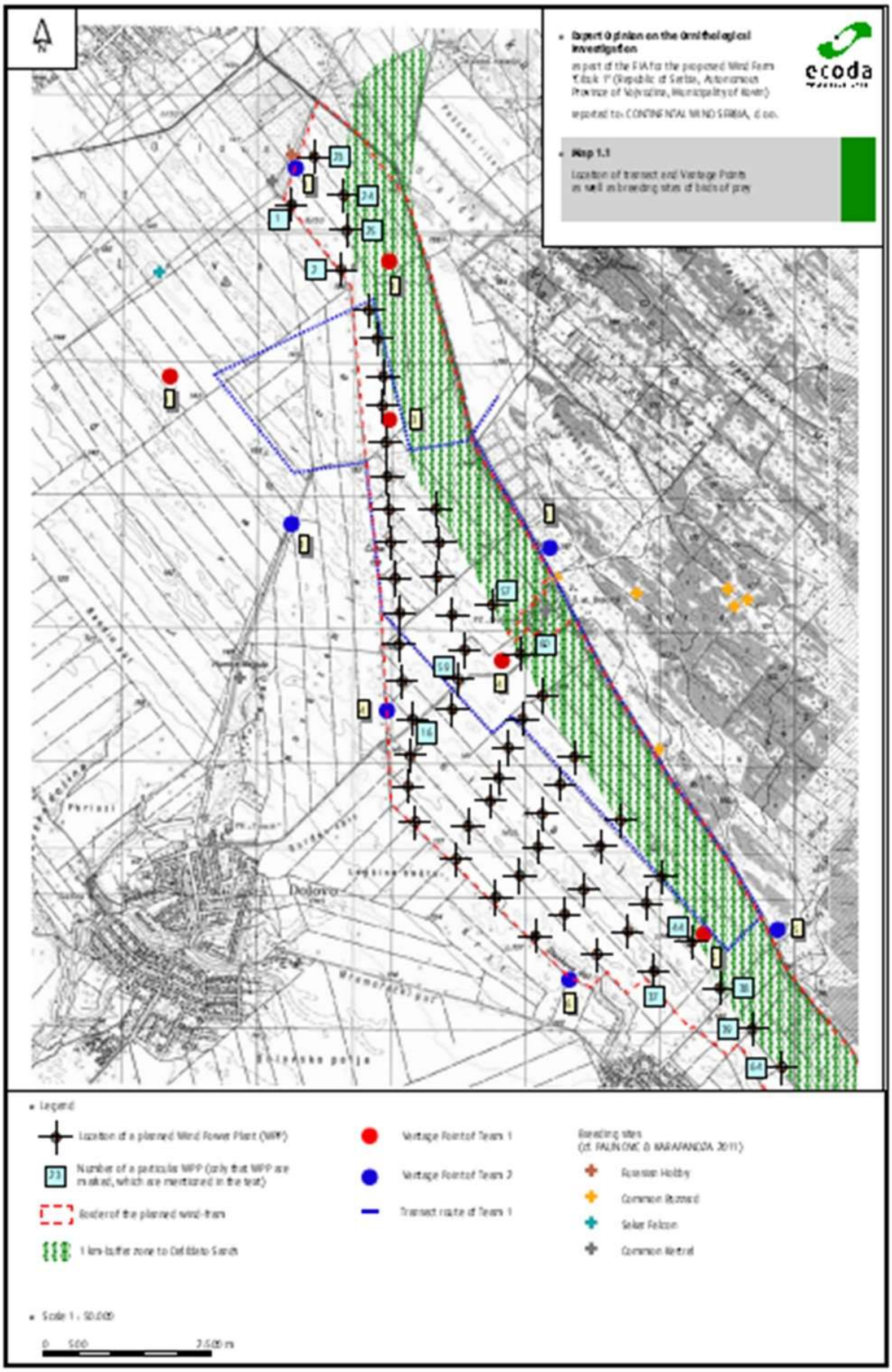
The habitat within the wind farm site is a uniform mix of intensive arable crops. Six 1km squares (600 ha) will be surveyed 9 times during the breeding season, allowing population estimates to be established for each survey area.

Due to the uniform arable habitat within the site, it will be possible to estimate the total breeding bird populations of the whole site by extrapolating the number of territories recorded within the breeding bird survey areas. The total population estimate for the whole survey area (600ha) can be multiplied by 5.29 to estimate the total populations within the wind farm site (3,716 ha). It will also be possible to identify the habitats within which particular species breed.

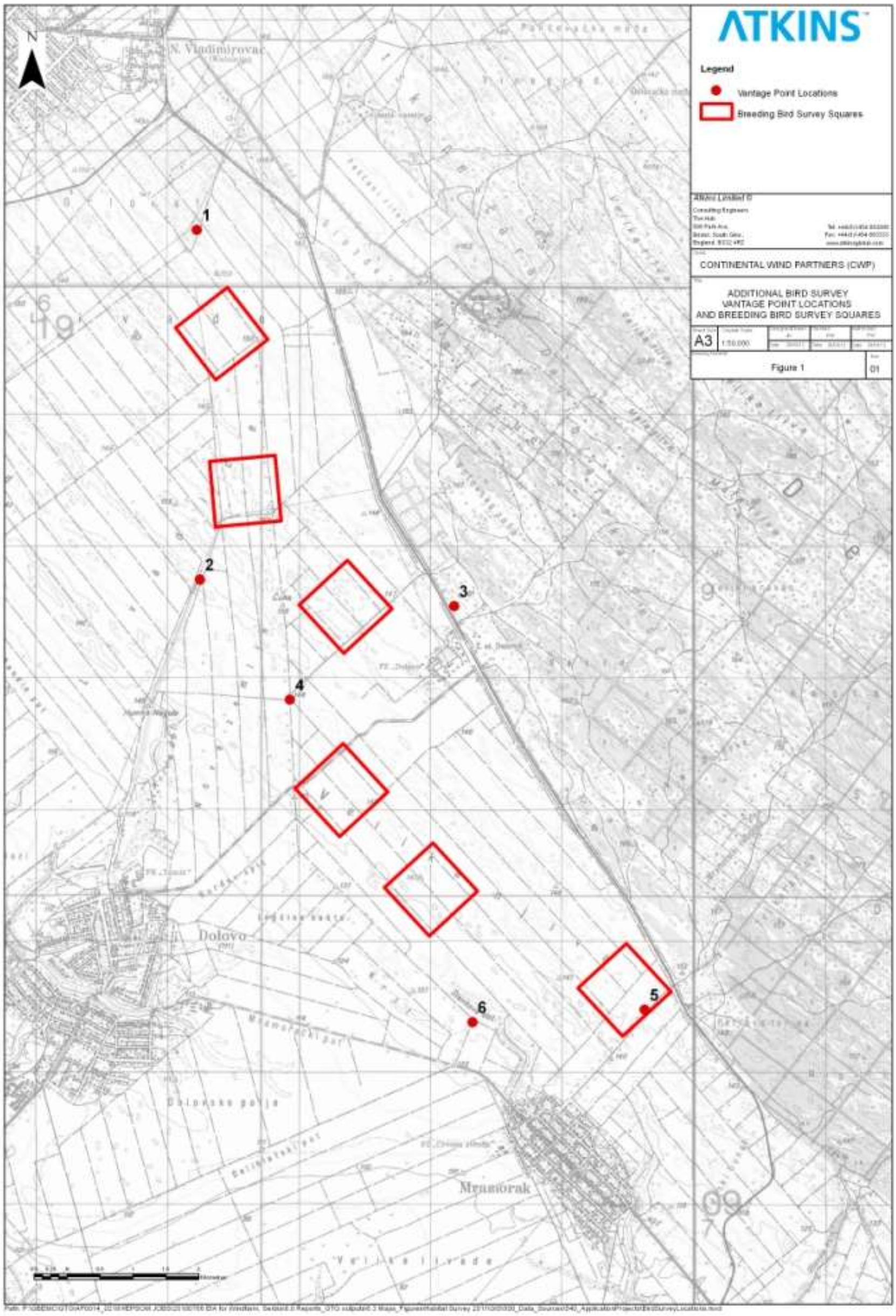
The results and the impact assessment are described in Appendix D I.III

[15] Beaufort scale is an empirical measure for describing wind speed, ranging from 0 (calm) to 12 (hurricane). Beaufort 4 = moderate breeze (11-16 knots)

CIII.V Original Bird Survey Locations



CIV Additional Bird Survey Locations



D Assessment of Impact

D1 Introduction

The following sections, detail the environmental and social impact assessment of the proposed Čibuk 1 wind farm. *Since the assessments were undertaken, the wind turbine design has changed so that the wind turbines are most likely to be 2.5 MW. The environmental and social assessments undertaken for the project were based on a worst case scenario of 3.2 MW turbines.*

The approach to the environmental and social assessment has been informed by:

- The requirements of the international investment banks, namely the requirements of the Equator Principles, the European Bank for Reconstruction and Development (EBRD) and International Finance Corporation (IFC);
- Serbian regulatory requirements, in particular the Law on Environmental Impact Assessment (Off. Journal of RS, No. 135/2004, 36/2010) as well as issue specific regulatory requirements such as those associated with noise emissions;
- The requirements of European Commissions, namely EC Directive 97/11;
- Guidance applicable to the project, including Guidelines on the Environmental Impact Assessment for Wind Farms, UNDP Serbia, 2010;
- The nature of the project design;
- The environmental and socio-economic background of the proposed project area;
- The expertise of the ESIA team in undertaking similar projects.
- The scope of assessment as agreed in the ESIA Scoping Study, submitted to the EBRD, and the EIA Scoping Study submitted to the Serbian regulatory authorities.

The applicable environmental and socio-economic requirements are discussed in more detail in Section A.

Environmental and social assessments are complex processes, are multi-faceted and with many overlapping elements. This requires experience, expert knowledge and expert judgement. Further, within each technical discipline associated with the assessment (i.e. ecology, noise, air emissions impact, landscape, social, economic etc.), there are specific approaches to assessment which are specific to that discipline. Where specific approaches to identify impacts have been adopted, these are described in the introductions to the pertinent sections associated with impact assessment. The impacts, corresponding management and mitigation measures together with the residual impact after management and mitigation have been applied are summarised in Section F of this report. In the presentation of residual impact, we have adopted a common approach to communicate the impacts of the project during construction, operation and closure and decommissioning.

D2 Construction

The following sections provide an assessment of the potential impacts of the project activities during the construction phase. A summary of the impacts, management and mitigation measures is presented in Section F2. The Monitoring Programme with all impacts is presented in Section E5.

D2.1 Ecology and Nature Conservation

D2.1.1 Approach

Apart from the 1.3 km offset of turbines from the Deliblato Sands SNR / IBA which was agreed at an early stage, the impact assessment below has been undertaken without taking into account mitigation measures. Details of mitigation, enhancement, and residual impacts can be found in Section E.

This impact assessment of the ecological receptors within the site is based on the Phase 1 habitat survey, desk study, and subsequent nature conservation evaluation.

Although no field survey of the overhead power lines has been undertaken, desk based assessment indicates that the habitats and associated species present along the route are the same as those found within the wind farm site itself. Construction impacts detailed below can be taken to apply to both the construction of the wind farm, and the overhead power line.

Impact assessments for birds and bats have been undertaken separately, and can be found in sections D2.2.5 and D2.2.6.

D2.1.2 Designated Sites

Deliblato Sands Special Nature Reserve / Important Bid Area

Serbian law requires a 600 m offset of turbines from designated wildlife sites. To ensure best practice, WEBG have agreed a 1.3 km set back of the proposed wind farm from the Deliblato Sands SNR/IBA. This measure has been introduced to reduce the potential impacts that the wind farm development may have on birds from the Deliblato Sands SNR/IBA. It is understood that all construction traffic will access the site from the west, and will not pass through the Deliblato Sands SNR/IBA.

The distance from the proposed wind turbine locations to Deliblato Sands SNR/IBA means that there will be no loss or disturbance to protected habitats during the construction phase.

Analysis of the potential impacts to qualifying bird species of the IBA can be found in section D2.2.6.

Bara Kraljevac, Crna Bara and River Danube

Any specific hydrological connections between the proposed wind farm and these sites is not known. However, it can be assumed that being within their catchment, surface and ground water from the proposed wind farm site will eventually discharge into the Danube via ditches, streams, canals and rivers.

The lack of watercourses within the site indicates that it is unlikely that potential pollutants from construction of the wind farm (e.g. fuel oil, silt etc.) would enter the hydrological system in the local area. In addition, the distance of Bara Kraljeva, Crna Bara, and the River Danube from the proposed wind farm site (7, 12, and 25 km respectively) suggests that there will be no significant risk of adverse impacts. In the event that the Danube is used as a transport route for plant and materials during construction, it is expected that there will be no detrimental ecological impacts, assuming good environmental practices are also adopted during transport (these will need to be set out in the Construction Environmental Management Plan). This is currently a significant shipping route with associated docks for suitable transportation of equipment.

No impacts to Bara Kraljevac, Crna Bara and River Danube are anticipated.

D2.1.3 Habitats

Arable Farmland

A total of at least 111,207 m^2 (11.12 ha) of largely intensively cultivated agricultural land will be permanently lost to the footprint of the wind turbines, access roads and other infrastructure. There

will be direct loss of this habitat, although this habitat has been assessed as being of negligible conservation importance. This impact is not significant.

Grasslands

The habitats of highest ecological value at the site are the steppic grasslands found along the eastern margins of the site, in the vicinity of the railway line and to the east of this. As a result of the 1.3 km offset from the boundary of the IBA, the turbines have been located to the west of the site, well away from this habitat, and no direct impact during the construction phase are anticipated.

Smaller areas of grassland bounding roads through the site will possibly be impacted during the construction phase through disturbance and permanent loss, although the exact extent of this is not known. It is understood that most of the turbines will be located away from roads passing through the site, and so these areas are not likely to be significantly affected. New tracks will be created between the turbines for access and maintenance, and so wayside grassland habitats such as these may increase. This impact is not significant.

Woodland and Scrub

Areas of woodland and scrub within the site are very limited. Small scale clearance of the habitat may be required to allow construction of turbine bases and access roads. New tracks will be created between the turbines for access and maintenance, and so wayside woodland and scrub habitats such as these may increase. This habitat is of ecological value within the site only, and the loss of some areas is considered to be insignificant.

D2.1.4 Ground Mammals and Reptiles

Though the assemblage of mammal species likely to be present on the site is not diverse and of negligible nature conservation value, the habitats present have been assessed as potentially suitable for a number of legally protected species of mammal (*Dolovo Windfarm Habitat Survey*, Atkins, 2011). Under Serbian legislation it is forbidden to take or destroy these animals, or undertake any activities which may endanger protected species and their habitats.

The bi-coloured white-toothed shrew (*Crocidura leucodon*), the lesser white–toothed shrew (*Crocidura suaveolans*), and lesser mole rat (*Nannospalax leucodon*) all inhabit open semi-natural agricultural landscapes, such as steppe grasslands which can be found at the east of the site. However, all species can be negatively affected by intensive agricultural practices including the use of herbicides and insecticides. Therefore although all three species may be present within the site, the context of intensive arable farmland means the site is considered sub-optimal for these small mammals and so significant numbers are unlikely to be present.

Weasel (*Mustela nivalis*), stoat (*Mustela erminea*), and badger (*Meles meles*) are all able to exploit a wide range of habitat types, including intensive arable farmland, although the lack of prey species caused by the use of insecticides and herbicides would make this habitat sub-optimal. The loss of areas of sub-optimal intensive arable farmland for the construction of the turbines is unlikely to offer a significant negative impact on these species.

The loss of areas of sub-optimal intensive arable farmland for the construction of the turbines is unlikely to result in a significant negative impact on the populations of mammal species, if present. However, they may be impacted if the steppic grasslands along access tracks are at risk during construction and therefore to comply with Serbian legislation, works will need to be undertaken in a manner which does not pose risk of damage or destruction to legally protected animals.

The site supports a common assemblage of reptile species considered to be of negligible ecological value. The construction of the wind farm will result in the loss of intensive arable farmland, of little value to reptiles. There may be some loss or disturbance to marginal grassland and ruderal habitats which reptiles inhabit. However this is likely to be offset by new marginal habitat formed alongside new access tracks and infrastructure. Impacts to reptiles are considered to be temporary, unlikely, and not significant.

D2.1.5 Bats

The habitats within the proposed site have been shown to be of value to commuting and foraging for bats. Habitats at the site are currently very open with few linear habitat features other than ruderal and grassland strips between blocks of arable farmland. Linear features will not be significantly affected by construction of the proposed wind farm and there would be no loss or fragmentation of habitat used as commuting routes or foraging areas.

Approximately 11.12 ha of arable farmland would be permanently lost at the turbine locations and for associated infrastructure. The loss of habitats within the construction footprint would result in a negligible magnitude of change, which for the most important bat receptors of moderate importance, would result in an effect that would be not significant.

Construction impacts to bats can come through damage or disturbance of bat roosts by heavy plant and disturbance to active bats from construction activities. The closest known bat roost is located over 150 m meters from the nearest planned wind turbine (near VP 8). There are no assessment standards for the effects of noise on wildlife. Although there is literature concerning the effects of noise on wildlife in general, and particularly on birds, the literature on noise disturbance of bats has concentrated on interference with echolocation and how this affects hunting and orientation rather than disturbance of bats in roosts during the day. A full noise assessment has been carried out and is reported in Section C3.9, although this assessment deals with noise in relation to human receptors. The nearest roost is located near to residential property and therefore controls on noise levels at this location will be required as a matter of course. In addition, this roost is located next to a road used by cars and agricultural vehicles. As such the noise levels experienced by bats as a result of construction traffic over 150 m away would be unlikely to cause significant disturbance. Due to the distance from the closest construction area, it is considered unlikely that there will be any disturbance impacts to this roost during construction.

Some areas of the site have been assessed as being of moderate to high value to foraging bats (see Maps 5.1-5.1 (Ecoda Consulting, 2011a)). There may be impacts to foraging and commuting bats in these areas from noise, vibration, and lighting. In particular, some bats such as greater horseshoe will actively avoid lit areas. Although specific details of the construction programme were not available at the time of writing, it is considered likely that construction work will be undertaken at a limited number of locations simultaneously, and works will largely be undertaken during the hours of daylight when bats are not active. Therefore disturbance to bats through noise, lighting and vibration will be restricted to limited areas of the site at a time, allowing bats to continue to forage and commute across the majority of the site where construction is not underway. These impacts will be temporary, and are not considered to be significant.

D2.1.6 Birds

Ecoda (Ecoda Consulting, 2011b) have assessed the overall significance of potential construction impacts on the 11 species of special interest for which adverse impacts from the wind farm are possible. Table D.1 considers the potential construction impacts in terms of mortality, disturbance and habitat loss on each species. The level of significance of each impact is assessed for each species using a four point scale (negligible, low, moderate, high). The scale of significance and the species-specific vulnerability is described in detail on pages 115-138 of the Expert Opinion (Ecoda Consulting, 2011b).

There will be no night working during construction and night-time lighting will be at a minimum. Therefore the potential impact of lighting on breeding birds and passage migrants has not been considered for the potential construction impacts.

When the potential impacts of construction on each species is taken into account, only one species, the common quail, is identified as potentially undergoing an adverse impact of more than negligible significance. The disturbance to common quails expected during construction is expected to result in an adverse impact of low significance, and the temporary loss of habitat is expected to cause adverse impact of low significance.

The installation of the OHL will cause temporary disturbance within a very narrow corridor. Due to the similar agricultural habitat, the bird species breeding within the OHL route are expected to be similar to those recorded within the survey area. This localised disturbance will not have a significant impact on any bird species.

Vegetation clearance for the wind farm and associated OHLs will be timed to avoid the breeding bird season, therefore ensuring that bird nests, eggs or young are not destroyed during the construction process.

Table D.1: Potential construction impacts on the 11 species of special interest for which adverse impacts from the wind farm are possible

Species	Potential construction impacts	Overall significance
Common quail	Adult birds are expected to avoid construction machinery and therefore mortality. There is a low risk that mortality may occur if quails chose to nest within construction routes. However, this low risk is not thought to have an effect on the conservational status of the common quail population within the survey area or the wider countryside and is thought to be of negligible significance. Construction is likely to overlap with the breeding season and therefore some disturbance may occur. However, it is considered that this disturbance will be temporary and will not affect the conservational status of the common quail population within the survey area or the wider countryside. This is considered to be of low significance. Some breeding habitat will be lost during the construction process. It is estimated that approximately 6.84 hectares will be temporarily lost and approximately 11.12 hectares will be permanently lost out of a total wind farm area of 3,716 hectares. The loss of habitat is relatively small, approximately 0.4% of the entire wind farm site. This temporary small loss of habitat is likely to have an impact of low significance on the common quail population within the wind farm site.	Negligible significance of mortality Low significance of disturbance Low significance of loss of habitat
Western marsh harrier	Western marsh harriers are considered sufficiently mobile to actively avoid construction collisions such as traffic. There is no evidence of breeding, nor suitable breeding habitat, within the survey area. Therefore mortality as a result of construction is expected to be of no significance. Due to the abundant surrounding cultivated land, the effects of temporary construction is expected to have a negligible impact on hunting western marsh harriers, either as a result of disturbance or habitat loss, since they have the use of alternative areas.	Negligible significance of mortality, disturbance or habitat loss
Common buzzard	Common buzzards are considered sufficiently mobile to actively avoid construction collisions such as traffic. There is no evidence of breeding or suitable breeding habitat, within the survey area that will be lost. Therefore mortality as a result of construction is expected to be of no significance. The distance of existing breeding sites to the nearest location of planned turbine is approximately 1km therefore disturbances of the nesting sites due to construction of the turbine or related infrastructure can be excluded. However, the construction of turbines could lead to temporary disturbance of hunting individuals during the reproduction period as well as during migration and hibernation. It is considered very likely that the effects of temporary disturbance during construction can be compensated by the affected individuals hunting within alternative cultivated land in the vicinity of the study area. Due to the availability of alternative habitats, there is not expected to be a significant influence on the success of breeding pairs or on reproduction and the survival rate of common buzzards. Breeding territories are approximately 1km from the nearest turbines. Therefore no destruction or deterioration of breeding sites during construction is expected.	Negligible significance of mortality, disturbance or habitat loss
Booted eagle	Booted eagles are considered to be sufficiently mobile to actively avoid construction collisions such as traffic. There is no evidence of breeding or suitable breeding habitat, within the survey area. Therefore mortality as a result of construction is expected to be of no significance.	Negligible significance of mortality, disturbance or habitat loss

	The nearest potential breeding habitat is within Deliblato Sands, over 1km away, therefore direct disturbance of nest sites is not considered to be a potential issue. Due to the abundant surrounding cultivated land, the effects of temporary construction is expected to have a negligible impact on hunting booted eagles, either as a result of disturbance or habitat loss, since they have the use of alternative areas.	
Common kestrel	Common kestrels are considered sufficiently mobile to actively avoid construction collisions such as traffic. There is no evidence of breeding within the habitat to be lost. Therefore mortality as a result of construction is expected to be of no significance. The distance of existing breeding sites to the nearest location of planned turbine is approximately 500m therefore disturbances of the nesting sites due to construction of the turbine or related infrastructure can be excluded. However, the construction of turbines could lead to temporary disturbance of hunting individuals during the reproduction period as well as during migration and over winter. It is considered very likely that the effects of temporary disturbance during construction can be compensated by the affected individuals hunting within alternative cultivated land in the vicinity of the survey area. Due to the availability of alternative habitats, there is not expected to be a significant influence on the success of breeding pairs or on reproduction and the survival rate of common kestrels.	Negligible significance of mortality, disturbance or habitat loss
Eurasian hobby	Eurasian hobbies are considered sufficiently mobile to actively avoid construction collisions such as traffic. There is no evidence of breeding within the habitat to be lost. Therefore mortality as a result of construction is expected to be of no significance. The distance of existing breeding sites to the nearest location of planned turbine is over 250m. Therefore disturbances of the nesting sites due to construction of the turbine or related infrastructure is considered unlikely. However, the construction of turbines could lead to temporary disturbance of hunting individuals during the reproduction period as well as during migration and hibernation. It is considered very likely that the effects of temporary disturbance during construction can be compensated by the affected individuals hunting within alternative cultivated land in the vicinity of the study area. Due to the availability of alternative habitats, there is not expected to be a significant influence on the success of breeding pairs or on reproduction and the survival rate of Eurasian hobbies.	Negligible significance of mortality, disturbance or habitat loss
Saker falcon	Saker falcons are considered to be sufficiently mobile to actively avoid construction collisions such as traffic. There is no evidence of breeding or suitable breeding habitat, within the survey area. Therefore mortality as a result of construction is expected to be of no significance. The nearest potential breeding habitat is approximately 2.5km to the west of the wind farm and therefore direct disturbance of nest sites is not considered to be a potential issue. Due to the abundant surrounding cultivated land, the effects of temporary construction is expected to have a negligible impact on hunting Saker falcon, either as a result of disturbance or habitat loss, as they will have the use of abundant alternative habitat	Negligible significance of mortality, disturbance or habitat loss
European bee-eater	European bee-eaters are considered to be sufficiently mobile to actively avoid construction collisions such as traffic. There is no evidence of breeding or suitable breeding habitat, within the survey area. Therefore mortality as a result of construction is expected to be of no significance. The nearest potential breeding habitat is approximately over 1km to the east of the wind farm, within Deliblato Sands and therefore direct disturbance of nest sites is not considered to be a potential issue. Due to the abundant surrounding cultivated land, the effects of temporary construction is expected to have a negligible impact on foraging European bee-eaters, either as a result of disturbance or habitat loss, as they will have the use of abundant alternative habitat.	Negligible significance of mortality, disturbance or habitat loss
White-fronted goose	White-fronted geese are considered to be sufficiently mobile to actively avoid construction collisions such as traffic.	Negligible significance of mortality, disturbance or habitat loss

	This species is recorded on passage and does not use the site for breeding or resting. Flocks of white - fronted geese may show avoiding action around construction areas, but the impact on the birds' survival is expected to be negligible. White-fronted geese do not use the site for breeding or resting and therefore will not lose any habitat as a result of construction.	
Hen harrier	Hen harriers are considered to be sufficiently mobile to actively avoid construction collisions such as traffic. This species is recorded on passage and over winter and does not use the site for breeding. Due to the abundant surrounding cultivated land, the effects of temporary construction is expected to have a negligible impact on hunting hen harriers, either as a result of disturbance or habitat loss, as they will have the use of abundant alternative habitat.	Negligible significance of mortality, disturbance or habitat loss
Montagu's harrier	Montagu's harriers are considered to be sufficiently mobile to actively avoid construction collisions such as traffic. The nearest potential breeding habitat is considered to be in western Vojvodina. Therefore direct disturbance of nest sites is not considered to be a potential issue. Montagu's harriers may occur during the breeding season or on passage. Due to the abundant surrounding cultivated land, the effects of temporary construction is expected to have a negligible impact on Montagu's harriers, either as a result of disturbance or habitat loss, as they will have the use of abundant alternative habitat.	Negligible significance of mortality, disturbance or habitat loss

D2.2 Landscape and Visual

D2.2.1 Methodology

The methodology of the landscape and visual assessment (LVIA) has been developed to ensure that it considers relevant sensitive receptors and the likelihood of significant landscape and visual impacts, including cumulative effects. The assessment describes the current landscape character of the site and surroundings and its sensitivity to the type of development proposed.

Landscape effects include direct and indirect effects on the landscape as well as effects on the general landscape character. Potential visual receptors and their sensitivity to the type of changes proposed will be identified. Any impacts will be identified and assessed, as well as mitigation measures to avoid, reduce and compensate for these impacts.

The report will assess both the short-term impacts associated with the construction of the wind farm and the long-term impacts relating to the operational lifetime of the wind farm.

A number of figures including photographic panoramas and accompanying photomontages have been prepared in support of the assessment and are referred to throughout this report; these are included within the listed Appendices CI and DI.

D2.2.2 Scope

The information presented in this section is based on the following:

- A site visit by an Atkins landscape architect accompanied by WEBG Wind & Global Information Systems (GIS) Specialist on the 4th and 5th August 2011;
- Information supplied by WEBG and its representatives on the proposed plant design;
- Searches conducted by Atkins on the site baseline, its surroundings and the potential impacts of the proposed facility; and

- Detailed assessment of the significant landscape and visual impacts arising as a result of the construction, operation and decommissioning of the wind farm including the overhead power line connection.

D2.2.3 Spatial Scope

During the initial stages of the assessment the spatial scope was defined at a distance of 30km radius from the turbine location. Based on this distance a computer generated Zone of Theoretical Visibility (ZTV) was calculated for the scheme using GIS software. This provided an indication of the potential visibility of the hub height (120m) and blade tip height (176m total) and enabled the spatial scope of the assessment to be refined.

The spatial scope was refined to during the site visit following the preliminary stages of the desk study which helped to identify which areas and receptors would be potentially subject to significant effects. The ZTV does not take into account landscape features or elements such as buildings or vegetation; the screening value of these has the potential to substantially reduce the degree of exposure to views to the scheme. Therefore site survey work was used to test the accuracy and spatial extent of the ZTV. The ZTV is included within the attached appendices.

D2.2.4 Perception of Wind Turbines

There are a number of different factors that can influence the perception of a wind energy proposal. Weather conditions and daylight are very important. The viewpoint photographs used in this assessment have been taken in times of clear visibility to show the worst case scenario, however timing of site survey work has meant that these are also taken in summer when vegetation is in full leaf and functioning at its most effective as a screen to views.

The 'Visual Assessment of Wind farms: Best Practice' (University of Newcastle, 2002) provides guidance about how turbines may be perceived from different distances. Whilst it is acknowledged that since 2002 there has been a trend for turbines to increase in height and thus be potentially visible over longer distances, it remains true that with increasing distance they are generally less prominent. Conversely it is possible that individual turbines which appear isolated from the main group may appear to create a discordant pattern.

These distances and associated perception are outlined in table below;

Table D.2: Wind Turbine Perception Distances

Distance from viewer to turbine	Perception
Up to 2kms	Likely to be a prominent feature
2-5km	Relatively prominent
5-15km	Only prominent in clear visibility – seen as part of the wider landscape
15-30km	Only seen in very clear visibility – a minor element in the landscape

Guidance on appropriate distances for ZTV diagrams as set out in Table 2, Page 36 of SNH guidance, notes that a radius up to 30km would be suitable for turbines of between 101m and 130m in height (Scottish Natural Heritage, 2006). The figures outlined in the above table are based on recommendations at the time from evidence and extrapolation of precedent wind farm developments.

Weather conditions and daylight are very important. The viewpoint photographs used in this assessment have been taken in times of clear visibility to show the worst case scenario, however timing of site survey work has meant that these are also taken in summer when vegetation is in full leaf and functioning at its most effective as a screen to views. Furthermore, for some of the

viewpoints, the angle of view means that the turbine would be backlit or silhouetted against the sky, potentially causing them to appear darker in colour and thus more prominent.

Shadow flicker, caused where the light from the sun passes through the blades of a moving turbine, can also have an effect at viewpoint locations close to the turbines by drawing the viewer's attention. The distance of the wind farm from the nearest residential properties is greater than 500m which is recognised to be the maximum area over which shadow flicker is experienced, according the Serbian regulations. According to best practice, 10 times the rotor diameter equals the minimum distance from the turbine in order to ensure shadow flicker is eliminated.

Finally, public perception of wind farms varies; different individuals may have firmly held and contrary views about a particular development. This study takes a worst case scenario that predicted effects are adverse. Local opinions are likely to differ both in favour of the wind farm and also and against it. These factors have all been considered and balanced in the judgements made in this assessment on sensitivity and significance of effect.

D2.2.5 Landscape Effects during Construction (short term)

During the enabling and construction phase it is anticipated that construction activities will result in adverse changes in localised areas of land cover. Localised pockets of tree and shrub vegetation will be cleared adjacent to the site to form the new site access points and access tracks between turbines, the route of the proposed overhead power line including the pylon footprints, compound and material storage facilities. Vegetation will be cleared for the installation of the concrete batching facility and the excavation for the underground cabling works, turbine and electric pylon foundations, believed to be 18m in diameter. As a result the site will experience **minor adverse** effects during this period.

It is considered that the construction processes and installation of both the underground and overhead electricity connections linking to the turbines and transformer station will not result in adverse changes to the land cover and vegetation of the area due to the limited footprint of the cabling works. As a result it is considered the above will have **negligible** effect during this period.

The above impacts would be both temporary and transient. It is worth noting that the wind farm including the associated overhead power line and pylons will ultimately occupy a large area (60 km^2), but given the relatively small footprint attributed to a single turbine, construction impacts on land cover and vegetation will occur within relatively small and localised areas across the site.

D2.2.6 Landscape Effects on Landscape Character

The proposals would result in considerable negative change in the landscape character of the site during construction due to the increased 'urbanisation' of the landscape associated with construction activities such as the movement of crane vehicles for the delivery and installation of the turbines and erection of the electricity pylons within a peaceful rural landscape. However as these effects would only occur within a short time period they will be temporary and overall would result in **moderate adverse** effects over this limited time period.

D2.2.7 Landscape Effects on Land Use

It is anticipated that construction activity will result in an increase in vehicular traffic including movement of construction vehicles, plant and equipment as well as any necessary traffic on adjacent roads and lanes, such as the delivery of turbines onto the site.

The proposals will result in adverse change in the land use of the site during construction due to the required construction activities within an agricultural landscape. However these effects will have a limited degree of exposure on the wider area and as such, the effects on the landscape resources throughout the construction phases are expected to be **minor adverse**.

D2.2.8 Landscape Effects on Designated Sites

The proposed development site extents about the Deliblato Sands site to the east; however the proposed development will be contained at a distance of a minimum of 1km from the designated landscape. Though the proposals will not result in direct physical effects on this area; the site must be considered as a contributor to its setting.

Due to variation in topography and vegetation cover it is judged that the designated site would not be directly affected by the presence of construction activity, however during latter phases of the installation of the turbines it is likely that localized areas will experience **minor adverse effects**. Given the alignment and distance of the overhead power line in relation to the designated site this aspect of the proposals are unlikely to have an adverse effect on the designated site.

These localised areas would as a minimum include the setting of the north and western fringes of the designated site areas. These impacts will be attributed to the limited exposure of these areas to the construction activities and impacts should decrease accordingly with distance and inter visibility from these localised areas.

D2.3 Traffic and Transport

D2.3.1 Introduction

The greatest potential for traffic and transport impact is likely to occur during the construction phase. The construction phase will involve a large number of transport movements involving slow, long and potential wide-load vehicles carrying the turbine components. The transport route covered by this assessment, as described in Section B5.3.2 will start at the port of Pančevo, will travel along the E-70 main road until the town of Vladimirovac, before one of several options are chosen to access the site to the east of Vladimirovac. Further, a large number of vehicle numbers will be required to deliver aggregates to the site for the creation of temporary and permanent gravel roads and to create appropriate foundations for the wind turbines. The creation of appropriate foundations will also require transport to the site of metal reinforcements. The wind turbine components and the aggregate and reinforcement transfers represent the bulk of the transport requirements for the site during construction. At present it is not know the extent of the foundations for the wind turbines and therefore the volume of fill materials and transport movements for the fill materials. Similarly, it is not known at present to what extent ground excavation will need to be undertaken for the foundations and the extent of transport off side of excavated materials. There will also be other incidental transport requirements which may lead to short term impacts such as the transport of large cranes to and from the site for construction, and the transport of modular structures such as cabins and sanitary requirements to support on site staff office/domestic requirements. Note that there will be no on site accommodation blocks.

Therefore, associated with the transport route, there are potential impacts that require management and mitigation associated with the harbour, the main and local road networks and within the project area itself.

D2.3.2 Harbour Impacts

The report produced by GE Energy (GE Energy, 2011), concluded that the harbour has appropriate facilities in place to manage the unloading of large scale wind turbine components from barges, additional mobile heavy cranes are used. Further, the harbour facility has appropriate laydown/storage areas to hold wind turbine components, prior to transfer to road going vehicles.

We do not expect that the presence of mobile cranes will disrupt normal operations and the presence of laydown/storage areas will ensure that there is minimal disruption to the normal activities of the harbour. Therefore, with appropriate management of the harbour activities, we do not predict that there will be a significant negative impact on the harbour operations, therefore we have classified the residual impact as **negligible**.

D2.3.3 Impacts on the Main Road Network

The impacts on the main road network are likely to occur in built up areas. There are three built up areas along the proposed transport route:

- Pančevo
- Banatsko Novo Selo
- Vladimirovac

The most significant potential for impact is in Pančevo. Figure D.1 illustrates the road network of Pančevo and the route from the harbour to the open road to Vladimirovac and on to the site.

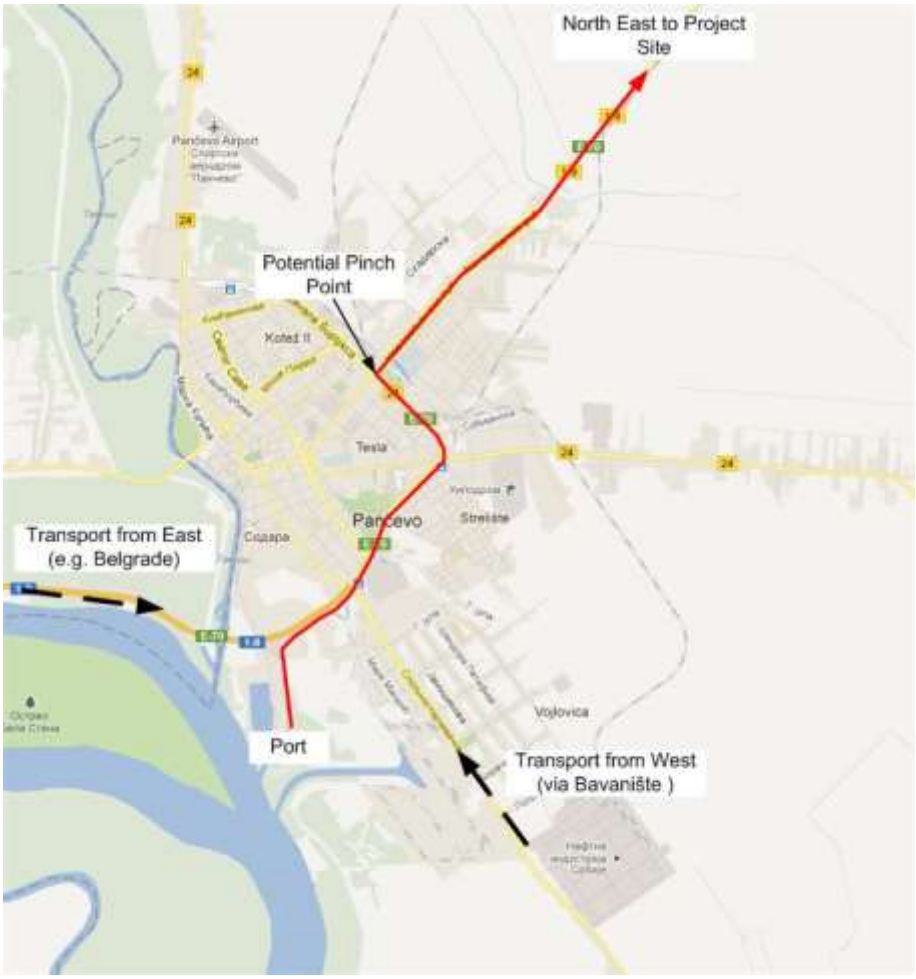


Figure D.1: Plan of the Pančevo Road Network and Transport Route

From Figure D.1 it can be seen that the transport from the harbour and any transport from the west (such as aggregates) will likely require transport along the same built up route. Transport from the east, via Bavanište will also likely use this route. Transport from north east may enter the site to the east via Dolovo. However, the roads from this direction are relatively poor in quality and may cause unnecessary disruption. Therefore, it is also likely that all transport from the east will also travel through the route indicated in Figure D.1.

From Figure D.1 it can be seen that the transport route through Pančevo is through a built up area, which are likely to be the busiest roads in the region. There are one or more potential pinch points such as the cross roads illustrated in Figure D.1. In order to avoid disruption it is

likely that it will be necessary to avoid peak traffic hours and liaise closely with local authorities responsible for traffic management. In the event that appropriate transport management plans are implemented, we classify the residual impact as **low,** in the event that appropriate plans are not in place then this may rise to moderate.

Transport through Banatsko Novo Selo and Vladimirovac is less likely to be problematic. Both villages are relatively small and traffic volumes are low. However, in both circumstances it will be necessary to ensure that transport avoids hours when build ups may occur (particularly during commuting hours) and also liaison with the authorities responsible for the cemetery will be necessary to ensure that transport movements do not cause nuisance during funeral ceremonies. In the event that appropriate management measures are implemented we classify the residual impact as moderate, this may rise to moderate if appropriate plans are not implemented leading to disruption and nuisance.

D2.3.4 Impacts on Local Roads

From the information available of potential transport routes, the main local roads which may be impacted are those associated with site access. Since all other transport roads will use the E-70 main road (discussed above) no other local roads have been considered in this assessment.

The impact on local roads is associated with Vladimirovac and is dependent on the chosen access route to the site. The potential for impact can be categorised as follows:

- Option 1: Access through the northern part of Vladimirovac. Moderate potential for impact. This route has been chosen as the final access route to the site.
- Option 2: Access through the southern part of Vladimirovac. Low/Moderate potential for impact.
- Option 3: Access south of Vladimirovac. Low potential for impact.

The above impacts may be reduced by avoiding transport during times which may cause disruption.

D2.3.5 Impacts within the Project Area

Impacts within the project area will mainly be associated with prevention of access to agricultural plots. The project site is a patchwork of small agricultural plots, crisscrossed with numerous dirt/gravel roads. The potential impacts associated with the proposed project, particularly during the construction stage may lead to moderate impact, particularly if access to plots is prevented by plant and machinery. It is unlikely that it will be viable to completely prevent any impact caused by the disruption of the construction activities. However, development of appropriate passing places, the main construction road (as illustrated in Figures B.6 and C.17) and effective management to avoid blocking of access tracks will reduce the potential impact.

Due to the problems of handling large, slow moving vehicles, the present construction plan includes moving cranes directly from plot to plot, not via any roadways. This will inevitably cause damage to crops and compaction of the agricultural soil and locally the impact will be moderate. WEBG is discussing with the appropriate stakeholders concerning this impact. As part of the Transport Management Plan, the shortest routes between plots should be identified and the transport movements should be planned and rationalised as far as possible in order to minimise impact on the agricultural land. The movements should be planned well ahead and should include appropriate compensation and reinstatement of land where it has been damaged.

The residual impact is likely to be **low** overall but may rise to moderate in some instances. Therefore, appropriate liaison with the local community, understanding and sensitivity towards their requirements, reinstatement where construction has cause disruption and compensation where necessary should be undertaken.

D2.3.6 Conclusions

We do not expect any negative impacts on the harbour operations. It is anticipated that the traffic generated by the construction phase will not have significant impact on traffic that use the main road ways, as long as peak hours of traffic are avoided. There will be some local disruption along the routes, particularly associated with transport in the centre Pančevo and Vladimirovac. The impact associated with Vladimirovac is particularly associated with proposed Site Access 1, to the north of Vladimirovac. Overall, the level of disruption is not expected to be significant as long as it is appropriately managed. Overall, the expected residual is **low** potentially rising to moderate if appropriate management plans are not implemented or followed.

D2.4 Noise

D2.4.1 Construction Activities

Guidance on acceptable levels of noise from construction activities is given in British Standard BS5228. Part 1 of this standard (British Standard, 2009) indicates that for long term and large scale activities involving earth movements, noise from daytime construction activities would not be significant if below 55dB L_{Aeq}. For smaller schemes, noise from daytime construction activities would not be significant if below 65dB L_{Aeq}.

The existing daytime ambient noise levels near the site are such that construction activities at 55dB L_{Aeq} are likely to be audible at the nearest noise sensitive locations.

The nearest noise sensitive receptors to the turbine locations and substation are approximately 1 km away. On this basis, provided the noise levels of the construction activities are below 90dB(A) at 10m or below 120dB(A) sound power level, then 55dB L_{Aeq} would not be exceeded. The majority of construction plant expected to be used would be below these levels, and noise from the construction activities associated with the turbines is not expected to significantly affect the nearby noise sensitive receptors.

There will be noise generated from the concrete batch plant and vehicle movements from the GE lay-down area. It is expected that the noise levels will be limited and that the 55dB L_{Aeq} would not be exceeded.

Should impact piling be required for the construction of the turbine foundations, there may be noise impacts at locations closer than 1500m from the turbine locations.

Away from the area of the turbine locations there are two construction activities planned:

The access route for construction traffic is to the north of the site, and there may be requirements to improve the existing road network including widening and alterations to bends. Such works would be localised and short term, and would not be expected to generate significant impacts.

The electricity generated by the site would be transmitted via overhead power lines, which would pass between the village of Dolovo and the potential site for the Bavanište wind farm. The construction of the overhead line would be localised and short term, and would not be expected to generate significant impacts.

D2.4.2 Construction Traffic

The foundations that will support each of the turbines will be constructed in steel reinforced concrete. Each of the foundations is calculated to require about 800m^3 of concrete. This is a significant quantity of concrete and it would be impractical to transport ready mixed concrete from Pančevo to the Čibuk site (due to the transportation time and the number of vehicles that would be required). The concrete will therefore be prepared on site using a concrete batching plant. This prefabricated plant will be provided and operated by Lafarge.

The concrete batch plant will be the focal point for the delivery of aggregates and cement as well as the movement of mixer trucks from the batch plant to the turbine bases. The batch plant proposed by Lafarge would be able to produce 700 to 800 m^3 of concrete per day, i.e. one

foundation per 10 hour working day. At a production level of 800 to 1000m^3 per day, the plant would require about 1500 t of gravel per day. To meet the production levels required a fleet of up to 12 trucks (making 5 round trips per day) would be required.

The prepared concrete will be transported to turbine foundations using rotating mixer trucks. Each of these trucks has a capacity of 8 to 9 m^3. This means that it will take about one hundred loads to complete each foundation. The trucks will use the internal roads to reach the turbine foundations. Properties near the road between the north of the site and the main E-70 road through Banatsko Novo Selo and Vladimirovac have the greatest potential for increases in noise due to construction traffic.

Properties within a few metres of a road with increased traffic flows may also be affected by an increase in ground borne vibration, particularly from heavy vehicles when there are irregularities in the road surface.

D2.5 Socio-Economic Impacts

The following section describes the socio economic impacts associated with the project construction activities, which have been grouped under the following headings:

- Impacts to land use
- Employment and procurement opportunities
- Impacts on livelihoods
- Impacts on community health, safety and security
- Impacts on infrastructure

The significance of socio-economic impacts was determined based on a consideration of their direction (positive, negative, mixed or neutral), magnitude (negligible, low, moderate, high), geographic extent (individual, local, regional, national, trans-boundary) and duration (short-term, medium-term, long-term).

D2.5.1 Impacts to Land Use

Agriculture is the dominant land use in the Kovin Municipality composing 74.3% (54.240 ha) of total land area. The total amount of land which will be occupied during construction is approx. 97 ha, most of which is agricultural land (corn, sunflower and wheat being the predominant crops). This represents 2.6% of the Project site which is 3,700 ha. Approx. 67 ha (over 69%) will only be temporarily occupied and available again for agricultural use after construction is completed.

Construction is expected to last 18-24 months, however, an average plot of land needed for the construction of the WTGs or OHL towers will only be unavailable for farming for a period of 2 to 3 months. This means that either one season's crops or no crops will be affected (depending on the season in which construction is carried out on a particular plot).

The total land which will be unavailable for a short period during construction is only a small portion of agricultural land in the area. This impact is assessed as ***low adverse***.

Some of the land acquired for the project is needed for widening existing access tracks, approx. 3.4 ha. The tracks will be expanded from 4 m to 6 m between farming plots (the land needed for this expansion is 2 m strips along one side of a plot). Before construction, access tracks will be upgraded and then used for the transport of materials, equipment, workers, etc. which will increase the amount of traffic in the construction area. During the upgrading of access tracks, as well as a result of increased traffic, particularly the presence of heavy vehicles some of the local farmers may have temporary difficulties accessing their plots of land. This impact is assessed as ***low adverse***, it may occur only occasionally, under certain circumstances, but nevertheless it will be managed to prevent impacts on livelihoods and preserve good community relations.

The possibility of impacts on livelihoods is discussed in Section D2.5.3 below.

D2.5.2 Employment and Procurement Opportunities

Direct employment

The workforce needed during the construction phase of the Project will be sourced locally (primarily from the Kovin Municipality[16], but also from nearby communities, i.e. Dolovo, Vladimirovac, Pančevo City), nationally (from other parts of Serbia) and internationally, through third party construction firms. Due to the technical nature of the Project and the low skill set in local communities (as shown in C4.1.8 and C4.1.9), it is likely that skilled and semi-skilled labour will be sourced nationally and internationally. WEBG and GE selected contractors through an open tender. They will hire their existing work force and will hire additional staff if needed. Typically, in Serbia, construction firms employ unskilled labour from the local communities, primarily to reduce costs associated with travel and accommodation.

Approximately 400 construction workers will be required during construction, of which 120 will conduct civil works, 100 MV electrical works, 50 HV electrical works, 60 supplying WTG, and the rest will be management and security staff.

The construction phase will last for about one and a half years up to two years, however not all workers will be employed all the time. The frequency at which workers will be employed and the duration of their engagement could not be estimated at the time of developing the ESIA and will depend on the contractors' organization of work.

It is expected that approximately 20% will be local labour (unskilled and some semi-skilled), 50% national labour and 30% international labour. The numbers of local workers may be greater, as opposed to people coming from other parts of Serbia, if individuals with the appropriate skills and experience can be found in the nearby communities. The estimated population of all three affected local communities is 12,649 (Section C4.1.3.) and therefore this translates to a generation of employment for 0.65% of the local population. Employment of locals will give a significant effect on those who are employed however this will be a small portion of the total population.

The employment of individuals from local communities will however be beneficial as it is expected to lead to improved relationships between the Project and local communities, improved local skill set which may be valuable for future projects and reduced influx of labour into the project area and associated negative impacts. This impact has been assessed as ***low beneficial***.

The possibility of impacts on livelihoods is discussed in Section D2.5.3 below.

Indirect employment

The creation of indirect employment opportunities is associated with:

- the project's supply chain (goods and services)
- spending of project employees in local communities

Turbine components will be imported and delivered to the site via the port of Pančevo. It is highly likely that materials needed for civil works (i.e. cement, clay), as well as the materials needed for infrastructure improvements (i.e. for the upgrading of access tracks) will be procured locally, in Pančevo City and the Kovin Municipality, as they are available in these areas. These materials will be procured by the selected construction company.

Employment of non-locals, as well as the increase of incomes of local employees, may also bring in some minor benefits for local communities, associated with increased spending in the project area. As described in C4.1.9, local communities surrounding the Project site have small shops, bars and restaurants, which may benefit from this. Indirect employment is likely to provide more

[16] The profit sharing agreement between WEBG and the Kovin Municipality includes a provision by which WEBG obliges itself to engage at least 70% of the workforce from the territory of the Municipality, provided that the workforce possesses qualifications needed for certain positions.

opportunities for women, as opposed to direct employment which will most likely involve more men.

There is no available data from which to estimate levels of indirect employment in Serbia and the impacts will depend on the nature of the local economy, the availability of required goods and services in the Project area and ways in which employees choose to spend their earnings. However, taking into account the import of turbine components, the technical nature of procurement requirements, the short one and a half to two years construction timeframe and the number of employment opportunities, impacts related to indirect employment are assessed as minor beneficial.

The possibility of impacts on livelihoods is discussed in Section D2.5.3 below.

It is assumed that the appointed construction contractors will abide by the Serbian Law on Labour and other relevant legislation, which is in agreement with EBRD's labour related requirements. Similarly, it is assumed that all suppliers will have to comply with the same legislation.

Employment related expectations among the local population

The development and implementation of projects in underdeveloped areas can sometimes lead to increased expectations among the local population in relation to employment opportunities. During the ESIA scoping phase it was concluded that there is some increased expectation in the local communities that the Project will result in widespread employment opportunities.

During subsequent meetings held with local communities in the ESIA development phase, it was established that such expectations are still present, however to a much lesser extend and mostly confined to individuals. This is probably the result of further meetings and contacts between WEBG and the local communities, where more information has been provided in terms of expected levels of employment opportunities. It is expected that continued engagement with local communities and provision of transparent information regarding employment will minimize unrealistic expectations even further. However, if not managed appropriately, it may lead to tensions between WEBG and the local communities.

This impact has been assessed as ***low adverse***.

D2.5.3 Impacts on Livelihoods

In relation to WEBGs land acquisition activities, involuntary resettlement, possibly leading to economic displacement may occur during construction for the following categories of people:

- Persons who are using the land plots which have been or will be acquired for the project, but who are not owners of land, and whose crops may be affected by construction.
- Persons who are using the land plots which will be crossed during the transport and installation of WTGs in their future locations or other land which may be disrupted during construction, whose crops may be affected.

As explained in Section C4.2, renting of privately owned land is very rare in the area and therefore the likelihood of the existence of users of land, who are not owners, is very small. The existence of individuals using the land without the knowledge of the owners is even less possible as all land is intensely farmed.

As described in Section D2.3.5, the present construction plan includes moving cranes directly from plot to plot, not via any roadways. This will inevitably cause damage to crops and compaction of the agricultural soil. The impact for an average land plot is expected to last less than one month, although any crops in the ground along the transport corridor will be lost.

WEBG will compensate all lost crops and damages in accordance with the Serbian Law on Planning and Construction and the principles set out in the Livelihood Restoration Framework. In addition, the implementation of the Transport Management Plan, reinstatement of all affected land and provision of information to farmers who will be affected, should assist in managing

impacts on livelihoods. This impact is assessed as being ***low to moderate adverse***, as it is presently impossible to determine the number of people who will be affected.

Reduction in land available for agriculture is not expected to have significant impact on livelihoods of those farming the land. Private land plots have already been compensated and actually livelihoods have increased, as described further in the text. Government owned land that is currently being rented by farmers has now been acquired, however due to the small scale of land take (22 ha) and the availability of agricultural land in the area, impacts on livelihoods are assessed as ***low adverse***.

Land acquisition for the Project has resulted in increased incomes for farmers who sold their land to WEBG (during 2010[17]) and received compensation with which they bought replacement land. This includes approximately 60 households who sold their land for the construction of WTGs. They continue to use the land they sold, for free (under long term lease contracts with WEBG), before construction and will continue to use some of it during construction. At the same time, they are already farming the newly purchased land. In that way, the income they received from the affected plot of land has doubled. This impact is assessed as ***low beneficial***.

Increased incomes generated through the above, together with those generated through direct and indirect employment may have a positive effect on livelihoods in the local area. Approximately 60 local households who have acquired more land, together with approximately 80 local households whose members will be employed by the project, will have increased incomes and consequently improved standard of living. In relation to the size of local communities 140 households is a small percentage and although this may be significant for the households in question, it is not significant to the population as a whole. Some increased spending of these households together with non-local employees in the local area could further positively benefit the local economies, although this is not expected to have a significant effect. This impact is assessed as ***low beneficial***.

Transport and increased traffic are not expected to have significant impacts on livelihoods. Difficulties in accessing land described in Section D2.5.1 may only be occasional and may impact only individuals. In relation to transport of materials to and from the Project site, the E-70 on which transport will be carried out from the port of Pančevo through the village Banatsko Novo Selo and possibly Vladimirovac, is a part of the main regional transport network and traffic volumes are moderate frequented by heavy goods vehicles. Any businesses along this route are not expected to suffer income losses, as a result of project related increased traffic. Only residential houses were observed on the three local road network options presented in Section C4.4 and D2.3 and therefore while there may be impacts on the quality of life of residents living in these areas, impacts on livelihoods are not expected. In addition, once the final transport route was selected, WEBG did consult with the representatives of the Municipality of Alibunar and local community of Vladimirovac and plans on organizing public meeting to talk to all potentially affected people to explain the possible impacts, determine if there are some additional impacts that they foresee and discuss all mitigation measures. At present, this impact is assessed as ***negligible with potential to rise to low adverse*** if any businesses along transport routes are identified.

As a result of increased demand for land by WEBG, other investors in the region[18], as well as landowners who received compensation for their land and purchased new land, prices of land in the area have increased[19]. At the time of purchasing land, WEBG offered either replacement land or cash compensation to farmers to minimise any impacts related to increased prices of land. However, none of the landowners opted for replacement land and instead preferred cash compensation, with which most immediately bought land by themselves and were not affected by

[17] Only one family sold their land in January 2011.
[18] Windvision was mentioned in the local community Vladimirovac, during a meeting held on 26.01.2012.
[19] According to feedback received from interviewed local landowners and community representatives, the prices increased from 2,500 EUR to above 3,500 EUR per 1 ha. By 2014, the price of land increased to at least 7,000 EUR per 1 ha (CWP, 2014).

increased prices. Ultimately, the impact is beneficial for people selling their land, while it can be considered adverse for those buying it. This impact is assessed as ***negligible***.

D2.5.4 Impacts on Community Health, Safety and Security

Impacts and mitigation measures associated with community health, safety and security, as well as occupational health and safety are addressed throughout other sections of the document (i.e. Section D2.6), while this section focuses on impacts associated with the influx of labour and the increase in traffic and heavy vehicles.

The introduction of temporary construction employment opportunities is sometimes associated with an increase in vulnerability and susceptibility of local communities to various social pathologies, such as increased crime, alcoholism, etc. The project is relatively small and an estimated 80 individuals will be employed from local communities as unskilled labour or as drivers, security personnel, etc. Apart from the local labour, approx. 200 employees will be national labour employed on semi-skilled or skilled jobs, who will most likely be from larger towns i.e. Pančevo City or the capital Belgrade. Due to the relatively short distances involved[20], these workers will probably commute to the Project site every day. There will also be approx. 130 international staff and they will be housed in apartments in the City Pančevo or in Belgrade and commute to the site every day. The presence of workers will inevitably cause some disturbances in the Project area, however these are expected to be minor and as a result, the impact on local communities in relation to social pathologies is assessed as ***low adverse***. Occasional incidents could however lead to tensions between local communities and WEBG.

Transport and increased traffic can lead to more possibilities for accidents[21] for the local population as well as to a reduced quality of life.

D2.5.5 Impacts on infrastructure

The construction of the Project will require the use of roads and access tracks through agricultural fields. Section B5.3.2 explains the road requirements for the transport of construction materials and equipment. Two impacts on roads are foreseen and are described below.

The upgrading and widening of access tracks prior to construction will benefit local farmers as it will lead to improved access to agricultural plots. The impact has been assessed as ***low beneficial***. On the other hand, damages to road surfaces during transport of heavy machinery, leading to damages to motor vehicles, road accidents and the increase in costs for local government, are also possible. WEBG is planning to make necessary preparations of roads for heavy transport before construction and therefore this impact has been assessed as ***low adverse***. *However,* if roads used during construction are not restored, this could lead to tensions between WEBG and the local communities.

The Project is unlikely to place any additional demands on local infrastructure during construction, as utility infrastructure connections are not available on the Project site. Water will be provided from tanks or possibly a groundwater well, electricity will be provided through a generator and sanitary containers will be installed on the site.

D2.6 Health, Safety and Public Nuisance

The construction of a wind farm and associated power lines, like all large industrial and infrastructure construction projects, carries with it several key health and safety risks to the workers employed on the project as well as members of the public who access the site. Key issues for consideration associated with the proposed project are as follows:

- working at height and in confined spaces;
- working with large scale structures and plant;

[20] Belgrade is approximately 30 km away, while Pančevo is some 15 km away from the Project site.
[21] Bicycle riders are common in the area and it will be particularly important to ensure their safety.

- traffic (see also Transport Assessment Section D2.3);
- issues associated unauthorised access and vandalism;
- ground excavation hazards;
- potential for electrocution;
- use of hazardous substances

Of the issues described above, two are particularly associated with injury and death in relation to the proposed construction project, they are:

- Falls from height
- Electrocution

We have found no sources of statistics from trustable sources, concerning falls from height associated with the construction of wind farms and structures such as pylons. However, there have been many reported incidents in the media, worldwide, associated with falls from height during construction and maintenance of wind farms. It is unclear whether statistically the rate of incident is any higher than compared to other construction projects or other activities where working at height is required. However, due to the nature of the activities undertaken, it is clear that the potential risks associated with working at height exist. Similarly, there is inadequate data to allow for statistical reporting concerning incidents associated with electrocution when working on power lines in Eastern Europe. Atkins experience of working in Eastern Europe and former Soviet states indicates that incidents associated with electrocution may be quite high when compared with western European states, or at least there appears to be an acceptance that casualties will occur due to the nature of the work undertaken. Experience suggests that relatively large organisations expect several fatalities every year associated with these activities.

Although the activities described above may be classified as high risk with a significant potential for incident, incidents are preventable through the implementation of appropriate management systems and the adherence to the management system requirements by the work force. Further, rates of accident associated with such projects, in our experience, tend to be higher when the there is a large immigrant work force and where the culture of health and safety is not embedded. Since a large immigrant work force is not planned for this project, our expectation is that the majority of workers associated with the project, and in particular the site management, will be familiar with appropriate safety measures for such projects, starting with undertaking appropriate hazard and risk assessments for all activities. This should be followed by appropriate training, that personnel undertaking hazardous tasks are certified to do so and implementation of specific international requirements for working at height, working in enclosed spaces and working in areas where there is risk of electrocution. A particularly vulnerable group of workers may be associated with the section of the workforce sourced from the surrounding communities who may not have previous experience of working on large scale construction projects. It is important that the project management team ensure that such workers are fully trained, have an appropriate awareness of the hazards of working at such construction sites and are issued with and use the appropriate equipment to undertake their tasks in a safe manner. An overview of the health and safety management and mitigation requirements for the construction phase of the project is presented in Section 2.6.

If the appropriate measures described above and in Section 3 are implemented, we rate the health and safety risk of the project during construction to be **low.**

D2.7 Other Construction Impacts

D2.7.1 Land and Groundwater Quality

During the construction activities, there will be no pre-planned direct discharges to ground. However, as a result of accident, construction activities have the potential to release pollutants to the ground (topsoil, subsoil and natural strata) and groundwater. Potential sources of pollution include:

- accidental release of fuels, oils, chemicals, hazardous materials, etc., to the ground, especially in the construction lay-down area, during delivery, storage, handling and use, for example, re-fuelling, maintenance activities, etc. with subsequent leaching to groundwater;
- accidental release of liquid wastes during storage, handling and removal, with subsequent leaching to groundwater;
- accidental discharge of sanitary wastewater to ground and groundwater from the workers domestic facilities; and
- discharge of pollutants in water used for plant, equipment and vehicle washing to ground and subsequent leaching to the groundwater.

Measures will be employed to reduce the risk posed by the potential sources of pollutants listed above. All possible steps will be taken to prevent materials being imported onto the site which are already polluted.

Potentially polluting materials, such as fuels, oils, chemicals and associated liquid waste materials, etc. will be stored in dedicated, segregated storage areas, with spillage protection and appropriate environmental security measures to prevent accidental release to ground during storage. In addition, appropriate working procedures will be adopted to minimise the risk of accidental release during delivery to and removal from the storage areas.

Working procedures will ensure that these materials (raw and waste) are handled correctly. Working procedures will seek to prevent accidental release during the use of these materials, for example, vehicle refuelling and plant maintenance, especially with regard to waste oil. Procedures will be adopted to minimise the potential for accidental discharge of pollutants during the washing down of plant, equipment and vehicles. Sanitary wastewater will not be discharged to either ground or groundwater.

In the event that the aforementioned measures are implemented, the residual impact to land should be **negligible** and there should be **no impact** to groundwater.

D2.7.2 Surface Water and Effluent

During the construction activities, there will be no pre-planned direct discharges to surface water or effluent systems. No pathways have been identified where releases to effluent systems could be made. However, construction activities have the potential to pollute surface waters through accidents from the escape of:

- Silty and contaminated water from de-watering of excavations;
- Silty and contaminated water from exposed ground, earth stockpiles, and muddy roads;
- Silty water from vehicle/plant washing areas;
- Leakage or accidental spillage of fuels, oils, chemicals etc., especially on the construction lay-down area;
- Washing down concrete mixing equipment; and
- Sanitary wastewater from the workers domestic facilities.

Areas of ground become exposed and disturbed during construction. This increases the potential for soil erosion and could potentially result in an increase in the sediment load of waters leaving the construction site. The site is relatively level and therefore the potential for water flowing across the site to cause significant soil erosion is low. To prevent impacts from runoff during land preparation and construction the following measures are foreseen: (a) excavations' face will be kept minimal to avoid the exposure of exposed surfaces to natural conditions, (b) surface runoff collection will be implemented through temporary drainage grooves and sedimentation ponds to avoid their direct discharge to the natural receptor, this is particularly important during wet seasons.

Appropriate measures will be employed at the construction site to reduce the risk of potentially polluting materials leakage. In particular, polluting materials such as oils, fuels and chemicals will be stored in dedicated storage areas, complete with spillage protection and working procedures,

which ensure that these materials are handled correctly. Further, any hazardous materials will be stored in areas with secondary containment.

Domestic type wastewater will be collected at site and will be removed from site for treatment at an appropriate treatment facility. The site will not be connected to the local waste water collection system and there will be no waste water treatment on site.

In the event that the aforementioned measures are implemented, there should be **no impact** to surface water and effluent systems.

D2.7.3 Archaeology and Cultural Heritage

The Institute for Protection of Cultural Monuments from Pančevo completed the detailed analysis of the territory of the wind farm (in July 2012) and OHL (in October 2012) and concluded that there are certain assumptions that traces of settlements from the Bronze Age and the medieval period exist in the area of the wind farm site. Figure C.14 shows the areas of concern in respect to cultural (archaeological) heritage identified by the local department of the Institute in Pančevo. The Institute has enforced the following conditions:

1. Wind farm: in 22 places (22 turbines) establish permanent oversight during the work on the foundations.
2. OHL: in 14 places (14 OHL towers) establish permanent oversight during the work on foundations. In 4 places (4 OHL towers), preliminary digging prior to commencement of earthwork is needed. The preliminary excavations have been successfully completed in October 2013.
3. Project developer is obliged to promptly inform the Institute for Protection of Cultural Monuments from Pančevo about the commencement of earthworks.
4. In case of chance finds, all work has to be immediately halted until the representatives of the Institute for Cultural Heritage from Pančevo secure the findings.

In order to ensure that the above measures are followed, the developer will have to ensure that appropriate management systems and training are in place, so that the Institute is contacted as required and that in the event of chance finds, the works are managed appropriately so as not to destroy the findings. In the first instance this will involve cessation of activities until further investigation by qualified personnel can be undertaken.

In the event that the aforementioned measures are implemented, there should be **no impact** on archaeology and cultural heritage.

D2.7.4 Water Supply

The only significant use of water during construction will be the cement batch plant. This unit will be provided with its own, dedicated water supply. The water has to be of good quality and this will be provided from the Dolovo municipal supply network.

The town of Dolovo has 2,200 houses that are supplied with water from the municipal treatment plant. The Dolovo treatment plant operates has 6 boreholes but only requires four of these boreholes to meet the water demand in the summer and two in the winter. The local people enjoy their gardens and irrigate them on a daily basis during the summer months. The water pressure is reported to be at its lowest between 4pm and 10pm during the summer. At the time of the ESIA, two of the six borehole pumps were said to be out of action.

The Dolovo boreholes are about 75 m deep and the in the summer the ground water level is reported to be drawn down by about 10m. It is understood that the groundwater level in the region is heavily influenced by the water level within the Krivaca dam.

Lafarge estimate that they will need 350 to 400 litres of water per m^3 of concrete. This means that they will need about of 17,500 to 20,000 litres of water to produce 50 m^3 of concrete. For an 800m^3 foundation this would require about 280 to 320m^3 of water.

The water supply company state that they have sufficient water to provide water to the community for at least ten years. The company is happy that they can meet the needs of the batch plant without impacting upon the residents' supply.

It is noted that the Dolovo water supply is subject to primary filtration and chlorination only. There are plans to improve the water quality by connect the Dolovo network to the Pančevo water supply system. It is currently planned that this will be begin in 2015 or 2016.

It is therefore considered that the operation of the concrete batch plant will not have a negative impact on the water supply of Dolovo. This will need to be monitored, particularly in the summer evenings. If there is a drop in water pressure it may be necessary to limit the hours of operation of the batch plant. Alternatively, it may be appropriate for WEGB to consider replacement/ refurbishment of one or two existing borehole pumps to ensure that the demand can be met.

An on-site borehole has been prepared for the use at the GE laydown area. This water may be used for dust suppression during the construction period.

D2.7.5 Air Emissions

Construction activities have the potential to affect air quality mainly due to the dust created by activities during demolition, completion of ground works and construction. In addition, construction plant and vehicles can affect air quality as a result of exhaust emissions.

Re-suspension of dust through activities on the site or the wind can cause a nuisance and affect human health and vegetation. Favourable conditions for dust generation are dry weather combined with high winds. Continual or severe concerns are most likely near to dust sources, usually within 100 metres. The perception of nuisance is subjective and highly variable, although crop cover with dust may lead to a reduction in crop yields and since farming is small scale, this may be locally significant if it occurs.

There are a wide range of dust control measures that are commonly used on construction sites. The measures should be incorporated into a Construction Environmental Management Plan (EMP) and will include:

- water-spraying of roads, surfaces prior to being worked, and material stockpiles to minimise dust raising, as required;
- sheeting vehicles carrying dusty materials to prevent materials being blown from the vehicles whilst travelling;
- enforcing speed limits for vehicles on unmade surfaces to minimise dust entrainment and dispersion; and
- employing suitable measures to ensure that vehicles leaving the site do not entrain dust onto public roads.

With the above measures employed, any emissions will be of a temporary nature and at some distance from residential properties, thus minimising any potential for a nuisance to occur.

Air emissions will also be released from the exhausts of the construction plant. These may lead to a negative impact particularly where plant pass or operate in the vicinity of occupational residences and if the number of vehicles is significant. The transport assessment details the proposed transport route options. However, since the vehicle routings pass through residential areas on main roads, that there will be no long term idling in the vicinity of residential receptors and that the actual total number of vehicles is relatively low, we do not expect an impact as a result of transport to and from the site. On site, operating plant, including diesel generators, will generate emissions, due to the scale of the operations these will not be significant. In order to ensure that emissions from all vehicles and plant are as low as possible, all vehicles shall be in a good state of repair, adhere to local emission limits where they apply and will be free from dark smoke with the exception of during start up and shut down.

There will be no on site burning of any material, therefore there will be no such emissions as a result of the construction activities.

In the event that the aforementioned measures are implemented, the impact of air emissions will be **negligible**, potentially limited short term dust and/or diesel and oil fume. We expect no health effects as a result of the emissions.

D3 Operational Impacts

D3.1 Introduction to Operational Impacts

The key topics assessed in detail for the operational phase of the project are:

- Ecology and Nature Conservation
- Landscape and Visual
- Noise Impact
- Socio-Economic Impacts
- Health, Safety and Public Nuisance

Other topics which do not represent significant potential issues and which are addressed in less detail are:

- Electric and Magnetic Fields (EMF)
- Electromagnetic Interference
- Traffic and Transport
- Land and Groundwater Quality
- Surface Water and Effluent

The following sections provide an assessment of the potential impacts of the project activities during the operational phase. A summary of the impacts, management and mitigation measures is presented in Section F3. The Monitoring Programme with all impacts is presented in Section E5.

D3.2 Ecology and Nature Conservation

D3.2.1 Habitats Assessment

This impact assessment of the ecological receptors within the site is based on the Phase 1 habitat survey, desk study, and subsequent nature conservation evaluation.

Designated Sites

It has been agreed that there will be a 1.3 km buffer between the wind farm and Deliblato Sands SNR. No direct or indirect impacts to habitats within the SNR are anticipated during the constructions phase. An assessment of potential impacts to birds (some of which are qualifying species of the Deliblato Sands IBA) has been undertaken in Section D3.2.3.

Bara Kraljevac, Crna Bara, and the River Danube are 7, 12, and 25 km from the site respectively. Due to the distance from the site, no direct or indirect impacts to any of these sites are anticipated during the operational phase during the operational phase.

Habitats

During operation of the wind farm, maintenance of the turbines and associated infrastructure will be undertaken, but this will be along existing access tracks and within compound areas.

No impacts to semi-natural habitats are anticipated during the operational phase.

Species (other than bats and birds)

During operation of the wind farm, maintenance of the turbines and associated infrastructure will be undertaken, but this will be along existing access tracks and within compound areas.

No impacts to mammals or reptiles are anticipated during the operational phase.

D3.2.2 Bats

As outlined in section C3.7, limited parts of the study area have a moderate to high value for four species of bat: Khul's pipistrelle, Nathusius' pipistrelle, common noctule, and serotine bat. The following assessment of expected operational impacts of the wind farm thus predominantly refers to these species.

Collision Risk

A detailed literature search of recent publications in relation to collision risk between bats and wind turbines can be found in section 6.1 of Ecoda's 'expert opinion on the impact on bats (Ecoda Consulting, 2011a). In summary, operational impacts to bats from wind turbines come from four key factors:

- Collision with moving turbine blades or barotrauma caused by changes in air pressure close to the blades;
- Disorientation of bats in flight through ultrasound emission by wind turbines and potential for interference with social interactions (Rodrigues et al, 2008);
- Disturbance to, or severance of, local commuting routes (i.e. barrier effects).

No other effects on bats are predicted. Day-time maintenance activities are likely to make use of established access tracks only and will not require any additional land-take. Maintenance would be unlikely to cause any observable effects on the local bat population and are not considered further.

Collision Risk

Kuhl's pipistrelle

Because this species is rare in central Europe where many of the studies on bats and wind turbines have been undertaken, there is a lack of published research concerning the potential impact of wind turbines on Kuhl's pipistrelle. As common pipistrelle has similar requirements regarding its preferred habitat characteristics and similar behaviours, analogous conclusions might be drawn by considering species specific susceptibilities of the common pipistrelle to wind turbines.

As outlined in section 6.1 (Ecoda Consulting, 2010), collision/barotrauma risk for common pipistrelle might be significant at forest edges. Bats hunt above trees lines and may fly within the rotor sweep area. This could be valid for Kuhl's pipistrelle, too. However, only few fatalities have been reported in open landscapes like unstructured open cultivated land. Up to now there have not been certain distances to forest edges defined at which the collision/barotrauma risk may be reduced to a moderate level. Seiche (Seiche, 2007) recommends keeping a distance of 100 m to structures like hedge-rows or edges of forests, while (Niermann, 2011) found no significant relationship between collision/barotrauma risk and structures. The EUROBATS 3 guideline (Rodrigues et al, 2008) recommends keeping 200m away from edge features such as this. It rather seems to be that collision/barotrauma rates depend on the particular site and the activity level of bats (Niermann, 2011).

In this study, the highest activity of Kuhl's pipistrelle was predominantly recorded at VP 8. This location is at least 200 m away from the nearest planned turbine, WPP 60. The next nearest turbine (WPP 57) is more than 400 m away from this area. At this distance, a significant collision/barotrauma risk to this species is not expected. WPP 16 and WPP 59 are located next to the asphalt road, which is frequently used as a flight path by Kuhl's pipistrelle. The closest distance between these turbines and the asphalt road is about 60 m. Risk of collision/barotrauma cannot be excluded, although recorded activity at the bat-boxes at WPP 16 and WPP 59 was rather low and measured flight heights during the thermal imaging camera surveys on 10th and 11th October 2011 were well below rotor height. Consequently, appropriate mitigation measures have been established (see section E2.1.2).

WPP 60 is located approximately 100 m from the flight path along the asphalt road. The recommendation from (Seiche, 2007) of keeping 100m between wind turbines and features of value to bats is maintained, although this is still closer than the 200m recommended by in EUROBATS 3 (Rodrigues et al, 2008). Consequently, it is not expected that there will be a significant collision/barotrauma risk at WPP 60. All other turbines are located at distances of at least 200 m to habitats of value to Kuhl's pipistrelle. Thus, a significant collision/barotrauma risk at these turbines can be excluded.

Nathusius' Pipistrelle

Nathusius' pipistrelle is one of the species which research indicates have a higher risk of colliding with rotor blades, or to which succumb to significant air pressure differences (leading to a so-called 'barotraumata'). Within the study area two areas with a high value for Nathusius' pipistrelle were identified. The distance between the proposed location of WPP 60 and the vegetation in the vicinity of VP 8 is over 200 m. The next nearest planned turbine, WPP 57, is over 400 m away from this area. Because of the distances, a significant collision/barotrauma risk to Nathusius's pipistrelle from these turbines in proximity to VP 8 is not expected.

WPP 16 and WPP 59 are located next to the asphalt road that is frequently used as a flight path by Nathusius' pipistrelle. The closest distance of turbines WPP 15 and WPP 59 to the road is approximately 60 m. Risk of collision/barotrauma cannot be excluded, although the recorded activity at the bat-boxes at WPP 16 and WPP 59 was rather low, and observed flight heights during thermal imaging survey were well below rotor height. Consequently, appropriate mitigation measures have been established (see section E2.1.2).

WPP 60 is located approximately 100 m from the flight path along the same flight path. The recommendation of keeping 100m between wind turbines and features of value to bats (Seiche, 2007) is therefore fulfilled. Consequently, it is not expected that there will be a significant collision/barotrauma risk at WPP 60. All other turbines are located at distances of at least 200 m to habitats of value to Nathusius' pipistrelle. Thus, a significant collision/barotrauma risk at these turbines can be excluded.

Common Noctule

Common noctules have comparably wider hunting ranges and hunt at higher altitudes than other bat species (e.g. species of the genus *Myotis*). Thus, collision/barotrauma risk is believed to be higher for common noctules than for many other species. In monitoring studies, most collision/barotrauma victims have been found in a period between mid-July and mid-September, which is the time of nursery roost dispersal at the end of the reproductive period, and also the beginning of autumn migrations (Durr, 2003), (Durr, 2007). This is taken as evidence that collisions principally occur during migrations (Durbourg and Savage, 2009), possibly because bats use echolocation only sporadically at that time. However, recent investigations show that collision/barotrauma risk of common noctule is not linked with migration. (Niermann, 2011) conducted an intensive two-year field study at several wind farms in Germany. In eastern Germany, where females are present during summer and give birth to young in nursery colonies, 27 dead common noctules were found, representing 40 % of all recorded collision/barotrauma victims. In contrast, at wind farms in south-western and southern Germany not a single dead common noctule was recorded. In these areas no nursery sites exist, but males are present during summer. Moreover, adults and juveniles migrate through these parts of Germany during late summer and autumn (in north-western Germany common noctules are quite rare). These results indicate that common noctules do not regularly collide at wind turbines during migration (no migration of common noctule has been recorded at the site).

Seiche (Seiche, 2007) suggested that the high collision risk of common noctule is restricted to juveniles / sub-adults. Of the 57 individuals killed whose age could be determined unambiguously, 54 were juvenile and just three were adult. The authors discussed a possible habituation effect or avoidance behaviour towards wind turbines for adult common noctules, which is suggested by studies in the U.S. (Erickson, 2003), as well. As a consequence, Seiche (Seiche, 2007) also see a correlation between collision risk and location of, or proximity to, nursery roosts for common noctule and presumably other affected bat species. The results obtained within the intensive investigation by Neirmann (Niermann, 2011) substantiate the comparatively high risk of collision/barotrauma or juvenile common noctules. About 84% of all common noctules found dead under a wind turbine were juveniles. This result, which might be different for other species is very much in accordance with the fact that common noctules were only recorded as collision/barotrauma victims in areas where nursery sites exist (eastern Germany). Moreover the result is consistent with the fact that most dead common noctules were found in a period between end of July and mid-September. Juveniles of common noctule are able to fly from about mid-July, whereas migration begins mainly in September. Hence, between mid-July, after dispersal of nursery roosts, and the end of August juveniles are most active, and presumably most prone to collision/barotrauma at wind turbines (Niermann, 2011).

A comparatively high activity was measured in the south of the study area and at VP 8. As outlined above, the nearest location of a turbine (WPP 60) is about 200 m away from VP 8 and therefore no significant collision/barotrauma risk is expected. The results of bat-boxes and transect walks show that the hunting area in the south of the study area comprises the locations of five proposed turbines (WPP 64, 39, 38, 44 and 37; Map 5.4 (Ecoda Consulting, 2011a). Bats in this area are

likely to breed in maternity colonies identified in the nearby settlement of Mramorak. Accordingly, a significant collision/barotrauma risk at these turbines cannot be excluded. Consequently, appropriate mitigation measures have been established (see section E2.1.2).

From the end of June 2011 to mid-July 2011 high activity was recorded by bat-boxes at WPP 48. As datasets from mid of July to mid of August of this particular bat-box location could not be analysed, it remains unclear how long the period of high activity lasted. However, in general, the value of the other areas for this species, especially the open and intensively cultivated land across much of the centre of the study area, is low to moderate at most. It is considered that a significant collision/barotrauma risk at turbines placed in this area is unlikely.

All other turbines will be at distances of more than 200 m to areas of at least moderate value for common noctules. Consequently, it is not expected that there will be a significant collision/barotrauma risk at these turbines.

The results obtained so far give no indication that the study area is of importance for migrating common noctules.

Serotine Bats

Studies have shown that the collision/barotrauma risk of serotine bats is comparatively low when compared to other large high flying species such as common noctule. Since 2001, a total of 33 bats of this species have been found dead due to collisions with wind turbines in Germany, totalling 2.2 % of all recorded collision casualties (Durr, 2011)

Collision/barotrauma risk at WPP 16 and 59, located close to the flight path along the asphalt road between Dolovo and Deliblato Sands, will be reduced by the proposed mitigation measures required for Kuhl's pipistrelle and Nathusius' pipistrelle (see Section E2.1.2).

Turbines WPP 1, 2, 37, 38, 39, 44, and 60, are located within or immediately adjacent to areas of moderate to high importance for serotine bat, and so collision/barotrauma between these turbines and serotine bats cannot be ruled out. However, the low recorded number of collisions of this species elsewhere in Europe would indicate this species is not at high risk of collision/barotrauma, and it is considered that a significant collision/barotrauma risk is unlikely.

Turbines WPP 4 to WPP 16 are over 200 m from the area of moderate value to serotine bats that extends from the asphalt road to the north, parallel to Transect 2 (Map 5.3, (Ecoda Consulting, 2011a)). Consequently, it is unlikely that there will be a significant collision/barotrauma risk to serotine bats at these turbines.

Other species

Other species of bat have been recorded much less frequently at the site, in comparison to the four species mentioned above. It should be noted that the low number of registrations of these species may be a result of a small population, impacts to which through loss of individuals can be more significant than similar impacts to a large population.

The very low activity of these species within the site, and the location of the majority of recordings at the east of the site away from proposed turbine locations, will mean they will have a lower risk of collision with the proposed turbines than species with high levels of activity. Most of these species are not believed to be particularly prone to collision/barotrauma.

Species of *Myotis* bat, brown long-eared bat, and grey long-eared bat spend much of their time in cluttered environments such as woodland (e.g. the wood steppe present in Deliblato Sands SNR), and have been assessed as being of low risk of collision with wind turbines (Natural England 2009).

In general, greater horseshoe bats fly very close to the ground while foraging and commuting, and been assessed as being of low risk of collision with wind turbines (Natural England 2009).

Leisler bats have been assessed as being of high collision risk (Natural England 2009). Common pipistrelle, soprano pipstrelle, barbastelle have been assessed as having medium risk of collision with turbines (Natural England, 2009). However, these species were registered in extremely small numbers, and generally on the east of the site that borders the Deliblato Sands Special Nature Reserve (vantage points 8 and 3), away from the proposed turbine locations. There are no signs that significant flight paths, feeding areas or roosts of the members of these species are located at the wind farm site and in its immediate surroundings (Karapandža and Paunovic, 2011).

Therefore a significant collision/barotrauma risk has been excluded for all other species registered within the study area.

D3.2.3 Birds

Ecoda (Ecoda Consulting, 2011b) assessed the overall significance of potential operational impacts on the 11 species of special interest for which adverse impacts from the wind farm are possible. The level of significance of each impact is assessed for each species using a four point scale (negligible, low, moderate, high). The scale of significance and the species-specific vulnerability is described in detail on pages 115-138 of the Expert Opinion (Ecoda Consulting, 2011b).

Disturbance and Habitat Loss

When the potential disturbance and habitat loss impacts of operation on the 11 species of special interest for which adverse impacts from the wind farm are possible is taken into account, only one species, the common quail, is identified as potentially undergoing an adverse impact of more than negligible significance. The permanent loss of breeding habitat for common quails as a result of displacement from the turbines is expected to result in an adverse impact of moderate significance before mitigation measures are considered.

Table D.3 considers the potential operational impacts in terms of disturbance and habitat loss (displacement) on each species.

Table D.3: Potential operational impacts of disturbance and habitat loss on the 11 species of special interest for which adverse impacts from the wind farm are possible

Species	Potential operational impacts	Overall significance
Common quail	The operational wind turbines can interfere with communication between individuals. As a result, common quails are believed to avoid the vicinity of wind turbines. Based on the assumption that common quails will avoid an area of approximately 200m from each turbine, an expected displacement of approximately 716 hectares is predicted. This is about 20 % of the wind farm site (3,716 ha). As arable land-use is most common and widespread in the vicinity of the survey area, it is very likely that common quails will find sufficient appropriate habitats in the surrounding, in which the species-specific requirements are fulfilled. Due to the abundant surrounding habitat, the potential loss of breeding quails is expected to be of moderate significance, only being significant at a site level. However, to compensate for the decrease in habitat quality within the proposed wind farm by appropriate measures should be implemented (see Section E2.1).	**Moderate significance** of loss of habitat
Western marsh harrier	Recent studies have demonstrated that marsh harriers hunt within wind farms and are not displaced as a result of their presence (see Ecoda, 2011b pages 122-123 for further details). Marsh harriers do not breed within the survey area and it is considered unlikely that they will in future, due to an absence of suitable habitat. Western marsh harriers are not expected to be significantly displaced or lose habitat as a result of the operational wind farm.	Negligible significance of disturbance, habitat loss or barrier to movement
Common buzzard	Recent studies have demonstrated that common buzzards do not avoid wind farms whilst breeding, hunting, resting or migrating (see Ecoda, 2011b pages 124-125 for further details). However, it is considered that breeding sites will not be negatively impacted as a result of the wind farm.	Negligible significance of disturbance, habitat loss or barrier to movement
Booted eagle	Booted eagles, like most birds of prey, are thought to show no avoidance behaviour to wind turbines. Booted eagles were rarely observed in the survey area and, due to the presence of abundant alternative cultivated land, it is considered that the operation of the proposed wind farm will have a negligible impact in the form of disturbance or habitat loss.	Negligible significance of disturbance, habitat loss or barrier to movement
Common kestrel	Recent studies have demonstrated that common kestrels do not avoid wind farms whilst breeding, hunting, resting or migrating (see Ecoda, 2011b pages 126-127 for further details). However, it is considered that breeding sites will not be negatively impacted as a result of the wind farm.	Negligible significance of disturbance, habitat loss or barrier to movement

Eurasian hobby	Studies have demonstrated that Eurasian hobbies do not avoid wind farms whilst breeding, hunting, resting or migrating (see Ecoda, 2011b pages128-129 for further details). However, it is considered that breeding sites will not be negatively impacted as a result of the wind farm.	Negligible significance of disturbance, habitat loss or barrier to movement
Saker falcon	Saker falcons, like most birds of prey, are thought to show no avoidance behaviour to wind turbines. The nearest saker falcon nest was approximately 2.5km from the wind farm and this species was rarely observed in the survey area. Due to the presence of abundant alternative cultivated land, it is considered that the operation of the proposed wind farm will have a negligible impact in the form of disturbance or habitat loss.	Negligible significance of disturbance, habitat loss or barrier to movement
European bee-eater	European bee-eater breeding sites are approximately Saker falcons, like most birds of prey, are thought to show no avoidance behaviour to wind turbines. The nearest saker falcon nest was approximately 2.5km from the wind farm and this species was rarely observed in the survey area. Due to the presence of abundant alternative cultivated land, it is considered that the operation of the proposed wind farm will have a negligible impact in the form of disturbance or habitat loss.1km from the wind farm and this species was rarely observed in the survey area, choosing to conduct most of the foraging within Deliblato Sands IBA. Therefore significance disturbance effects on European bee-eaters are not expected. Due to the preference for Deliblato Sands, this is expected to be the main migration route for European bee-eaters and it is not expected that the proposed wind farm would cause a barrier to movement Due to the presence of abundant alternative cultivated land and the preference of foraging within Deliblato Sands, it is considered that the operation of the proposed wind farm will have a negligible impact in the form of disturbance or habitat loss.	Negligible significance of disturbance, habitat loss or barrier to movement
White-fronted goose	This species is recorded on passage and does not use the survey area for breeding and only small numbers for resting. Therefore operational effects will have no significance displacement effects on white-fronted geese. White-fronted geese demonstrate avoidance behaviour of wind farms, therefore there is a possibility that some geese may be forced to fly around or over the wind farm. This would lead to a slight increase in energy expenditure, but is not expected to have a significant impact. White-fronted geese do not use the survey area for breeding and only small numbers for resting and therefore will not lose any habitat as a result of operation.	Negligible significance of disturbance, habitat loss or barrier to movement
Hen harrier	The wind farm is located outside the breeding range of hen harriers and therefore the effects on breeding hen harriers can be excluded. There is no evidence that hen harriers avoid wind farms whilst hunting (see Ecoda, 2011b pages 135-136 for further details). Therefore no significant displacement or loss of habitat is expected as a result of the operation of the wind farm.	Negligible significance of disturbance, habitat loss or barrier to movement
Montagu's harrier	Montagu's harriers do not breed or rest within the survey area and are not expected to in the near future. There is no evidence that hen harriers avoid wind farms whilst hunting (see Ecoda, 2011b pages 137-138 for further details). Therefore no significant displacement or loss of habitat is expected as a result of the operation of the wind farm.	Negligible significance of disturbance, habitat loss or barrier to movement

Collision (mortality)

When the potential collision (mortality) impacts of operation on the 11 species of special interest for which adverse impacts from the wind farm are possible is taken into account, it is considered that none of the species are at significant risk of adverse impacts. See Table D.4 for the potential operational collision (mortality) impacts on each species. With regards to the route of the power line, available information at the time of writing indicates that due to the sparse spread of flights recorded during the vantage point surveys, the proposed power lines will not dissect any significant flight routes used by birds. Therefore, the results presented in Table D.4 are also applicable to the potential for impact associated with the power line.

Table D.4: Potential operational impacts of collision on the 11 species of special interest for which adverse impacts from the wind farm are possible

Species	Potential operational impacts	Overall significance
Common quail	Common quails predominantly live on the ground, so the risk of collisions at wind turbines is in general very low (Ecoda, 2011b pp115-116). Collisions of single individuals at the planned wind farm cannot be excluded but are regarded to be highly unlikely. A significant collision risk can be excluded for the planned wind.	Negligible significance of collision risk
Western marsh harrier	Western marsh harriers occurred regularly in the survey area without showing any preferences to certain localities. They are searched or hunted throughout the entire survey area, almost exclusively observable flying close to the ground up to 50 m. Two flights were recorded at heights between 50 to 200 m. The collision risk at wind turbines for Western marsh harriers is generally rated as low also (see Ecoda, 2011b pages 122-123 for further details). Based on previously published results and those of this study, it is not assumed that a significant risk of collision at the planned wind farm exists, despite the moderate hunting activity. Collisions of single individuals at the planned turbines cannot be excluded but are regarded to be extremely unlikely. A significant collision risk can be excluded for the planned wind farm.	Negligible significance of collision risk
Common buzzard	There were four common buzzard breeding sites within Deliblato Sands IBA and two additional breeding sites at the margins of the survey area. Due to this large breeding presence, there were high numbers of observations of mainly hunting individuals at heights between 50 and 200 m. Therefore there will be a certain collision risk for the species in the area of the planned wind farm. When comparing the high abundance of common buzzard with the rate of fatalities in Europe, this species seems to show a strong avoidance of collision with wind turbines. Furthermore, no special features (e.g. aggregations of individuals) within the survey area were observed that could lead to a significant collision risk at the proposed wind turbines compared to other locations. Collisions of single individuals with turbines of the planned wind farm cannot be excluded but are regarded to be extremely unlikely. A significant collision risk can be excluded for the planned wind farm. In fact, the collision risk is expected to be so low that single fatalities will have no influence on the ecological function of the area or the conservational status of the local population.	Negligible significance of collision risk
Booted eagle	Breeding sites of the species may exist in Deliblato Sands IBA, but were not found within recent investigations. Individuals were recorded occasionally while hunting or flying at the margins of areas of the planned wind farm and outside of it. Taken this into account collisions of single individuals at the planned wind turbines cannot be excluded but are regarded to be unlikely. A significant collision risk can be excluded for the planned wind farm.	Negligible significance of collision risk
Common kestrel	Two common kestrel nest sites were located near to the survey area; one site was located within the buffer zone, approximately 1km from the nearest turbine and the other site was just north of the survey area, approximately 400m from the nearest turbine. A further territory was recorded approximately 2.5km to the west of the survey area. Common kestrels generally hunt in open, agricultural landscapes. As a consequence kestrels were often seen hunting in the survey area. Due to the existence of three breeding pairs and the regular use of the wind farm area by kestrels a certain risk of collision at the planned turbines will exist. Comparing the high abundance of this species with the low number of fatalities in Europe, the collision risk is assumed to be very low. Collisions of single individuals cannot be excluded but are regarded to be extremely unlikely. A significant collision risk can be excluded for the planned wind farm. In fact the collision risk is expected to be so low that single fatalities will have no influence on the ecological function of the area and the conservational status of the local population.	Negligible significance of collision risk

Eurasian hobby	One breeding site was found in the north of the survey area on a power transmission pole about 470 m north to the planned WT 23. Consequently, in the northern part (at VP 1) this species was regularly recorded. In all other parts of the survey area it occurred rarely, probably because the individuals were hunting in other habitats. In general, they often hunt dragonflies at fresh water bodies or other large insects that can be found in insect-rich habitats like Deliblato Sands IBA. Thus, Eurasian hobbies did not use the planned wind farm intensely as a hunting site. Taking this into account, as well as the comparatively low number of fatalities in Europe, the collision risk is expected to be very low. Two other pairs were assumed to breed in the protected area of Deliblato Sands but more than 1 km east of the planned wind farm. Collisions of single individuals at the planned wind turbines cannot be excluded but are regarded to be unlikely. A significant collision risk can be excluded for the planned wind farm. In fact, the collision risk is expected to be so low that single fatalities will have no influence on the ecological function of the area or the conservational status of the local population.	Negligible significance of collision risk
Saker falcon	One probable (unsuccessful) breeding site was found north to the survey area on a power transmission pole more than 2 km west of the nearest planned turbines. Another probable breeding pair was present in the wider vicinity of Deliblato Sands IBA. Consequently, this species was occasionally recorded, predominantly at the margins of the planned wind farm area or outside of it. Within the survey area saker falcons were rarely observed. Collisions of single individuals at proposed turbines cannot be excluded but are regarded to be unlikely.	Negligible significance of collision risk
European bee-eater	European bee-eater breeding sites are approximately 1km from the wind farm and this species was rarely observed in the survey area. In addition, European bee-eaters are not expected to be particularly prone to collision at wind turbines. A significant collision risk for European bee-eaters can be excluded.	Negligible significance of collision risk
White-fronted goose	The known number of fatalities of this species is very low, thus the collision risk is assessed to be low as well (see Ecoda, 2011b pages 134-136 for further details). Collisions of single individuals at the planned wind farm cannot be excluded but are regarded to be extremely unlikely. A significant collision risk can be excluded for the planned wind farm.	Negligible significance of collision risk
Hen harrier	Hen harriers predominantly fly in low heights close to the ground. Furthermore, only one fatality of the species has ever been recorded up to now, indicating that collision risk of the species is very low. Collisions of single individuals at the planned turbines cannot be excluded but are regarded to be extremely unlikely. A significant collision risk can be excluded for the planned wind farm.	Negligible significance of collision risk
Montagu's harrier	Montagu's harriers predominantly fly in low heights close to the ground. Furthermore, only 17 fatalities of the species have ever been recorded up to now, indicating that collision risk of the species is very low. Collisions of single individuals at the planned turbines cannot be excluded but are regarded to be extremely unlikely. A significant collision risk can be excluded for the planned wind farm.	Negligible significance of collision risk

D3.2.4 Findings of the Addition Bird Surveys

The additional surveys (vantage point surveys and breeding bird surveys) carried out between November 2011 and July 2012 recorded a total of 93 species. Of these, 55 species are believed to breed within or near the wind farm site.

See Appendix D I.III for a full list of species and their breeding status within the wind farm, as well as all supporting data for this survey and the Collision Risk Assessment.

Vantage point surveys

A total of 91 species were recorded during the 432 hours of vantage point surveys carried out at 6 vantage points between November 2011 and July 2012.

Thirteen target bird species were recorded flying at rotor height (the height between the upper and lower turbine blades): northern goshawk, European sparrowhawk, hen harrier, Eurasian kestrel, saker falcon, black kite, common buzzard, greylag goose, white-fronted goose, white stork, common crane, European bee-eater and great cormorant.

An additional species, black stork, was not on the target species list, but was recorded during the vantage point surveys and has been treated as a target species. Black stork was also recorded flying at rotor height.

All 14 target species (including black stork) were recorded within the survey area during surveys undertaken between November 2011 and July 2012. A further 5 target species (Western marsh harrier, pallid harrier, merlin, Eurasian hobby and white-tailed eagle) were recorded within the survey area, but not at rotor height and were therefore not at collision risk and were excluded from the collision risk calculations.

It was not always possible to differentiate between white-fronted geese and greylag geese (although flocks that could be identified suggested proportions of at least 90% greylag geese to 10% white-fronted geese). Therefore, both species have been recorded and analysed as a single group: 'grey geese'.

For each target species flight, the flight time (in 15 second periods) can be multiplied by the number of birds in flight to give the total flight time. For example:

30 common cranes flying for 45 seconds = 30 x 45 = 1350 seconds total flight time

1 buzzard flying for 180 seconds = 1 x 180 = 180 seconds total flight time

Table D.5 shows the flight details of all 19 target species (including black stork) recorded during the vantage point surveys.

Table D. 5. Flight details of target species recorded during vantage point surveys (November 2011 to June 2012)

Target species group	Species	Total no. of flights	Total no. of flights that pass within collision risk height	Percentage (%) of flights that pass within collision risk height	Total flight time (seconds)	Total flight time (seconds) at collision risk height (50m – 200m)
Raptors	Common buzzard	246	72	29	37530	10585
	Eurasian kestrel	80	7	9	7995	750
	Western marsh harrier	16	0	0	2145	0
	Eurasian sparrowhawk	15	1	7	825	120
	Hen harrier	13	4	31	2190	465
	Northern goshawk	9	4	44	1590	345
	Eurasian hobby	7	0	0	495	0
	Merlin	6	0	0	165	0
	Saker falcon	5	1	20	285	45
	Black kite	1	1	100	345	300
	White-tailed eagle	1	0	0	165	0
	Pallid harrier	1	0	0	135	0
Waterfowl	Grey goose species (greater white-fronted goose and greylag goose)	153	68	44	1522035	835335
Storks and cranes	White stork	6	5	83	3465	2955
	Common crane	4	3	75	390	165
	Black stork	2	1	50	450	90
Cormorants	Great cormorant	2	2	100	4140	1740
Passerines	European bee-eater	32	10	31	4800	1230

The total flight time at collision risk height (final column of Table 2) has been used to carry out collision risk analysis on the 13 species (counting greylag geese and greater white-fronted geese as a single group) with flights recorded at a collision risk height.

The aim of collision risk analysis is to establish an annual mortality estimate for each target species. The findings of the collision risk analysis are shown in Table D.6; the collision risk analysis process itself is described in detail in the section below (Collision Risk Assessment).

Table D.6. Collision risk analysis results for target bird species

Target species group	Species	Predicted number of collisions per year	Predicted number of years per collision
Raptors	Common buzzard	0.90	1.1
	Eurasian kestrel	0.43	2.3
	Eurasian sparrowhawk	0.03	38
	Black kite	0.03	36
	Northern goshawk	0.03	36
	Hen harrier	0.02	51
	Saker falcon	0.01	74
Waterfowl	Grey goose species (greater white-fronted goose and greylag goose)	56	0.02
Storks and cranes	White stork	0.56	1.8
	Common crane	1.9	0.53
	Black stork	0.02	58
Cormorants	Great cormorant	0.31	3.2
Passerines	European bee-eater	0.43	2.4

Breeding bird surveys

A total of 47 species were recorded during the breeding bird surveys carried out between March and July 2012, of which 31 species are thought to breed within or near the wind farm site (see Appendix D for a full list of species and their breeding status).

A review of the breeding bird surveys has identified nine species that were confirmed to have breeding territories within the survey squares: common quail, corn bunting, crested lark, Eurasian skylark, European bee-eater, European stonechat, red-backed shrike, tawny pipit and yellow wagtail. See Appendix E for territory maps for each of the six breeding bird squares.

Seven of these species were identified in the Environmental and Social Impact Assessment (Atkins, 2012) as breeding within the wind farm survey area. European bee-eater and tawny pipit were not identified as breeding within the wind farm survey area in the Environmental and Social Impact Assessment, but have been confirmed as breeding during the additional bird surveys (a pair of European bee-eaters were observed at a nest hole and tawny pipits were observed singing and seen carrying food).

The 2012 breeding bird surveys also recorded a further 6 species considered to have possible breeding territories within or near the breeding bird squares: blackcap, chaffinch, common whitethroat, Eurasian kestrel, Eurasian tree sparrow and house sparrow. Of these, Eurasian kestrel was confirmed as breeding in the Environmental and Social Impact Assessment, and Eurasian tree sparrow and house sparrow were thought to probably breed within the wind farm survey area.

The Environmental and Social Impact Assessment identified a further eight species as breeding within the wind farm survey area: common buzzard, common cuckoo, common pheasant, European magpie, grey partridge, hooded crow, turtle dove and whinchat.

All of these species, with the exception of grey partridge, were recorded during the breeding bird surveys carried out between March 2012 and June 2012. These species are all believed to breed

within the wind farm site or immediate surrounds but are not considered to actually breed within the breeding bird squares.

Table D.7 gives a list of bird species identified as breeding within the wind farm survey area in the Environmental and Social Impact Assessment or recorded as confirmed or possible breeding during the 2012 breeding bird surveys.

Table D.7. Breeding status of birds within the proposed wind farm site

Species	Breeding status in Environmental and Social Impact Assessment (Atkins, 2012)	Breeding status in 2012 breeding bird surveys
Blackcap	Not recorded as breeding within wind farm survey area	Probably breeds within or near survey squares
Common buzzard	Breeds within wind farm survey area	Breeds within or on outskirts of wind farm site, but not within survey squares
Common cuckoo	Breeds within wind farm survey area	Breeds within wind farm site, but not within survey squares
Common pheasant	Breeds within wind farm survey area	Breeds within or on outskirts of wind farm site, but not within survey squares
Common quail	Breeds within wind farm survey area	Breeds within survey squares
Common whitethroat	Not recorded as breeding within wind farm survey area	Probably breeds within or near survey squares
Corn bunting	Breeds within wind farm survey area	Breeds within survey squares
Crested lark	Breeds within wind farm survey area	Breeds within survey squares
Eurasian kestrel	Breeds within wind farm survey area	Breeds within wind farm site, probably breeds near survey squares
Eurasian skylark	Breeds within wind farm survey area	Breeds within survey squares
European bee-eater	Not recorded as breeding within wind farm survey area	Breeds within survey squares
European magpie	Breeds within wind farm survey area	Breeds within wind farm site, but not within survey squares
European stonechat	Breeds within wind farm survey area	Breeds within survey squares
Grey partridge	Breeds within wind farm survey area	Breeds within wind farm site, but not within survey squares
Hooded crow	Breeds within wind farm survey area	Breeds within or on outskirts of wind farm site, but not within survey squares
House sparrow	Probably breeds within wind farm survey area	Breeds within wind farm site, probably breeds near survey squares
Red-backed shrike	Breeds within wind farm survey area	Breeds within survey squares
Tawny pipit	Not recorded as breeding within wind farm survey area	Breeds within survey squares
Eurasian tree sparrow	Probably breeds within wind farm survey area	Breeds within wind farm site, probably breeds near survey squares
Turtle dove	Breeds within wind farm survey area	Breeds within wind farm site, but not within survey squares
Whinchat	Breeds within wind farm survey area	Possibly breeds within wind farm site, but not within survey squares
Yellow wagtail	Breeds within wind farm survey area	Breeds within survey squares

The survey squares covered an area of 600 ha and were considered to fairly reflect the whole wind farm site, covering the intensively farmed open fields and the network of tracks and roads with sparse hedgerows.

Due to the fair representation of the habitat within the whole wind farm site, it is considered reasonable to multiply the number of breeding territories recorded within the 600 ha covered by the breeding bird surveys by 6.19 to estimate the total populations within the wind farm site (3,716 ha).

Table D.8 shows the estimated number of breeding territories for birds recorded within each survey square and the extrapolated estimation of the total number of breeding squares within the whole wind farm site.

Table D.8. Estimated breeding territories within the wind farm site

	Common quail	European skylark	Red-backed shrike	Yellow wagtail	Tawny pipit	Crested lark	Corn bunting	European stonechat	Eurasian kestrel	House sparrow	Eurasian tree sparrow	Blackcap	Common chaffinch	European bee-eater	Common whitethroat
Square 1	2 possible territories	6 confirmed territories	2 confirmed territories	1 possible territory	2 possible territories	1 possible territory									
Square 2	1 confirmed territory, 1 possible territory	8 confirmed territories, 1 possible territory	3 confirmed territories	2 confirmed territories	1 possible territory	1 confirmed territory, 1 possible territory	2 confirmed territories	1 confirmed territory, 1 possible territory	1 possible territory						
Square 3	2 confirmed territories, 1 possible territory	10 confirmed territories	3 confirmed territories	3 confirmed territories, 1 possible territory	1 confirmed territory		2 confirmed territories, 1 possible territory								
Square 4	1 possible territory	8 confirmed territories	1 confirmed territory, 1 possible territory							1 possible colony		1 possible territory	1 possible territory		
Square 5		9 confirmed territories, 2 possible territories		1 confirmed territory											
Square 6		8 confirmed territories	2 confirmed territories				2 confirmed territories	1 confirmed territory			1 possible colony			1 confirmed territory	1 possible territory
Total for all 6 squares	3 confirmed territories, 5 possible territories	49 confirmed territories, 3 possible territories	11 confirmed territories, 1 possible territory	6 confirmed territories, 2 possible territories	1 confirmed territory, 3 possible territories	1 confirmed territory, 2 possible territories	6 confirmed territories, 1 possible territory	2 confirmed territories, 1 possible territory	1 possible territory	1 possible colony	1 possible colony	1 possible territory	1 possible territory	1 confirmed territory	1 possible territory
Extrapolated value for whole survey area (x 6.19)	**19-50 territories**	**303-322 territories**	**68-74 territories**	**37-50 territories**	**6-25 territories**	**6-19 territories**	**37-43 territories**	**12-19 territories**	**0-6 territories**	**0-6 colonies**	**0-6 colonies**	**0-6 territories**	**0-6 territories**	**6 territories**	**0-6 territories**

Discussion

Six target species are predicted to have a single collision fatality every 20 years or longer:

- Eurasian sparrowhawk (one fatality every 38 years);
- Black kite (one fatality every 36 years);
- Northern goshawk (one fatality every 36 years);
- Hen harrier (one fatality every 51 years);
- Saker falcon (one fatality every 74 years);
- Black stork (one fatality every 58 years)

It is considered that these species can be immediately excluded from any potential significant collision impacts as a result the proposed wind farm. This is because the rate of collision fatality is so low that it would not have an impact on the population size of these birds at a local, regional or country scale, when considered against environmental factors such as habitat change and climate change.

For the remaining seven species (including greylag geese and greater white-fronted geese combined in a single group) that cannot be immediately excluded, population estimates have been collated from Ecoda (2011). In addition, background adult mortality rates (juvenile mortality rates are higher, so using adult mortality only is considered to provide a precautious underestimate) have been established from Robinson (2005)22. The background mortality rates are based on UK populations, but these are considered to give a fair indication of population background mortality rates throughout Europe.

Background mortality rates were not available for white stork and European bee-eater, so a precautionary level of 10% annual mortality has been used.

- An estimate of 10% annual mortality for white stork is believed to be a cautious estimate. This has been based the lowest annual mortality rate of any closely related species: common crane has an annual mortality rate of 10%, grey heron has an annual mortality rate of 28% and little egret has an annual mortality rate of 29%.
- An estimate of 10% annual mortality for European bee-eater is believed to be a cautious estimate for a passerine species. The closely related common kingfisher has an annual mortality rate of 72%.

Based on the estimated population size and the background mortality rates, it has been possible to estimate an annual mortality figure for each target species population. Table D.9 assesses whether the predicted number of collisions per year as a result of the proposed wind farm will have a significant impact on the annual mortality of each target species population at a level of 5% significance.

The predicted collision rates are considered to be non-significant on the bird populations for all target species

[22] Robinson, R. (2005) BirdFacts: profiles of birds occurring in Britain and Ireland (BTO Research Report 407). BTO, Thetford.

Table D.9. Significance of annual mortality estimates of target species recorded at collision risk height during the additional vantage point surveys (November 2011 – July 2012)

Species	Estimated population size	Background adult mortality rate (taken from Robinson, 2005)	Annual regional mortality number	Predicted number of collisions per year	Significance (5% of background mortality = significant)
Common buzzard	1600-2000 in Vjovodina region	10%	160-200	0.90	Not significant at a regional level
Eurasian kestrel	2,600-3,400 Vjovodina region	31%	806-1054	0.43	Not significant at a regional level
Grey goose species (greater white-fronted goose and greylag goose)	10,000 – 15,000 greater white-fronted geese winter in Serbia and Montenegro	28%	2800-4200	56	Not significant at a national level
	>240,000 greylag geese breed in Europe	17%	>40800		Not significant at a European level
White stork	2,000-2,200 in Vjovodina region	Not known, estimated to be 10% (precautionary rate based on common crane)	200-220	0.56	Not significant at a regional level
Common crane	148,000-220,000 breeding population in Europe	10%	14,800-22,000	1.9	Not significant at a European level
Great cormorant	2,000-2,400 in Vjovodina region	12%	240-288	0.31	Not significant at a regional level
European bee-eater	2,000-4,000 in Vjovodina region	Not known, precautionary estimate of 10% used	200-400	0.43	Not significant at a regional level

However, due to the limited availability of data on Serbia's birds, target species population sizes were not available at a regional level for greater white-fronted goose, greylag goose and common crane. For these target species, only European population estimates were available, and therefore Table D.9 is only able to conclude that greater white-fronted goose, greylag goose and common crane will not be significantly affected by the proposed wind farm at a European population level.

These three target species have been discussed in greater detail below.

Grey geese (greylag goose and greater white-fronted goose)

It was only possible to establish estimates of greylag geese at a European level (>240,000) and greater white-fronted geese at a national level (10,000-15,000).

An annual mortality of 56 grey geese would not be significant (at 5% significance) with a background mortality of 17%, if regional wintering populations reached 6,590. During the winter surveys, it was noted that grey geese were not abundant throughout the region and were not restricted to the proposed wind farm site. With flocks of up to 1000 geese recorded during the vantage point surveys, it is considered likely that the regional population exceeds 6,590.

As described in the Environmental and Social Impact Assessment (Atkins, 2012), greylag geese and greater white-fronted geese are expected to be displaced from the wind farm to alternative foraging grounds, rather than being at risk of collision.

It is considered that the combination of (i) numbers of grey geese overwintering in the region likely to exceed 6,590 (due to the large numbers observed throughout the region), and (ii) the expectation that the estimated collision rate of 56 birds a year is an overestimate (due to predicted displacement rather than collision as described in Atkins, 2012), means that the proposed wind farm will have a non-significant impact on the regional greylag goose and greater white-fronted goose populations.

Common crane

It was only possible to establish estimates of common cranes at a European level (148,000-220,000).

An annual mortality of 1.9 common cranes would not be significant (at 5% significance) with a background mortality of 10%, if regional passage populations reached 380.

Common cranes were only recorded passing through the site on 4 occasions (with flocks of up to 60 birds recorded). Birdlife International (France) describes the European common crane migration23, with up to 45,000 common cranes passing south through Hungary (typically at heights of 200-1000m) on their way to winter in Spain. It is therefore considered that this major common crane passage is likely to occur across the wider regional area, with numbers passing through the Vojvodina region far exceeding 380 birds.

Therefore it is considered that the predicted collision mortality of 1.9 birds per year will have a non-significant impact on the regional common crane populations.

Breeding birds

The Environmental and Social Impact Assessment (Atkins, 2012) estimated that approximately 30 pairs of common quail breed within the wind farm site. It was estimated that approximately 20% of the wind farm common quail population will be displaced by the operational turbines, equating to 6 common quail territories.

During the 2012 breeding bird surveys, common quails were recorded in 4 squares, with three breeding territories confirmed and a further five possible common quail territories (where birds were recorded on single occasions).

When multiplied by 6.19 to represent the total area of the wind farm site, an extrapolation of the confirmed and possible common quail territories within the squares produced an estimate of 19-50 territories within the wider wind farm site. This gives a mean of 34.5 territories and supports the 30 common quail territories estimated in the Environmental and Social Impact Assessment (Atkins, 2012).

It is considered that the 2012 breeding bird survey data supports the findings of the Environmental and Social Impact Assessment (Atkins, 2012), estimating a similar number of common quail breeding territories, and therefore supporting the proposed mitigating habitat creation of 4.5 ha of fallow strips and flower-rich field margins over 250 m from any wind turbines.

D3.2.5 Collision Risk Assessment

The collision risk calculations followed the methodology outlined in the Scottish Natural Heritage (SNH) guidance Windfarms and Birds: Calculating a theoretical collision risk assuming no avoiding action (SNH, 200024).

Thirteen target bird species were recorded flying at rotor height (the height between the upper and lower turbine blades): northern goshawk, European sparrowhawk, hen harrier, Eurasian kestrel, saker falcon, black kite, common buzzard, greylag goose, white-fronted goose, white stork, common crane, European bee-eater and great cormorant.

[23] Ligue pour Protection des Oiseaux *The common crane (*http://champagne-ardenne.lpo.fr/English/e_grue_cendree.htm; accessed 17th August 2012)
[24] Scottish Natural Heritage. (2000). Windfarms and Birds: Calculating a Theoretical Collision Risk Assuming no Avoiding Action

It was not always possible to differentiate between white-fronted geese and greylag geese (although flocks that could be identified suggested proportions of at least 90% greylag geese to 10% white-fronted geese). Therefore, both species have been recorded and analysed as a single group: 'grey geese'.

An additional species, black stork, was not on the target species list, but was recorded during the vantage point surveys and has been treated as a target species. Black stork was also recorded flying at rotor height.

All 14 target species (including black stork) were recorded within the survey area during surveys undertaken between November 2011 and July 2012. A further 5 target species (Western marsh harrier, pallid harrier, merlin, Eurasian hobby and white-tailed eagle) were recorded within the survey area, but not at rotor height and were therefore not at collision risk and were excluded from the collision risk calculations.

The volume of airspace within the vantage point visual envelopes at rotor height is known as the collision risk zone. For the target species recorded at collision risk height, the amount of time spent within the collision risk zone was calculated. Each recorded flight time within the collision risk zone was multiplied by the number of birds recorded during that flight. These flight times were then added together to give a total flight time within the collision risk zone for all target species over the 9 month survey period (November 2011 to July 2012).

All recorded flights within the collision risk zone are averaged across this volume of airspace. The proportion of this airspace taken up by the turbine blades is used to calculate the amount of time that each target species spends within the rotor sweep volume25 over the course of the survey period.

SNH (2000) describes two methods of calculating collision risk:

1. For birds that make regular flights through a windfarm, and

2. For birds using the whole windfarm space.

As can be seen from the target species flight maps in Appendix DI.III, the majority of flights did not follow regular paths, and so method 2 was chosen to estimate collision risk for target species.

The calculation of potential collision risk involves four stages:

Stage 1. The first stage is to calculate the amount of time each target species was present throughout the year within the rotor sweep volume of the proposed turbine. This is based on the observed flight activity during the survey period (in this case November 2011 – July 2012) and the parameters and design of the wind turbine. Based on the amount of time each target species spends within the rotor sweep volume, and their known average flight speeds, it is possible to estimate the number of transits through the rotor sweep volume that each target species would make over the survey period (264 days). This can be extrapolated to estimate the number of transits through the rotor sweep volume per year.

Stage 2. The proportion of transits through the rotor sweep volume that will result in a collision between the bird and a wind turbine blade are then estimated, based on the size of turbine blades, the rotor period (time for one revolution of rotor), the size of the bird and the average speed of the bird. All predicted collisions are presumed to be fatal. This provides an estimate of the number of fatalities per season (or per year) for the wind farm but assumes that there is no avoidance action to prevent a collision.

Stage 3. The third stage of the calculation involves applying an avoidance factor. Avoidance rates are still unknown for many species. However, guidance by Scottish Natural Heritage (Use of Avoidance Rates in the SNH Wind Farm Collision Risk Model, SNH, 201026) proposes that a default avoidance rate of 98% should be used. For some species where detailed analysis has been undertaken, the guidance provides more specific avoidance values: 'grey geese' (greylag geese and greater white-fronted geese) and hen

[25] This is the space that the turbine blades occupy and can be taken as the diameter of turbine blades x the width of turbine blades (see Fig 2, SNH 2000).
[26] Scottish Natural Heritage. (2010). Use of Avoidance rates in the SNH Wind Form Collision Risk Model.

harriers have an avoidance rate of 99%, whereas kestrels have a lower avoidance rate of 95%.

Stage 4. The final stage of the calculation involves applying an estimate of downtime for the turbines, and reducing the predicted collisions per year accordingly.

The output from each table is identified by a letter in bold, which is carried through to subsequent tables within this analysis.

Stage 1 –

The data from this study has been used to calculate the number of transits through the rotor sweep volume that each target species would make for the 9 month survey period. Thirty-six hours of survey have been undertaken for the summer and winter periods, giving a total of 72 hours.

The proposed turbines will have a maximum rotor diameter of 126m and will occupy a height range between 60-80m and 180-200m. All birds recorded within the height range of 50m – 200m were considered to be at collision risk. As such, some birds recorded within the collision risk height range will not be within the rotor height range of the chosen turbine design, and so collision risk value will be overestimated for some species. A correction factor of 0.84 (126m rotor diameter ÷ 150m collision risk range) is applied to reduce this overestimation.

Table D. 10.Calculating total flight time within the collision risk zone

Species	'Grey geese'	Common buzzard	Common crane	White stork	Great cormorant	European bee-eater	Eurasian kestrel	Hen harrier	Northern goshawk	Black kite	European sparrowhawk	Black stork	Saker falcon
Total flight time within collision risk zone (seconds)	835,335	10,585	9,420	2,955	1,740	1,230	750	465	345	300	120	90	45
Total flight time within collision risk zone (hours)	232.04	2.47	2.32	0.82	0.48	0.34	0.21	0.13	0.10	0.08	0.03	0.03	0.01
Flight time in hours per survey hour	3.22	0.04	0.04	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Flight time in hours per survey hour with correction factor (**a**)	2.71	0.03	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

N.B. The 'grey geese' category above refers to greylag and white-fronted geese combined.

Table D.11. Flight Data

Using the flight time per survey hour (a) calculated above in Table D.10, the predicted daily flight time of each species, and the duration of the study, Table D.11 below extrapolates the bird occupancy within the collision risk volume.

All target species recorded are diurnal and are generally only active (and therefore flying) during daylight hours. For the purpose of this assessment, it was assumed that these species are active for an average of up to 12 hours per day over the survey period.

Species	'Grey geese'	Common buzzard	Common crane	White stork	Great cormorant	European bee-eater	Eurasian kestrel	Hen harrier	Northern goshawk	Black kite	European sparrowhawk	Black stork	Saker falcon
Flight time in hours per survey hour (**a**)	2.71	0.03	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average daylight flight period (in hours) per day during study (estimated)	12	12	12	12	12	12	12	12	12	12	12	12	12
Duration of study (days)	264	264	264	264	264	264	264	264	264	264	264	264	264
Assumed activity during the study in hours (**b**)	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168
Predicted occupancy time (hours) within visual envelope collision risk volume: **a** x **b**	8576	109	97	30	18	13	7.7	4.8	3.5	3.1	1.2	0.9	0.5
Bird occupancy (seconds) within visual envelope collision risk volume	30,873,982	391,222	348,163	109,217	64,310	45,461	27,720	17,186	12,751	11,088	4,435	3,326	1,663

Table D12: Calculating bird occupancy within wind farm site

There were six VPs and due to the flat open nature of the site, it was considered possible to survey a visual envelope of 2km with a 1800 field of view from each VP for larger species (grey geese, white stork, black stork, common crane, great cormorant, northern goshawk, common buzzard, hen harrier, black kite). The visual envelope has been reduced to 1km for smaller species (Eurasian kestrel, saker falcon, European sparrowhawk and European bee-eater) to allow for reduced detectability at a distance. The total area surveyed (A) was then calculated:

- 6 VPs with a 2km visual envelope = 3,770 hectares
- 6 VPs with a 1km visual envelope = 942 hectares

Species	'Grey geese'	Common buzzard	Common crane	White stork	Great cormorant	European bee-eater	Eurasian kestrel	Hen harrier	Northern goshawk	Black kite	European sparrowhawk	Black stork	Saker falcon
Bird occupancy (seconds) within visual envelope collision risk volume	30,873,982	391,222	348,163	109,217	64,310	45,461	27,720	17,186	12,751	11,088	4,435	3,326	1,663
Visual envelope (hectares)	3,770	3,770	3,770	3,770	3,770	942	942	3,770	3,770	3,770	942	3,770	942
Wind farm site area (hectares) (**A**)	3,716	3,716	3,716	3,716	3,716	3,716	3,716	3,716	3,716	3,716	3,716	3,716	3,716
Bird occupancy (seconds) within wind farm site collision risk volume (**c**)	30,431,755	385,618	343,176	107,652	63,389	179,334	109,350	16,940	12,569	10,929	17,496	3,279	6,561

Once the bird occupancy within collision risk volume (C) has been calculated for each species (Table D.12), it is then necessary to establish the number of transits through the turbine rotors each species would have made over the survey period (Table D.15). This is done by establishing the

flight speed, body length and wingspan of each species (Table D.13) and by establishing the wind turbine parameters (Table D.14), to allow the volume of air space swept out by the wind turbines.

Table D.13. Biometric Data

Body length (including tail) and wingspan measurements taken from Svensson (200927).

The values of Body length (L), Wingspan (W) and Flight speed (v) have been treated as fixed values. The majority of flight speeds have been taken from Bruderer and Boldt (200128), although grey geese, merlin and saker falcon have been taken from alternate sources, referenced in Table D.13 below. Calculations have typically been derived from small data sets, and assume birds are flying at constant speed. However, it should be noted that flight speeds may only have a limited influence on collision estimates29.

Species	'Grey geese'[30]	Common buzzard	Common crane	White stork	Great cormorant	European bee-eater	Eurasian kestrel	Hen harrier	Northern goshawk	Black kite	European sparrowhawk	Black stork	Saker falcon[31]
Flight speed m/s (**v**)	18.9	11.0	14.5	13.5	16.7	12.2	12.3	11.4	9.7	12.1	11.5	15.4	14.4
Body length average m (**L**)	0.79	0.52	1.08	1.03	0.86	0.27	0.34	0.5	0.57	0.53	0.35	0.98	0.51
Wingspan average m (**W**)	1.59	1.2	2.01	1.99	1.35	0.38	0.73	1.08	1.05	1.43	0.69	1.89	1.17

[27] Svensson, L., Mullarney, K. and Zetterstrom, D. (2009) Collin Bird Guide: 2nd Edition. Collins:Italy.
[28] Bruderer, B. and Boldt, A. (2001) *Flight charateristics of bird: .I radar measurements of speeds*. Ibis, 143, 178-204.
[29] Madders and Whitfield. (2006). *Upland raptors and the assessment of wind farm impacts.* Ibis, 148, 43-56.
[30] Speakman, J.R. and Banks, D. (1998) *The function of flight formations in greylag geese; energy saving or orientation?* Ibis, 140, 280-287.
[31] Based on peregrine falcon flight speed, taken from Cochran, W. (1986) *Speed of flapping flight of merlins and peregrine falcons* The Condor, 88, 397-398.

Table D.15. Wind turbine Parameters

The volume of airspace within the wind farm site at rotor height is known as the collision risk zone.

Measurement	Symbol	Value	Comments
Wind farm site area (m^2)	**A**	37,160,000	
Rotor height (m)	**h**	126	Difference between upper and lower rotor height
Collision risk zone (m^3) **A** x **h**	**Vw**	4,682,160,000	
Number of turbines	**N**	57	
Rotor blade radius (m)	**r**	63	Specification provided by Continental Wind Partners
Width of rotor blade (m)	**d**	4.0	Specification provided by Continental Wind Partners

Calculation of the number of bird transits through the rotors over the 9 months of survey is based on the 'Birds using windfarm airspace' approach outlined in Stage 1 of *Windfarms and Birds: Calculating a theoretical collision risk assuming no avoiding action* (SNH, 2000) using data from Tables D.12, 13 and 14 above. Results of this calculation can be viewed in Table D.15 below.

Table D.15: Collision Risk Calculation

Species	Grey geese	Common buzzard	Common crane	White stork	Great cormorant	European bee-eater	Eurasian kestrel	Hen harrier	Northern goshawk	Black kite	European sparrowhawk	Black stork	Saker falcon
Combined volume swept out by the wind turbine rotors **Vr = N** x πr^2 x (**d**+**L**)	3,404,847	3,212,925	3,607,432	3,571,891	3,451,051	3,035,219	3,084,977	3,198,708	3,244,912	3,220,033	3,092,085	3,536,350	3,205,817
Bird occupancy in seconds within collision risk volume (**c**)	30,431,755	385,618	343,176	107,652	63,389	179,334	109,350	16,940	12,569	10,929	17,496	3,279	6,561
Bird occupancy (sec) of the volume swept by the rotors **d** = **c** x **Vr/Vw**	22,130	265	264	82	47	116	72	12	9	8	12	3	4
Bird flight speed **v** (m/s)	18.9	11.0	14.5	13.5	16.7	12.2	12.3	11.4	9.7	12.1	11.5	15.4	14.4
Time for bird to make a transit through the rotor (sec) **t = (d + L) / v**	0.25	0.41	0.35	0.37	0.29	0.35	0.35	0.39	0.47	0.37	0.38	0.32	0.31
Number of bird transits through the rotors over 9 months **e = d / t**	87,318	644	755	221	161	332	204	29	19	20	31	78	14

Table D.16: Annual estimates

The calculations so far have estimated the number of bird transits over the nine month period (264 days) over which the surveys were carried out. The original baseline data collected by Ecoda established that the site is not important for migratory birds, with the majority of birds being resident (e.g. common buzzard, Eurasian kestrel) or over-wintering (e.g. grey geese). Therefore the bird activity over the months not covered in the additional bird surveys (August – October) are considered to have similar or reduced bird activity to those included in the additional bird survey period (November 2011 to July 2012, which included the spring migration period).

The number of bird transits through the rotors over the 9 month period (264 days) can therefore be extrapolated (multiplied by 1.38) to calculate the number of bird transits in a single year.

Due to the presence of grey geese being restricted purely to January and February, no records would be expected in the months of August to October. Therefore the number of grey geese transits has not been extrapolated, as the existing value is already considered to be an annual total.

Species	**Grey geese**	**Common buzzard**	**Common crane**	**White stork**	**Great cormorant**	**European bee-eater**	**Eurasian kestrel**	**Hen harrier**	**Northern goshawk**	**Black kite**	**European sparrowhawk**	**Black stork**	**Saker falcon**
Number of bird transits through the rotors over 9 months **e = d / t**	87,318	644	755	221	161	332	204	29	19	20	31	8	14
Number of bird transits through the rotors over 1 year	87,318	890	1,044	305	222	459	282	41	26	28	42	11	20

Stage 2 - Estimation of collision risk assuming no avoiding action

The information in the Table D.17 below is input into the Band Model (SNH, 200032) to generate a collision probability for each bird species (P) in Table D.18 below, based on the bird size, flight speed and the turbine dimensions and details.

Table D.17: Details required for the Band Model to calculate the probability of a bird being hit when flying through the rotor

Measurement	Value	Comments
Number of blades	3	
Maximum chord (m)	4.0	Specification provided by Continental Wind Partners
Pitch (degrees)	6	Specification provided by Continental Wind Partners
Flapping or gliding	0	0 = flapping (1 = gliding)
Rotor diameter (m)	126	Specification provided by Continental Wind Partners
Rotor period (sec)	6.5	Specification provided by Continental Wind Partners

[32] Band, W., Madders, M. and Whitfield, D.P. (2006) Developing field and analytical methods to assess avian collision risk at wind farms; cited in De Lucas, M., Janss, G. and Ferrer, M. 'Birds and Wind Power' Barcelona, Spain: Lynx Edicions

Table D.18: Estimate of number of collisions assuming no avoiding action

Species	Grey geese	Common buzzard	Common crane	White stork	Great cormorant	European bee-eater	Eurasian kestrel	Hen harrier	Northern goshawk	Black kite	European sparrowhawk	Black stork	Saker falcon
Average collision probability (**P**) [SNH 2000]	6.4	6.3	7.8	7.8	6.5	4.9	5.3	6.1	6.7	6.3	5.4	7.3	5.9
Estimated number of collisions per year without avoidance **e** x **P** / 100	5,588	56	81.5	23.8	14.4	22.5	11	2.5	1.7	1.8	1.7	0.77	0.9

Stage 3 – Applying the avoidance factor

Table D.19 shows the predicted number of collisions per year for all species (the collision risk). Collision avoidance rates are taken from SNH (2010). A default avoidance rate of 98% has been used, with the exception of three target species, where the guidance provides more specific avoidance values: 'grey geese' (greylag geese and greater white-fronted geese) and hen harriers have an avoidance rate of 99%, whereas kestrels have a lower avoidance rate of 95%.

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Table D.19. Application of the collision avoidance rate

Species	Grey geese	Common buzzard	Common crane	White stork	Great cormorant	European bee-eater	Eurasian kestrel	Hen harrier	Northern goshawk	Black kite	European sparrowhawk	Black stork	Saker falcon
Estimated number of collisions per year without avoidance **e** x **P** / 100	5,588	56	81.5	23.8	14.4	22.5	11	2.5	1.7	1.8	1.7	0.77	0.9
Avoidance rate taken from SNH (2010)	99%	98%	98%	98%	98%	98%	95%	99%	98%	98%	98%	98%	98%
Average number of predicted collisions per year using avoidance rate (**f**)	55.88	1.1	1.6	0.48	0.29	0.45	0.54	0.02	0.03	0.04	0.03	0.02	0.02

<u>Stage 4</u> - Adjustment for rotor downtime and unsuitable flight conditions

The predicted number of collisions per year for each species per year has been adjusted to allow for rotor downtime and unsuitable flight conditions. . High and low wind speeds will reduce the operational time of the turbine to approximately 80% (g) of its life. Estimates have been provided by Continental Wind Partners

Table D.20. Predicted collisions for each species per year using a 20% estimate for rotor downtime

Species	Grey geese	Common buzzard	Common crane	White stork	Great cormorant	European bee-eater	Eurasian kestrel	Hen harrier	Northern goshawk	Black kite	European sparrowhawk	Black stork	Saker falcon
Adjusted average number of predicted collisions per year **f x g**	44.71	0.90	1.3	0.38	0.23	0.36	0.43	0.02	0.03	0.03	0.03	0.01	0.01

Number of years per collision	0.02	1.1	0.77	2.63	4.3	2.78	2.3	51	36	36	38	81	74

Summary

An assessment of the additional data collected between November 2011 and July 2012 suggests that the findings are consistent with the original baseline data collected between September 2009 and February 2011 and the interpretation of that data:

- A total of 93 species were recorded during the additional bird surveys between November 2011 and June 2012. This species list is similar to the 117 species recorded between September 2009 and February 2011, with the lower number believed to be reflective of the reduced survey effort.
- The additional vantage point survey data collected between November 2011 and July 2012 supports the findings of the original baseline data (collected between September 2009 and February 2011), identifying the same ten target species with the greatest number of flights: common buzzard, Eurasian kestrel, Eurasian hobby, western marsh harrier, hen harrier, northern goshawk, Eurasian sparrowhawk, greylag goose, greater white-fronted goose and European bee-eater.
- Collision risk analysis of the additional vantage point survey data confirmed that the proposed wind farm is not expected to have a significant impact on any of the target species.
- The breeding bird surveys carried out between March 2012 and July 2012 has identified nine species that bred within the survey squares and a further six species that possibly had breeding territories within or near the breeding squares. Nine of these species were identified as breeding species within the wind farm site in the Environmental and Social Impact Assessment (Atkins, 2012). The Environmental and Social Impact Assessment identified a further eight species believed to breed within the wind farm site, of which seven were recorded during the 2012 breeding surveys, but are not thought to actually breed within the breeding bird squares.
- The breeding bird surveys carried out between March 2012 and July 2012 identified three confirmed common quail territories and a further possible five common quail territories within the breeding bird survey squares. When multiplied by 6.19 to represent the total area of the wind farm site (3,716 Hectares), this equates to approximately 19-50 territories. This gives a mean of 34.5 territories and supports the estimation of 30 common quail territories in the Environmental and Social Impact Assessment (Atkins, 2012).

Other Bird Species

The significance of the study area for all other species is assessed as **low to moderate** at most. Furthermore, most of these species are not believed to be particularly prone to collision/barotrauma. Thus, a significant collision/barotrauma risk can be excluded for all other species registered within the study area.

D3.2.6 Species (other than bats and birds)

During operation of the wind farm, maintenance of the turbines and associated infrastructure will be undertaken, but this will be along existing access tracks and within compound areas.

No impacts to mammals or reptiles are anticipated during the operational phase.

D3.3 Landscape and Visual

D3.3.1 Introduction

This section addresses the nature and significance of the perceived alterations in landscape character and visual amenity that would result from the scheme during the operation of the wind farm. The prominence of the development proposals will be dependent upon a combination of land use and topographic factors relative to the position of the visual receptor and their sensitivity. The sensitivity of visual receptors is an important issue in the assessment of the significance of an impact. This sensitivity is based on the type of receptor, as well as the special nature of the view. For example, residential properties are considered to have a high sensitivity.

D3.3.2 Landscape Effects during Operation

Effects on Vegetation and Land Cover

The site comprises large agricultural fields with open, undefined boundaries and therefore the proposals will not result in the loss of any significant landscape features or vegetation of particular value for its contribution to the wider landscape. It is anticipated that upon completion of construction the access tracks and the footprint of the turbines as well as the electricity pylons will occupy a limited area of the overall site extents, this combined with the restoration of construction areas will in the main return the site to its current land cover condition. Therefore it is considered that the effects on vegetation and land cover throughout the operational phase are expected to be **no change** as land cover re-establishes.

Effects on Landscape Character

The placement and operation of the wind farm in the landscape may result in a negative change to the landscape character of the site and its immediate surroundings. This is due to the introduction of tall industrial structures in the agricultural setting and predominantly low and open landscape. It should be noted that the existing site and surrounding area contain a number of other tall elements such as a line of electricity pylons and telephone poles.

Furthermore the turbines and to a lesser extent the line of electricity pylons would introduce additional modern and dominant elements to the landscape which would both dwarf the existing pylons and poles and contrast with the character of the rural landscape. Therefore they would become the dominant feature and a key characteristic of the landscape within the local area. As a result the changes to the site would predominantly cause a **minor to moderate adverse** impact on the landscape character on commencement of operation.

Effects on Land Use

The scheme would introduce 57 new tall vertical, manmade elements and associated infrastructure (including the transformer sub-station and HV overhead power line/ pylons, into an area of existing rural landscape character. This represents a small percentage of the total development area (200 ha) and it is anticipated that there will be continuation of current agricultural land use over the rest of the site during operation. It is considered that, overall; there will be no detrimental change to the land use of the site.

With regards to the ancillary structures and access tracks, these will be developed to reflect the scattered development which is typical of the landscape character of the surrounding area characterised by occasional farm buildings and tracks. All new infrastructure would be directly associated with the turbine development. As such, the negative effects on the land use throughout the operational phases are expected to be **negligible to low adverse**.

Effects on Designated Areas

As previously acknowledged, the site extents around the Deliblato Sands site to the east; however the proposed development will be contained at a distance of a minimum of 1km from the designated landscape. Though the proposals will not result in direct physical effects on this designated area, the proposed site must be considered as a contributor to the setting of the landscape protection area.

The landscape character of the protected area is strongly defined by the tranquillity and scenic quality of the area. These qualities are considered essential to the attraction the area has to tourists, seasonal visitors and residents. However due to the variation in topography, the predominance of dense mature vegetation which covers most of the designated site, and given the relative remoteness and restricted accessibility of the designated area in relation to the wider

landscape, only a limited number of turbines would be visible, or partially visible from a limited number of locations of the Deliblato Sands area. As such the landscape effects on the designated site are likely to be **low adverse to no change** during the operation phase of the development. Given the alignment and distance of the proposed overhead power line from the Deliblato Sands area – the designated site is unlikely to be affected by the associated power line.

D3.3.3 Potential Visual Impacts

Visual impacts will result from operations throughout construction phases, including construction plant operations and traffic movements, facility installation and operational phases.

The prominence of the development proposals will be dependent upon a combination of land use, land cover and topographic factors relative to the position of the visual receptor and their sensitivity.

The sensitivity of visual receptors is an important issue in the assessment of the significance of an impact. This sensitivity is based on the type of receptor, as well as the special nature of the view. For example, residential properties are considered to have a high sensitivity.

Additional factors to consider in the classification of sensitivity of visual receptors include:

- The period of exposure to view;
- The degree of exposure to view;
- The function of receptor, and
- The nature of the view.

The following tables identify the visual impacts that will potentially be generated by the scheme as viewed from a series of key viewpoints. For the purposes of this assessment the table contains the impacts resulting from both construction and operation phases. Reference is made to a corresponding viewpoint photomontage, these are contained within the attached appendices section; DI.

Table D.5: Identification of Receptors and Associated Potential Visual Impacts

Receptor	Sensitivity of receptor	Description of impacts	Duration of impacts	Nature of impact	Significance of impact
Villages and Hamlets:					
Dolovo	High	- Properties on the eastern edge of Dolovo approximately 2.5km from the nearest turbines and 300m from the proposed overhead power line. - Construction would necessitate tall plant (cranes) that would have short term impacts. - Properties on the north, east and south east edge of Dolovo village will have views of a considerable number of wind turbines in the development area and direct, close up views of the electricity pylons within the foreground of their views to the east. - Operational phase would see the introduction of large scale features that, from certain locations, would occupy a large proportion of the view from residential properties. However some intervening vegetation would limit the number and extent of turbines seen and would also reduce the likelihood that dwellings will have extensive views. **- Refer to Viewpoint Photomontages A, B and C (representative views)**	**Temporary** Impacts associated with construction activity such as crane and plant machinery movement, compound/ welfare facilities, turbine and electricity pylon installation. **Permanent** Impacts associated with views of turbines in relative proximity (2.5km) to the village and a number of electricity pylons conveying the overhead power lines in direct proximity to the eastern side of the village.	Negative	**Moderate / Substantial adverse**

Receptor	Sensitivity of receptor	Description of impacts	Duration of impacts	Nature of impact	Significance of impact
Mramorak	High	- Less than 1km from turbine groups in southern extent of proposed development. - Approximately 5.5km east/ south east of the proposed overhead power line. - Views during construction and permanent views of group of turbines nearest to the village. - Where views are available, these would be of the southernmost turbines with the main development viewed as a narrow/ confined belt due to the orientation of the development to the village. - Operational phase would see the introduction of large scale features which would occupy a large proportion of the view from properties on the northern edge of the village. However some intervening vegetation local to properties and the orientation of the settlement would limit the number and extent of turbines visible. **- Refer to Viewpoint Photomontage E and F**	**Temporary** Installation of turbines on the northern side of the development and erection of the overhead power line, pylons and turbines. **Permanent** Impacts associated with views of a number of turbines including turbines within direct proximity (1km) of Mramorak village. Introduction of new pylon structures approximately 5.5km to the west of the village. Affecting properties on the western edge of the village.	Negative	**Moderate / Substantial adverse**
Deliblato	High	- 4.5km to turbines on southern extent of development. - Views towards the development area from a limited number of properties on the north western edge of the village. - The village is relatively well screened by intervening vegetation and topography. - Where views are available, these would be limited to the southernmost turbines as a narrow group or cluster due to the orientation of the proposed development to the village. - Views of the proposed overhead power line and pylons to the west of the village will be limited owing to distance (about 12.5km) and intervening vegetation. **- Refer to Viewpoint Photomontage I for representative view.**	**Temporary** Associated with construction activity such as crane and plant machinery movement and installation of a limited number of turbines. **Permanent** Impacts associated with views of a limited number of turbines. Limited potential for views of the overhead power line	Negative	**Minor / moderate adverse**
Bavanište	High	- 10km to the nearest turbine north east of Bavanište village. - View towards development area from a limited number of properties on the eastern edge of the village. - Where views are available, these in all likelihood would comprise a wide panoramic view of majority of turbines across the middle to southern area of the proposed development site. - Possible long distance views of the uppermost sections of turbines due to intervening vegetation. - Potential direct views of the new overhead power line and pylons directly to the north east of the village, running on a northerly alignment towards Dolovo and beyond to the development site.	**Temporary** Associated with construction activity. **Permanent** Impacts associated with views of a limited number of turbines from a long distance. Moderate adverse impacts owing to direct views of power line and pylons connecting with existing grid to the east of the village.	Negative	**Minor / moderate adverse**

Receptor	Sensitivity of receptor	Description of impacts	Duration of impacts	Nature of impact	Significance of impact
Vladimirovac	High	- 2km to nearest turbines in northern extent of development. - Potential views of turbines to the south and south east of the hamlet from a very limited number of properties, due to village built form and particularly orientation to the development. - Views of the overhead power line and pylons are unlikely owing to distance (greater than 12km) and alignment of the power line. - Construction would necessitate some taller plant (cranes) that would have short term impacts. - Operation phase would see introduction of large scale features that, from certain locations would be viewed as a narrow cluster due to the orientation of the development. **- Refer to Viewpoint Photomontage D for representative view.**	**Temporary** Associated with construction activity such as crane movement and plant machinery and turbine installation. **Permanent** Direct views towards turbines on south west side of development.	Negative	**Minor / moderate adverse**
Banatsko Novo Selo	High	- 15km to nearest turbine - Potential views of wind farm to the east and north east from a very limited number of properties on the edge of the settlement. - Construction would necessitate tall plant (cranes) that would have short term impacts. - Possible long distance views limited to the uppermost sections of turbines only would be visible due to intervening vegetation. - Views of the overhead power line and pylons are unlikely owing to excessive distance, intervening settlement (Dolovo village) and vegetation.	**Temporary** Impacts associated with construction activity. **Permanent** Direct views of turbines and limited views towards the uppermost sections of turbines.	Negative	**Minor adverse**
Pančevo	High	- 23km from the main group of turbines - Limited views from very few properties owing to distance from development and intervening vegetation and undulating topography east of settlement edge. - Views of the overhead power line and pylons are unlikely owing to distance (greater than 17km). - Limited opportunity for temporary views	**Temporary** Limited opportunity for views during construction **Permanent** Slight potential for long distance views of turbines and pylons. However these are likely to be barely perceivable due to distance.	Negative	**No change**

Receptor	Sensitivity of receptor	Description of impacts	Duration of impacts	Nature of impact	Significance of impact
Gaj	High	- 16km from southernmost group of turbines. - Greater than 12km from overhead power line connection with grid at Bavanište. - Limited views from very few properties owing to distance from development and intervening vegetation and undulating topography east of the settlement. - Potential for views during construction and permanent views of upper sections of turbines - Possible long distance views of the uppermost sections of the turbines only due to intervening vegetation. - Possible long distance views of a limited number of individual electricity pylons.	**Temporary** Limited opportunity for views during construction **Permanent** Long distance views of turbines. Likely to be barely perceivable due to distance.	Negative	**No change**
Kovin	High	- 18km from southernmost turbines. - Limited views from very few properties owing to distance and orientation from development, intervening vegetation and undulating topography along northern edge of settlement. - Limited opportunity for views during construction. - Views of the overhead power line and pylons are unlikely owing to distance (greater than 8km) and alignment of the power line to the village settlement.	**Temporary** Limited opportunity for views during construction **Permanent** Long distance views of turbines. Likely to be barely perceivable due to distance and orientation.	Negative	**No change**
Sumarak	High	- 17km from main group of turbines. - Limited views from very few properties owing to sloping landform, with some vantage points along north of settlement edge. - Limited potential for views towards temporary construction plant. - Limited potential for views of cluster of turbines in the south of the development due to development orientation. - Potential views of the overhead power line/ pylon connection to the east of Bavanište village from a limited number properties on the edge Sumarak village.	**Temporary** Limited opportunity for views during construction **Permanent** Turbines are likely to be barely perceivable due to distance and orientation. Potential adverse impact on views due to overhead power line connection east of Bavanište Village.	Negative	**Minor Adverse/ No change**
Vehicle Travellers:					

Receptor	Sensitivity of receptor	Description of impacts	Duration of impacts	Nature of impact	Significance of impact
Various Roads	Medium	- Numerous locations throughout the study area at a variety of distances often associated with locations between villages and settlements. - Potential views would be from varying hierarchy of roads/ lanes and tracks in the area. - Views from E70 would be limited to vehicle travellers travelling north eastwards towards the development. Views would be fleeting due to speed of travel and intervening vegetation alongside the road and within the intermediate landscape. - Views from village link roads would be restricted to a limited number of road sections and direction of vehicle travellers to the development site. - Views from tracks between villages and farmland within close proximity of the development would be most severely affected; however these are infrequently used by a limited number of receptors. **- Refer to Viewpoint Photomontage N for representative view.**	**Temporary** Impacts associated with short term activities during construction such as crane and plant machinery movement during wind turbine and electricity pylon installation. **Permanent** Potential views of varying numbers of turbines dependent upon road section and alignment. Potential direct views of the overhead power line and pylons on roads in the vicinity of Dolovo and Bavanište village road network.	Negative	**Minor to Moderate adverse**
People in work (agricultural, infrastructure):					
Various	Low	- Various distances from the scheme, ranging from immediate to in excess of 15km. - Views of the scheme would vary, from direct views of the temporary construction activities and direct views of the turbines. In other areas views from the area tend to be disrupted by intervening vegetation and few vantage points are available due to the low and level landform.	**Temporary** Impacts associated with short term activities such as construction **Permanent** Associated with introduction of turbines and additional electricity pylons into a rural landscape	Negative	**Minor to Moderate adverse**
Visitors / Users of the Deliblato Sands Designated (Nature) Site :					
Various	High	- About 1.5/2km to the nearest turbines from accessible/viewable areas - Potential views of a very limited number of turbines from the Deliblato Sands site, these views would in all likelihood comprise only the upper sections of a limited number of turbines dependent on viewer's position within the area. - Potential for views during construction and permanent views of upper sections of turbines concentrated near western fringes of designated area. - Where views are available the wind farm development would form a small proportion of the view and, from these areas, the scale and composition of the view are not likely to be affected due to intervening vegetation and topography. -Limited potential for views of the power line and pylons owing to distance and intervening vegetation and built settlements to the west of the Deliblato Sands area.	**Temporary** Impacts associated with construction activity such as crane and plant machinery movement and turbine installation. **Permanent** Limited impacts - Views of the upper turbine hubs and blades of a limited number of turbines	Negative	**Minor adverse/** **No change**

D3.3.4 Shadow Flicker

Shadow flicker is caused where the light from the sun passes through the blades of a moving turbine. It may become a problem for those people who live near, or have a specific orientation to, the wind farm.

Serbian regulations state that the distance from the turbines to the nearest residential properties must be greater than 500m. This is considered to be the maximum area over which shadow flicker is experienced. However, international to best practice, states that the minimum distance from the turbine to a residential property must be at least ten times the rotor diameter to ensure shadow flicker is eliminated. This ESIA has used this best practice figure, i.e. 1,260m.

The distances from the nearest turbine (as shown in Figure D.2) are given in Table D.3, below.

Table D.6: Distance from Wind Turbine to Mramorak Structures

Structure	Distance from structure to turbine	Condition of the structure
A	800m	Derelict house
B	854m	Derelict house
C	968m	Farm building (in use)
D	1,038m	Residential (appears to be occupied)
E	1,117m	Derelict house
F	417m	Derelict farm building
G	486m	Derelict farm building

Structures A to E are along the north of Mramorak village, see Figure D.2.

Figure D.2: Satellite Photo of the Buildings to the North of Mramorak

Upon inspection, it was confirmed that structures A, B and E are either derelict or abandoned (Figure D.3). Structure C is an agricultural building within a small orchard. The building and the orchard are very well maintained but is not a residential property (Figure D.4). Structure D is the only occupied house in the row. It can be seen from the site photographs that these buildings are along the top edge of a shallow valley and many are surrounded by mature trees.

Figure D.3: Derelict Buildings (A, B and E) to the North of Mramorak

Figure D.4: Farm Building (C) to the North of Mramorak

Figure D.5: Residential House (D) to the North of Mramorak

The Assessment has confirmed that the closest structures to the any of the turbines are located to the west of Deliblato village. These structures are 417m and 468m from the closet turbine (structures F and G in Figure D.6). Upon inspection, these structures, and those to the east on the same plot, were confirmed to be derelict farm buildings; they have the appearance of poultry sheds.

Figure D.6: Satellite Photo of the Derelict Farm Buildings (F and G) to the West of Deliblato

It is considered that shadow flicker will not be a significant issue for the site.

D3.4 Noise Impact

D3.4.1 Approach

In order to assess the noise impacts from the operation of the wind farm, noise levels from the operation of the wind farm have been calculated and compared with the permitted noise levels and the existing noise climate described in this Section.

D3.4.2 Noise Calculations

The noise levels from the wind farm have been calculated by WEBG using WindPro software, which implements the method of calculation given in ISO 9613: Attenuation of sound during propagation outdoors - Part 2: General method of calculation 1996.

ISO 9613 Part 2 provides an engineering method for calculating the attenuation of sound during propagation outdoors and for predicting the levels of environmental noise at a distance from a number of sources. The method described in Part 2 can be applied to a wide variety of noise sources, and covers most of the major mechanisms of attenuation. For this study the following attenuation mechanisms have been taken into account;

- Attenuation from geometrical divergence – i.e. noise levels decreasing with additional distance from each turbine;
- Attenuation from atmospheric absorption – i.e. further attenuation as the noise passes through the atmosphere;
- Attenuation from ground effects – i.e. further attenuation as the noise passes over the ground between the turbine and the receptor;

The calculation method is for downwind conditions. Noise levels would be lower upwind of a source, and so this method calculates a worst case condition as it takes receptors in every direction to be downwind.

Each of the 57 wind turbines is modelled separately, and the total noise from all turbines is calculated at each noise sensitive receptor.

Calculation Settings

Calculations have been based on a temperature of 10°C and a relative humidity of 70%. Data for the region indicates that temperatures range between -10°C and 30°C, and that relative humidity's range between 30% and 90%.

The propagation of noise through the atmosphere changes with temperature, and values for the temperature and pressures in the area are reported in ISO9613-1. This variation means that the noise from the wind farm may sound different on a cold dry day compared with a warm humid day for example.

The temperature and pressures selected for the calculations are representative of the worst case noise propagation conditions.

ISO 9613 allows different methods for calculating the effects of ground absorption. The 'Alternative' method of ground absorption has been used as the ground in the study area undulates, and therefore is not regarded as flat.

As the alternative method of ground absorption has been used, and octave band data is not required, the other attenuations used are based on the value from the 500Hz octave band, in accordance with the Standard.

Wind Turbine Noise Levels

The original ESIA was undertaken before the final selection of turbines had been made. It was therefore decided to complete the ESIA noise calculations using data from two different wind turbines (Vestas V112 and a REPower 3.2). This was done to examine the sensitivity of the results to any future change in turbine and represent a "worst case scenario" in terms of size of the turbine and, therefore, noise implications. At the time of the ESIA update, WEGB had refined the turbine selection to two GE units, the GE 2.5 – 120 and the GE 2.75 – 120. The noise characteristics of the GE units are lower than those used within the original modelling (worst case 105 dBA), see Table D.7.

In addition, the new 2.5-120 and 2.75-120 units have improved control systems that can automatically switch to noise-reduced operating mode (NRO or Noise-Reduced Operation). The maximum noise levels can be set within the control system and can ensure that noise limits are not exceeded. This NRO technology is thought to be particularly important during night time operation.

The noise emitted by the 2.5-120 and 2.75-120 is predominantly determined by the aerodynamic broadband noise of the rotor blades, which is directly dependent on the blade tip speed. Blade noise increases with increasing wind speed until rated power is reached. The sound power level can be lowered by reducing the rotor speed, thus lowering and limiting the tip speed. The rated power level is reduced accordingly, which has a secondary positive effect on the noise level through earlier blade pitching. In the upper wind speed range at the benefit of lower noise levels, there is some loss in energy yield because of the reduction in power level.

Calculations have been undertaken for a Vestas V112 and a REPower 3.2 (approved technology of the Repower 3.4M104), both at a single wind speed of 10m/s. Data for the turbines indicates that the Vestas V112 turbine generates equally high noise levels at wind speeds above 10m/s. The REPower 3.4M104 has a guaranteed acoustic output level, therefore these calculations represent a worst case for noise generation.

The following noise data has been used in the calculations:

Table D.7: Wind Turbine Sound Power Levels

Turbine	Overall Sound Power, dBA
Vestas V112	106.5
REPower 3.4M104	105.2

Calculated Noise Levels

The results of the noise calculations are given in the following table. Where there is more than one calculation reference for each location, the reference with the highest noise level is listed.

Table D.8: Calculated Noise Levels

No.	Location	Calculation Reference Day / Night	Vestas V112 dB L_{Aeq}	REPower 3.4M104 dB L_{Aeq}
1	Mramorak	1678 / 1640	37.8	36.5
2	Devojački bunar	1658 / 1620	35.8	34.5
3	Dolovo	1683 / 1645	31.7	30.4
4	Vladimirovac	1705 / 1703	28.5	27.2
5	Vladimirovac to Devojački bunar	1680 / 1642	38.5	37.3
6	Devojački bunar to Mramorak (north)	1673 / 1635	39.6	38.4
7	Devojački bunar to Mramorak (mid)	1675 / 1637	37.4	36.1
8	Devojački bunar to Mramorak (south)	1686 / 1648	35.9	34.7
9	Devojački bunar to Dolovo	1688 / 1650	41.0	39.8

Overall, the Vestas V112 generates noise levels that are approximately 1dB(A) higher than the REPower 3.4M104, which is in accordance with the overall dB(A) sound power level of the turbines.

D3.4.3 Noise Impact Assessment

The predicted noise levels from the wind turbines are below the permitted night time level of 45dB(A) as specified in the Decree of Environmental Noise at all locations. This ensures that people living in the area are sufficiently protected from noise generated by the wind farm.

However, given the existing ambient noise levels near the site, the impact of the wind farm can also be assessed by a comparison of the predicted noise levels from the wind farm with the existing noise levels.

In the following table the results from the Vestas V112 turbine are used and compared with the night time noise levels to be representative of a worst case.

Table D.9: Noise Impact Summary: Night Time

No.	Location	Wind Farm Noise dB L_{Aeq}	Existing Night Noise dB L_{Aeq}	Total Noise Level dB L_{Aeq}	Change in Noise dB L_{Aeq}
1	Mramorak	37.8	33	39.0	6.0
2	Devojački bunar	35.8	32	37.3	5.3
3	Dolovo	31.7	29	33.6	4.6
4	Vladimirovac	28.5	32	33.6	1.6
5	Vladimirovac to Devojački bunar	38.5	32	39.4	7.4
6	Devojački bunar to Mramorak (north)	39.6	27	39.8	12.8
7	Devojački bunar to Mramorak (mid)	37.4	27	37.8	10.8
8	Devojački bunar to Mramorak (south)	35.9	33	37.7	4.7
9	Devojački bunar to Dolovo	41.0	29	41.3	12.3

These assessments show that noise levels from the wind farm are typically higher than the existing noise levels during the night, and it is likely that the wind turbines would be audible. However, overall noise levels during the night would remain below the permitted levels.

The noise calculations are for a downwind situation and the prevailing wind direction is from the South East, with wind from the North West being the other dominant direction. Therefore, the impacts shown for locations to the north and west are expected to be typical – locations 2, 4, 5, 6, 7 and 9, with impacts also expected at locations to the south and east at other times – locations 1, 2, 6, 7 and 8. Dolovo – location 3 is not typically downwind of the wind farm, and these impacts would not be expected to occur frequently.

During the day the ambient noise levels are higher, which gives rise to the following worst case assessment:

Table D.10: Noise Impact Summary: Day Time

No.	Location	Wind Farm Noise dB L_{Aeq}	Existing Day Noise dB L_{Aeq}	Total Noise Level dB L_{Aeq}	Change in Noise dB L_{Aeq}
1	Mramorak	37.8	49	49.3	0.3
2	Devojački bunar	35.8	37	39.5	2.5
3	Dolovo	31.7	46	46.2	0.2
4	Vladimirovac	28.5	37	37.6	0.6
5	Vladimirovac to Devojački bunar	38.5	37	40.8	3.8
6	Devojački bunar to Mramorak (north)	39.6	47	47.7	0.7
7	Devojački bunar to Mramorak (mid)	37.4	47	47.5	0.5
8	Devojački bunar to Mramorak (south)	35.9	49	49.2	0.2
9	Devojački bunar to Dolovo	41.0	46	47.2	1.2

At the majority of locations during the day the noise from the wind turbines is lower than the baseline noise levels, and the change in noise would be negligible. Overall noise levels during the day would remain below the permitted levels.

The noise contours from the software are shown below for both turbine types.

The modelling confirms that noise levels will be in compliance with Serbian regulatory limits; the maximum predicted noise level during the night being 41.3 dBA against a limit of 45 dBA. The maximum predicted noise level during the day being 49.3 dBA against a limit of 55 dBA.

It is also noted that the IFC guidelines require that the noise generated by the turbines must not result in a maximum increase in background levels of 3 dB at the nearest receptor location. The modelling has suggested that this may be an issue at some locations during the night. It is expected that the GE 2.5-120 or 2.75-120, with NRO controls in place, will perform better than these worst case predictions. The ESAP contains a requirement to monitor levels and to take remedial action (e.g. by modifying turbine speeds) should the noise levels cause significant complaint.

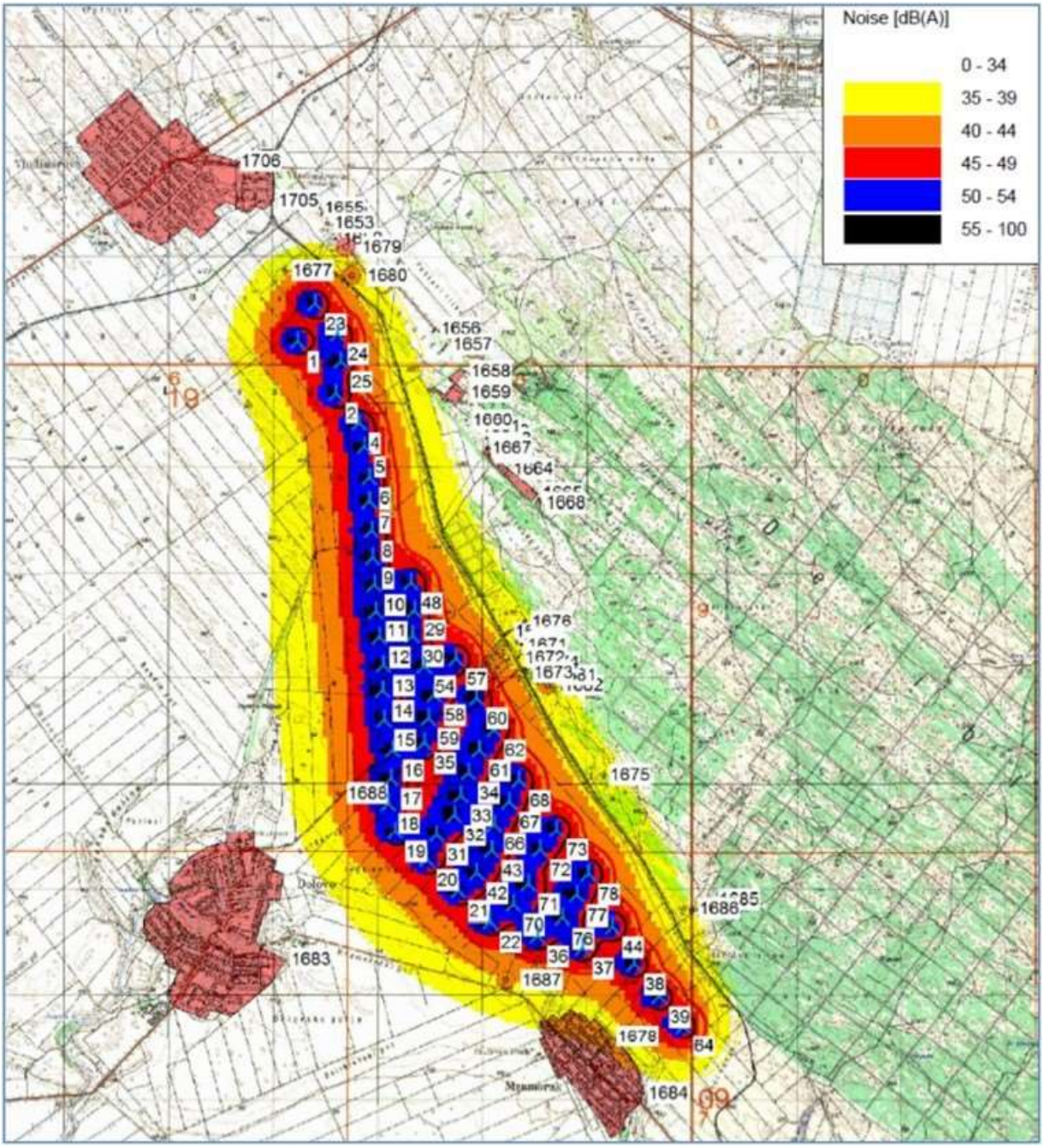


Figure D.7: Noise Contour – Vestas Turbine.

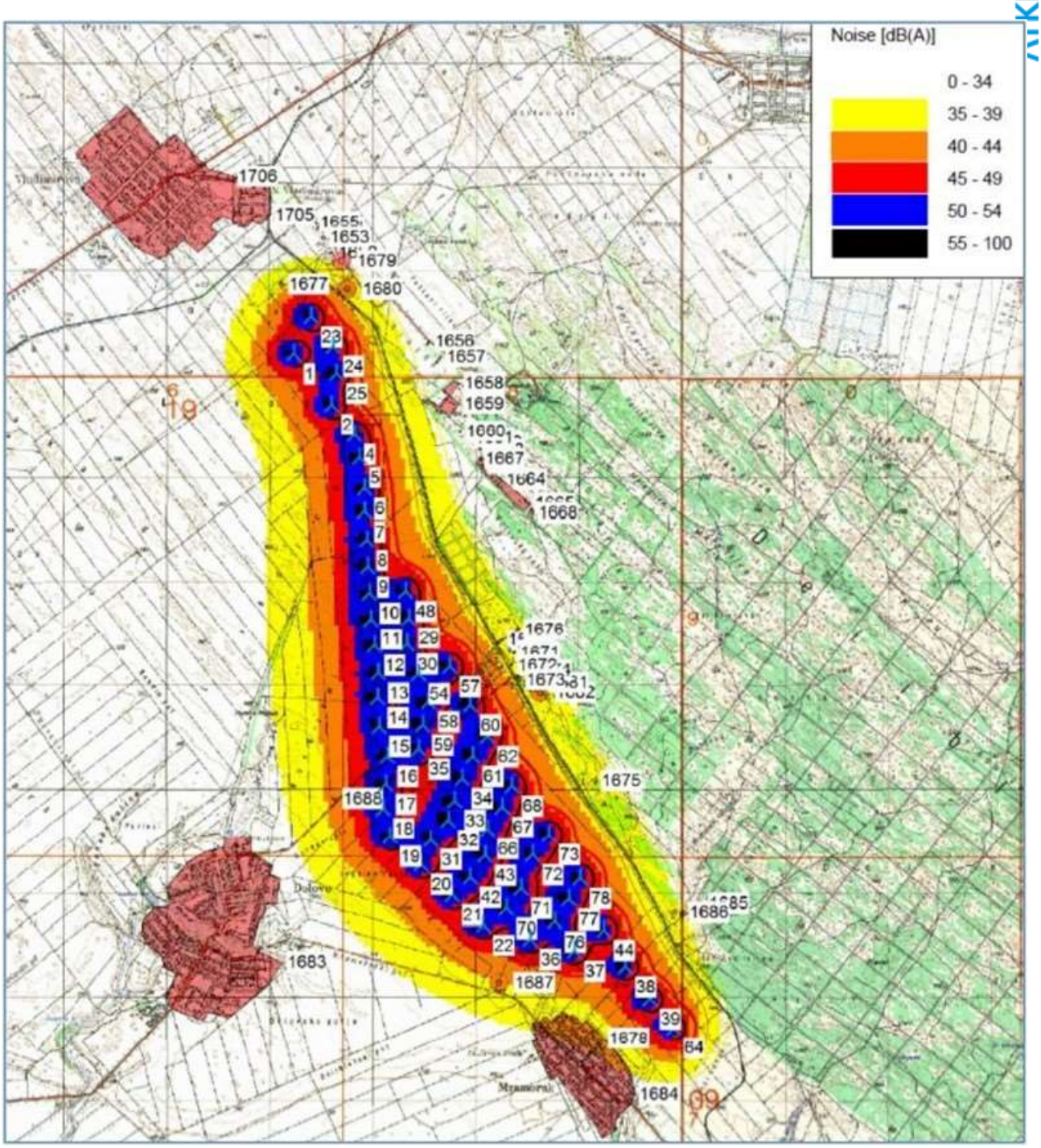


Figure D.8: Noise Contour – REPower Turbine

D3.5 Social-Economic Impacts

The following section describes the socio economic impacts associated with the operation of the Čibuk 1 wind farm, grouped under the following headings:

- Impacts to land use
- Employment and procurement opportunities
- Impacts on livelihoods
- Revenue generation for the local government / community
- Impacts on infrastructure

Impacts and mitigation measures associated with health, safety and public nuisance are addressed in Section D3.6.

The significance of socio economic impacts was determined based on a consideration of their direction (positive, negative, mixed or neutral), magnitude (negligible, low, moderate, high), geographic extent (individual, local, regional, national, trans-boundary) and duration (short-term, medium-term, long-term).

D3.5.1 Impacts to Land Use

Approximately 98 ha of land previously occupied for construction will become available for agriculture again. Only 30 ha will remain unavailable during the operation of the wind farm and will be rezoned to construction land. This includes land occupied by the WTGs, the OHLs, the substation and management complex and access roads. Of the whole Project site which is 3.700 ha, this represents 0.8%. As discussed in earlier sections, agriculture is the dominant land use in the Kovin Municipality composing 54.240 ha of total land area. This means that 0.06% of agricultural land in the municipality will be lost. Compensation for privately owned lost land has already been provided as described under construction impacts. This impact has been assessed as ***low adverse***.

A part of the land on which WTGs are constructed will be subject to some use restrictions. Farmers who have signed lease contracts with WEBG for the use of land on which WTGs will be constructed, are prevented from growing vineyards and orchards and are obliged to refrain from any other types of land use which may hinder the work of the WTGs. However, land that was acquired for the WTGs is of 3rd, 4th or 5th class quality[33] and is used for growing corn, sunflowers and wheat. There are no vineyards or orchards on the land and therefore the restrictions are not expected to have any significant impact on land use. This impact is assessed as ***negligible***.

D3.5.2 Employment and Procurement Opportunities

Direct employment

The life of the project is expected to be at least at least 25 years and during that time a small workforce will be needed. WEBG estimate that up to 20 individuals (a few local and international, but mostly national) will be employed during operations. This will give long term stability to the full time employees and will have a significant effect on their lives. However, within the local communities and even more at the national level, this number is very low and the impact has been assessed as ***low beneficial***.

Indirect employment

Indirect employment may occur as a result of increased spending of those employed by WEBG, however since this number is so low, this is also assessed as a negligible positive impact. The procurement of local goods and services is also likely to be minimal and have a negligible effect on local economies.

D3.5.3 Impacts on livelihoods

During the operational phase, involuntary resettlement, possibly leading to economic displacement may occur for persons who are using the land plots which may be crossed during repairs of WTGs, whose crops may be affected. WEBG will compensate all lost crops and

[33] Out of 8 classes defined by Serbian legislation; as recorded in the cadastre.

damages in accordance with the Serbian Law on Planning and Construction and the principles set out in the Livelihood Restoration Framework. Therefore, this impact is assessed as being ***low adverse***.

Farmers who regain full access to land under lease from WEBG, previously occupied for construction will experience an increase in incomes. This is explained in Section C4.2. Approximately 60 local households will benefit from this. Similarly, approximately 16 ha of government owned land will become available to the Municipality for lease again and local farmers and companies will benefit. The impacts are assessed as ***low beneficial***.

D3.5.4 Revenue Generation for the Local Government / Community

A profit sharing agreement has been signed between WEBG and the Kovin Municipality foreseeing that the municipality will get a total of 2% of WEBG net income generated from the sale of locally produced electricity (of which 0.5 % will be earmarked for the local community Mramorak). This means that the municipal budget will be increased by approximately 2.2% in the first year of the wind farm operation, gradually increasing and reaching its peak in year 13 of operations at over 6%, which will continue until decommissioning.

Additionally, the business section of WEBG dealing with this Project will deregister for tax / VAT from Belgrade and re-register in Kovin so that the municipality would become the recipient of tax / VAT revenues.

The benefits, as described above, will be felt by residents of the Kovin municipality and particularly the local community Mramorak, which is also among the most directly affected communities. Although in terms of percentages this impact may be seen as only minor beneficial for the Kovin municipality, in reality any increase in the local budget will have significant benefits. This will allow the municipality to make some important investments and will most likely improve the delivery of certain services to citizens. This is even more so the case for the local community Mramorak, whose budget will see a significant increase. Therefore this impact has been assessed as ***moderate beneficial***.

At the same time, if benefits are not felt by the other affected communities, primarily Dolovo and to some extent Vladimirovac, tension may be created between these communities and the Project. Aware of this fact, WEBG has already provided some support to various local activities and initiatives. As of 1 January 2013, the company supports local communities through the WEBGs Social Investment Programme (See Appendix EI.I; more details on WEBG Social Investment Programme for 2013 and 2014 can be seen on the Project's website www.wpc.rs). Overall, the expected residual is ***low potentially rising to moderate*** if appropriate support is not implemented.

Representatives of all three local communities (Mramorak, Dolovo and Vladimirovac) mentioned that the construction of the wind farm may be accompanied by increased tourism opportunities in the area. Being one of the first wind farms to be constructed in Serbia, local residents are hoping that people may be encouraged to visit the area to see it. An existing tourist settlement in the area is "Devojački bunar", located about 5 km north from the proposed project location, administratively belonging to the Alibunar Municipality. The settlement consists mainly of weekend houses[34] and has some tourist infrastructure i.e. restaurants, pools with thermal water, etc. which are mostly in poor condition but may represent a potential for further development. It is difficult to assess whether the wind farm alone will be enough of a stimulus to trigger tourism in the area further contributing to local economic development and therefore the impact has been assessed as ***low beneficial, with potential to grow to moderate***.

WEBGs presence in the Municipality Kovin, is attracting foreign and domestic investments in the municipality and the wider area, fostering local economic development. In addition to this, WEBG strives to increase Kovin's presence in the Serbian economic arena. For those purposes, WEBG has mediated between the Serbian National Alliance for Local Economic Development (NALED), which is the leading Serbian think-tank gathering major corporations, local governments and civil society organizations with the common goal to increase Serbia's competitiveness and business-friendliness, and the Kovin Municipality, so that it may become one of their members. WEBG also volunteered to pay Kovin's membership fees. This resulted in greater presence and visibility of Kovin and it puts the municipality directly in touch with potential foreign and local investors. This impact is assessed as ***low beneficial with potential to grow to moderate***.

[34] Including approx. 50 residents.

D3.5.5 Impacts on infrastructure

WEBG will have to carry out regular maintenance of upgraded and widened access tracks needed to access WTGs for repairs and maintenance. This in turn will have a ***low beneficial*** impact on local farmers' access to their plots of land.

Bearing in mind that there is no utilities infrastructure in the area covered by the plan, it is planned that the needs for such infrastructure should be secured locally on the control building and substation, as described in Section B5.3. This includes water supply, sewage and low-voltage power supply. This further leads to a conclusion that there will be no impacts on community infrastructure.

D3.6 Health, Safety and Public Nuisance

This section details the direct potential health and safety impacts associated with the operation of the wind farm. Issues such as health impacts associated with electromagnetic waves are dealt with in Section D3. The operational activities of a wind farm and associated power lines carries with it several key health and safety risks to the workers employed on the project as well as members of the public. Key issues for consideration associated with the proposed project are as follows:

- working at height;
- potential for electrocution;
- frosting and ice shed;
- blade shear or breakage;
- turbine collapse;
- lightning strike and fire;
- issues associated unauthorised access and vandalism.

The issues above may be grouped into those which may primarily carry a physical risk to workers, those which carry a physical risk to members of the public but also possibly workers and those which may impact other stakeholders.

D3.6.1 Worker Health and Safety

Of the issues described above, two are particularly associated with injury and death in relation to the proposed workers during the operational phases of the project, they are:

- working at height; and
- potential for electrocution.

We have found no sources of statistics from trustable sources, concerning falls from height associated with the operational phase of wind farms and associated structures such as pylons. However, there have been many reported incidents in the media, worldwide, associated with falls from height during maintenance of wind farms. It is unclear whether statistically the rate of incident is any higher than compared to other activities where working at height is required. However, due to the nature of the activities undertaken, it is clear that the potential risks associated with working at height are relatively significant. Similarly, there is inadequate data to allow for statistical reporting concerning incidents associated with electrocution when working on power lines in Eastern Europe. Atkins experience of working in Eastern Europe and former soviet states indicates that incidents associated with electrocution may be quite high when compared with western European states, or at least there appears to be an acceptance that casualties will occur due to the nature of the work undertaken and relatively large organisations expect several fatalities every year associated with these activities.

Although the activities described above may be classified as high risk with a significant potential for incident, incidents are preventable through the implementation of appropriate management systems and the adherence to the management system requirements by the work force. Our expectation is that the permanent, operational phases workers associated with the project, including the wind farm management, will be familiar with appropriate safety measures for such projects. Further all personnel undertaking hazardous work should be certified to do so and implementation of specific international requirements for working at height and working in areas where there is risk of electrocution. An overview of the health and safety management and mitigation requirements for the proposed project during the operational phase is presented in

Section 3.6. In the event that the appropriate measures are implemented, the residual risk is classified as **low.**

D3.6.2 Public Health and Safety

Issues which may impact on public health and safety, but which also may impact worker health and safety are associated with:

- frosting and ice shed;
- blade shear or breakage;
- turbine collapse;
- lightning strike and fire; and
- issues associated unauthorised access and vandalism.

Frosting and Ice Shed

The risk of frosting/ice build-up leading to ice throw and potential injury is considered to be low for the following reasons:

- As discussed in the BAT assessment in Section B.6.2 and the climatological data presented in Section C2.3 of this Statement, the wind farm is not situated in a particularly cold region where there is significant on-going risk of ice build-up. Risk of ice build-up will be relatively short term.
- The turbines will be equipped with sensors as part of their design to detected imbalances on the turbine blades, which among other causes, will indicate ice build-up leading to shut down of the turbines and therefore prevent ice throw.
- During cold periods, it is highly unlikely that the agricultural fields will be occupied.
- The residential dwelling is approximately 1 km from the nearest turbine, and ice throw over that distance is highly unlikely.
- Workers attending the site during cold conditions will be aware of potential hazards associated with ice build-up on the turbine structures and in the event of a potential risk, should not undertake any tasks associated with the turbine structures.

Based on the above information we have determined that the potential risk of ice throw from ice build-up on the turbine blades leading to injury or damage is considered to be **negligible**.

A further risk associated with ice build-up is falling ice directly from turbine structures. There is a potential for injury or death caused by falling ice as from all large scale structures where snow/ice have built up. If the local population are aware of this potential hazard, the risk of accident should also be **negligible.**

Blade Shear or Breakage

Blade shear or breakage is a relatively rare occurrence and injury as a result of blade shear or breakage is rarer still. As with ice shed, it is unlikely that persons will be in the vicinity of the wind farm during conditions which may lead to blade shear/breakage and the distance from the nearest residential property will minimise any risk. Based on the above information we have determined that the potential risk of blade shear or breakage leading to injury or property damage is **negligible**.

Turbine Collapse

Occurrences of turbine collapse are extremely rare. As with ice shed and blade shear or breakage, it is unlikely that persons will be in the vicinity of the wind farm during conditions which may lead to turbine collapse and the distance from the nearest residential property will eliminate any risk. Based on the above information we have determined that the potential risk of turbine collapse leading to injury or property damage is **negligible**.

Lightning Strike and Fire

Due to the nature of the structure lightning strike is an inevitability. However, damage caused to turbines is Lightning damage, particularly to wind turbines, is often attributed to design issues associated with inadequate direct-strike protection, insufficient earthing (grounding) and/or other insufficient protection. In such cases breakup of the turbine structure could potentially result in injury or damage to property. However, it is expected that the proposed design will be state of the art and incorporate all possible modern methods to eliminate damage caused by lightning

strike. Further, for the reasons listed above, it is unlikely that persons or property will be impacted in an event where damage is caused to the turbine by lightning strike. Based on the above information we have determined that the potential risk of lightning strike leading to damage to the turbine structure and causing injury or property damage is **negligible**.

Fire associated with wind turbine structures is extremely rare, the few public reports of such occurrences may be classified as 'freak events' and compared to other power generation structures the risks associated with wind power are extremely small. Due to the nature of the design, there is a very small amount of readily combustible materials associated with wind turbine structures. We have found no incidents where turbine fires have led to injury or property damage. Therefore, the risk of turbine collapse leading to injury or property damage is **negligible**. Fire may also be associated with the transformer station, and previous reported incidents are more dramatic than those associated with wind turbine structures. However, the transformer will be located away from persons and public property and will be designed with a fire protection system. Therefore, the risk of a transformer fire leading to injury or property damage is **negligible**.

Unauthorised Access and Vandalism

Unauthorised access and vandalism are a problem with all remotely managed technical equipment. The turbines will be designed to as to prevent unauthorised access, but there will be no enclosing fencing around the turbine array. The transformer station and management compound will be fenced and locked so as to prevent access. Further, there will be an onsite security presence in order to deter any would be unauthorised access and/or vandalism.

Experience dictates that no matter what security is in place, determined persons will gain access to hazardous areas. However, information indicates that appropriate measures to prevent access will be in place in accordance with industry standards. Issues associated with unauthorised access and vandalism also pose a risk to the operational work force. We expect that appropriate management systems will be in place to allow for risk assessment where wind farm plant and structures have been accessed and/or vandalised, and where necessary work routines are altered to eliminate risk to the work force. That appropriate design requirements will be in place and management systems will be implemented, we determine the risk of injury as **negligible**.

D3.7 Other Potential Operational Impacts

D3.7.1 Electric and Magnetic Fields (EMF)

Introduction

Alternative current generates electrical and magnetic fields, collectively known as an 'electromagnetic field' (EMF). Electric fields are produced by voltage and increase in strength as the voltage increases. Magnetic fields result from the flow of electric current and increase in strength as the current increases. Electricity transport lines are the best known sources of electromagnetic fields, but any electrical equipment is capable of generating an electromagnetic field. Sources associated with the proposed project are the overhead head power lines (OHLs), the wind turbines themselves and the transformers.

Potential Health Effects

There has been considerable research over the last 30 years associated with the potential impacts on human health associated with EMF. The original controversy was initiated by a study published in 1979 (Wertheimer and Leeper, 1979), which attempted to link rates of certain types of childhood leukaemia and constant exposure to electromagnetic fields. Although the original study has been described as flawed, the work sparked significant public interest and many further scientific studies. A detailed review and discussion of the scientific literature associated with this area of research is outside of the scope of this project. However, the IFC health and safety guidance for overhead power lines (IFC, 2007c) states the following in regards to the available scientific information:

Although there is public and scientific concern over the potential health effects associated with exposure to EMF (not only high voltage power lines and substations, but also from everyday household uses of electricity), there is no empirical data demonstrating adverse health effects from exposure to typical EMF levels from power transmissions lines and equipment. However, while the evidence of adverse health risks is weak, it is still sufficient to warrant limited concern.

One of the most recent large scale studies, published in the British Journal of Cancer (Kroll et al, 2010) studied the records of 28 968 children born in England and Wales during 1962–1995 and diagnosed with cancer in Britain under age 15. The researchers found no evidence of causality and if causality were assumed the '*estimated attributable risk is below one case per year*'.

Assuming the worst case scenario that there is a link between EMFs and impacts on human health, it is evident that EMFs have the highest intensity in close proximity to their source, with intensity declining in relation to distance from the source. Therefore, it is logical that only receptors that are have long term close contact with high exposure rates to EMF *may* potentially be affected. Such a receptor can be categorised as residential situated in close proximity to a high voltage source. Both the transformer and the wind turbines are located a significant distance (about 1 km) from the nearest residential receptor and can therefore be immediately screened out. At 400 kV, the OHL is the most significant EMF source associated with the proposed project and therefore with the highest potential to lead to human health impact, if taking the worst case scenario in to account. The nearest residential receptor to the planned power line is approximately 400 m. At 400 m the exposure levels are a very small and will be a very small fraction of the exposure limits described anywhere in the world.

In conclusion, the scientific literature provides no causal link to human health impacts and long term exposure to EMFs at the levels emitted from the proposed wind farm and associated structures, including the OHLs. Further, the distance between all EMF sources and potential receptors is significant so that the potential exposure will be a small fraction of any safe exposure level quoted by regulatory and other agencies, in the world. Therefore, we consider that there will be **no impact** on public health as a result of exposure to EMR from the proposed project.

As part of the Serbian regulatory process it will be necessary for the developer to undertake an impact assessment associated with the power lines, separate from the assessment undertaken and submitted for the wind farm. That assessment will also include further assessment of the potential health effects of the power line.

D3.7.2 Electromagnetic Interference

Aviation Radar and Radio Communications

Wind farms may have an impact on aviation radar and radio communication systems when the wind farm is situated particularly close to an airport. However, the Čibuk 1 project is located 30 km from Belgrade airport. A landing strip is situated within 10 km of the proposed project but it is not in use. Due to the distance between the wind farm and the nearest potential receptors of disruption, it is thought that there will be **no impact** on aviation radar and radio communication systems.

Television and Telecommunication Systems

It is expected that the appropriate measures to minimise disruption to television and telecommunication systems, as detailed in the BAT assessment B6.2.6, will be implemented. Further, any interference that occurs and is shown to be as a result of the wind farm, appropriate measures will be implemented (such as installation of an additional television mast) will be implemented. There may be some short term impacts to television and or telecommunication systems as a result of the wind farm, however there is unlikely to be any long term impact, as the developer will be bound to address any issues associated with impacts on television and telecommunications. In the long term we expect **no negative impact** associated with this issue.

D3.7.3 Traffic and Transport

The main traffic and transport impacts associated with the project will be during the construction phase. The operational phase will typically be characterised by a low presence of workers on site, with occasional maintenance involving use of access cranes (not heavy lifting cranes). Access to the site of heavy vehicles should be along the routes established during construction for heavy vehicles. Management measures to prevent disruption to traffic and rail transport should be amended for the operational phase and adopted. It is likely that small vehicles could access the site from the east without any disruption as long as they are in relatively low numbers. During the operational phase it is expect that there will be no disruption of access to the agricultural plots. As long as appropriate established routes are used and management measures are implemented, the residual impact during the operational phase of the project is therefore deemed to be **negligible impact**.

D3.7.4 Land and Groundwater Quality

During the operational activities, there will be no pre-planned direct discharges to ground. However, as a result of accident, operational activities have the potential to release pollutants to the ground (topsoil, subsoil and natural strata) and groundwater. Potential sources of pollution include:

- accidental release of fuels, oils, chemicals, hazardous materials, etc., to the ground, especially associated with maintenance, chemicals storage areas and the transformer area with subsequent leaching to groundwater;
- accidental discharge of sanitary wastewater to ground and groundwater from the domestic waste water management system.

Measures will be employed to reduce the risk posed by the potential sources of pollutants listed above. All possible steps will be taken to prevent materials being imported onto the site which are already polluted.

Potentially polluting materials, such as fuels, oils, chemicals and associated liquid waste materials, etc. will be stored in dedicated, segregated storage areas, with spillage protection and appropriate environmental security measures to prevent accidental release to ground during storage. In addition, appropriate working procedures will be adopted to minimise the risk of accidental release during delivery to and removal from the storage areas.

The design of the transformer compound has not been finalised as the time of writing. However, for the purpose of this assessment we have assumed that modern containment standards will be applied and that the transformer will be situated within a contained area, capable of holding 110% of the oil capacity of the transformer. Similarly, transfers associated with the wind each of the wind turbines should also be suitably contained.

At the time of writing the operator is considering developing a well at the site for the supply of water necessary during the operational phases. In the event that a well is developed, we expect that no hazardous materials, including oils, will be stored in the vicinity of the well head and that there will be no pathway between the well head and any hazardous materials associated with the operation of the wind farm.

In the event that the aforementioned measures are implemented, the residual impact to land should be **negligible** and there should be no impact to groundwater.

D3.7.5 Surface Water and Effluent

During the operation activities, there will be no pre-planned direct discharges to surface water or off site effluent treatment systems. Further, it is unlikely that there will be a pathway between operational areas (e.g. transformer compound) that store hazardous materials and any surface water or effluent system. Therefore, potential releases are likely to be limited to accidental releases as a result of maintenance activities during site operations. In the event of any release, we expect that appropriate containment and clean up measures will be in place. Further, it is expected that the potential volumes that may be released are relatively small. Therefore, it is unlikely that there will be any releases that may find their way into surface water during the operational phase of the project.

In the event that the aforementioned description of the proposed site operations is accurate and that appropriate containment and clean up measures are implemented, there should be **no impact** to surface water and effluent systems.

D4 Closure and Decommissioning Impacts

D4.1 Introduction to Closure and Decommissioning Impacts

For the purpose of this assessment, no issues have been assessed in significant detail. The potential for impact during decommissioning is similar to those of construction activities. The key issues are potentially:

- Noise
- Traffic and Transport
- Socio-Economic Impacts
- Health, Safety and Public Nuisance

Other decommissioning impacts are likely to be as follows and which have addressed in this section of the report are:

- Ecology and Nature Conservation
- Landscape and Visual Impact

The following sections provide an assessment of the potential impacts of the project activities during the closure and decommissioning phase of the project. A summary of the impacts, management and mitigation measures is presented in Section F4. The Monitoring Programme with all impacts is presented in Section E5.

D4.2 Noise

Decommissioning Activities

Decommissioning activities are expected to generate similar noise levels to the construction activities, and similar noise significance levels would apply.

The majority of plant expected to be used for decommissioning would be of sufficiently low noise levels not to significantly affect the nearby noise sensitive receptors.

Some adverse noise impacts may be expected if the concrete foundations for the turbines are broken out and removed, with impacts being potentially greater at locations closer than 1500m.

Decommissioning Traffic

Similarly to the construction activities, there would be a number of vehicle movements associated with the decommissioning of each turbine, and dependent on the routes that the vehicles take to get to the site, there may be increases in noise arising from increased traffic.

Properties near the road between the north of the site and the main E-70 road through Vladimirovac have the greatest potential for increases in noise due to decommissioning traffic.

Properties within a few metres of a road with increased traffic flows may also be affected by an increase in ground borne vibration, particularly from heavy vehicles when there are irregularities in the road surface.

D4.3 Traffic and Transport

Traffic and transport impacts during the decommissioning phase are likely to be very similar to the construction phase. As with the construction phase, appropriate management and mitigation measures should be implemented to prevent disruption or nuisance. If appropriate management and mitigation measures are implemented as detailed in the construction (Section D2.3), then the residual impact should be **low**, rising to moderate if appropriate management and mitigation measures are not implemented.

D4.4 Socio-Economic Impacts

Generally speaking the socio economic impacts from decommissioning activities will be similar to those during the construction phase, apart from the considerably reduced impact on land use. In

summary, impacts to land use, impacts on livelihoods and employment and procurement opportunities, include the following:

- The total amount of land which will be permanently lost to agriculture is approx. 18 ha. This impact is assessed as **negligible**.
- Increase in land available for agricultural use and no more use restrictions on land. Upon dismantling of WTGs, another 12 ha (out of 30 ha occupied during operations) will become available for agricultural use. At the same time, use restrictions will cease to exist on 67 ha. This impact is assessed as **low beneficial.**
- The dismantling of WTGs, disposal of materials and reinstatement of land will generate some direct and indirect employment opportunities. A part of those opportunities will be available for local people. This impact is assessed as **low beneficial**.
- During decommissioning, involuntary resettlement, possibly leading to economic displacement may occur for persons who are using the land plots which may be crossed during dismantling and transport of WTGs and site clearance, whose crops may be affected. This impact is assessed as **low adverse**.
- Owners of land and/or their descendants will have the possibility to regain full ownership of land after the decommissioning of WTGs, for a fee of 1 EUR (for approximately 62 ha). They will be obliged to bear the transaction costs themselves. This provision is already included in the lease contracts signed between WEBG and the owners, and registered with the courts. This impact is assessed as **low beneficial**, as they will have been effectively using the land throughout operation.

D4.5 Health and Safety

In general, the health and safety risks to workers and the community from decommissioning activities will be similar to those during the construction phase, as outlined above.

The project will be designed to reduce potential risks during its decommissioning. This is typically done by ensuring that a design risk register is kept and maintained through the design process, allowing potential risks that can arise during decommissioning to be identified and addressed in the design process. For example, the use of hazardous materials in construction that could lead to health and safety risks during decommissioning will be avoided wherever possible.

Upon closure of the site, inspections will be undertaken to ensure that contamination of the ground has not taken place during the operational phase, and that measures put in place during the design and construction phases have been successful in protection ground, surface water and groundwater at the site.

It will be important that documentation is maintained during the operational phase that shows that any incidents or accidents have been managed and cleaned up to ensure that no significant contamination has been caused that could lead to health and safety risks during decommissioning.

D4.6 Other Closure and Decommissioning Impacts

D4.6.1 Ecology and Nature Conservation

The primary effect from decommissioning will be through temporary disturbance to the site from heavy plant and vehicle movement. Works during the decommissioning phase would involve activities similar to those used during the construction phase; therefore these effects would be similar to and no greater than those that may occur during the construction of the wind farm as described in this chapter.

D4.6.2 Landscape and Visual

It should be noted that the turbines have a limited operational life span (i.e. 25 years). Following this period of operation it would be necessary to decommission and remove the out-of-service wind turbines. Impacts of decommissioning are anticipated to be of a similar magnitude and severity as those experienced during construction (see section D2.5). This will likely not be the case with overhead power lines and 400kV part of the transformer stations which will remain in the use of the Serbian grid operator (EMS) for operation, maintenance, and improvement in the grid.

Following the decommissioning of the turbines, impacts would be generated by the effects of changes in the land management of the site. This would include slight and very short term impacts generated by reinstatement proposals undertaken as part of the land restoration scheme. Upon completion of the decommissioning and restoration process, impacts on the landscape character of the area would be insignificant resulting in no change to moderate beneficial (in case of OHL as they'll be used for further improvements in the Serbia's grid operations), once the site has been fully and successfully restored thus reverting back to its current baseline condition.

D5 Cumulative Impacts

It is important to consider the potential cumulative impact of the Čibuk 1 WF with other windfarms that may be developed in the area. Organisations like the IFC provide excellent Guidance on how to complete a Cumulative Impact Assessment (or CIA) and this Guidance has been to support this CIA. The main challenges in the completion of the CIA are the likelihood that other wind Projects will be constructed and the availability of data for these Projects. The CIA must be meaningful in order to allow sound decision making.

The CIA should be risk based and should assess the impact on 'valued' environmental and social components. This means that speculative assumptions relating to potential or possible projects must not be seen by Project stakeholders as true or inevitable. For the Čibuk 1 Project the valued components are considered to be:

- Impact on birds and bats;
- Landscape and visual impact;
- Employment and community revenues.

The second point for consideration is the geographic and temporal boundary of the CIA. The general area has wind characteristics that make it suitable for wind power. For the purposes of this CIA, a boundary of 30km from Čibuk 1 has been set; this includes the whole of the Deliblato Sands. The time horizon has been set at 5 years as it is impossible to consider development activities beyond this.

As a consequence of the extremely limited availability of data, this CIA fulfils the definition of a Rapid CIA provided by the IFC.

At the beginning of September 2014, there were seven wind farm schemes under development within a 30km radius of the Čibuk wind farm. Approximate locations of all developments are shown in Figure D.9. These schemes were in different stages of development, from early planning (preparation of spatial plans) to construction. The only wind farm where construction had started was Plandište (27km to the north of Čibuk).

Figure D.9: Location of proposed wind farm developments

The scheme closest to the Čibuk wind farm (up to 5 km distance) is Čibuk 2 (planned in the area of Bavanište village). Čibuk 2 is in the rather early stage of development, the Plan of detailed regulation followed by the Strategic Impact Assessment is yet to be prepared.

Overview of wind farm developments with information on their current stage of development and estimated start of construction is provided in Table D.11.

Wind farm (capacity)	No. of turbines	Distance from the Čibuk 1 site boundary	Stage of development	Expected start of construction
Čibuk 2 (former Bavanište) (160 MW)	57 (TBC)	5 km to the South	Very early stage (spatial plan not yet prepared)	3 - 5 years
Alibunar 2 (42 MW) + Malibunar (8MW) – Electrawinds	21 + 4	11 km to the North	Local EIA approved	1-3 years
Bela Anta (120 MW)	40	15 km to the West	Very early stage (spatial plan under preparation)	> 5 years
Alibunar 1 - Windvision (172 MW)	33	14 km to the North	Local EIA approved	> 5 years
Kosava & La Piccolina (120 + 6MW)	41	25 km to the East	Local EIA approved	1-3 years
Kovačica (125 MW)	39	25 km to the North-West	Local EIA approved	1-3 years
Plandište (102 MW)	34	27 km to the North	Construction of transformer station	Started in 2013

Table D.11: Wind farm developments in the area of South Banat, Vojvodina

From this list we can exclude Bela Anta and the Alibunar 1 windfarms as the likelihood that these units will be constructed is considered to be low to very low.

Of the identified wind farm developments, there are two EIA Reports and two Non-Technical EIA Summaries available on the public domain. It should be noted that the documents reviewed do not include the bird survey reports (only excerpts of findings are in the public domain) and do not provide data on bird collision risk assessments. An overview of specific information available in those EIA Reports is provided in Table D.12.

Wind farm (capacity)	Information available[i]	Bird Survey Done	Bird Survey Report Available	Location of turbines known	Construction program confirmed
Alibunar 1 (172MW)	Main EIA Report	Y	N	Y	N
Kosava & La Piccolina (120 + 6 MW)	Main EIA Report	Y	N	Y	N
Kovačica (125 MW)	Non-Technical Summary of EIA	Y	N	Y	N
Plandište (102 MW)	Non-Technical Summary of EIA	Y	N	Y	N

Table D.12: Overview of available information related to wind farm developments in the area of South Banat, Vojvodina

As there is uncertainty as to whether all the wind farms will be developed, at this stage it is possible only to qualitatively assess the potential cumulative impacts.

D5.1 Cumulative impact on birds and bats

Of all the published EIAs, only the EIA for Kovačica windfarm states that the SNH methodology had been used for the consideration of the impact of the windfarms on birds. None of the other EIAs have used the SNH methodology. None of the EIAs in the public domain identified a significant impact on migratory birds. Their conclusions are quite similar - the region comprises intensively cultivated monoculture of agricultural fields and does not include any large and obvious landscape features which could be used by migrating birds as navigational aids.

In respect to sensitive raptor species, two EIAs (Alibunar and Kovačica) mention that Saker falcon was observed in the area but both conclude that no nests or evidence of actual breeding was recorded and that the potential impact is considered low.

The Čibuk bird survey undertaken from 2009 to 2011 indicated that the main migration route for birds in the area is from the Deliblato Sands towards the Danube River valley. It can be seen from Figure 8 that this migration route to the east and south of the Čibuk site, is currently free of proposed wind farm development.

It is possible that the Čibuk windfarm will lead to some displacement of bird feeding locations. However, the distances between the potential windfarms are thought to be sufficient to provide sufficient arable land for feeding for over-wintering birds. Given that the habitat within the region represents a uniform cultivated land, the effects of habitat loss for birds at one wind farm site are not considered significant, as they will have the use of abundant alternative habitat in the wider area.

The Čibuk site is located 1.3km west of the Deliblato Sands (a buffer zone required by the Institute for Nature Conservation). Results of the bat monitoring for Čibuk indicate that bat migration, in particular species which migrate long-distances, occurs within the site. These species were present in the study area as residents but migratory movements were not recorded.

Bird and bat surveys for the Čibuk 2 and Bela Anta wind farms are yet to be undertaken. However, information on bird and bat monitoring in the areas of Alibunar and Kovačica wind farms indicate that there was no evidence the sites are along the route of any habitually used migration pathway for any birds including migratory raptors, wild fowl, water fowl and storks. No bat roosts were identified within any of the sites (Čibuk, Alibunar, Kovačica) and no evidence of the use of the sites as migration flyway for bats was found. Given the distance between the Čibuk site and the Alibunar and Kovačica site (more than 10km) it is not likely that any in-combination effects will arise as a result of construction of all developments even for species potentially migrating through the region.

In respect to the Kosava wind farm, information on bird monitoring provided in the EIA indicate that migration activity over the site was rare with number of migratory birds observed being rather low. It should be noted that the Kosava site is located about 1 km east of the Deliblato Sands (a buffer zone required by the Institute of Nature Conservation). Conclusion of the EIA was that the site itself is suboptimal and has a low value for birds. Presence of bird species at the site is considered most likely a result of wet habitats along the Danube-Tisa-Danube canal (running about 5 km to the east), out of the site's boundaries. Given that migratory routes are related to wet habitats along the canal and the Danube, the Kosava wind farm is not considered relevant in respect to the Čibuk cumulative impact assessment.

D5.2 Cumulative impact on landscape and visual impact

D5.2.1 Landscape

The introduction of the Čibuk wind farm on its own has been assessed to have a minor to moderate adverse effect on the landscape character. The turbines are likely to become the dominant feature and a key characteristic of the landscape within the local area (Mramorak, Dolovo, and Vladimirovac).

If all seven developments were to be constructed (although this considered unlikely), wind turbines would become a characteristic feature of landscape in the South Banat Region: wrapping around west, north and east of the Deliblato Sands. This would be a significant cumulative change to the character of landscape assessed to be uniform and ordinary.

D5.2.2 Visual impact

The visual impact of the Čibuk wind farm has been assessed moderate to substantial in respect to a small number of residential properties at the edges of Dolovo, Mramorak and Vladimirovac villages. It has also been assessed to have a minor to moderate effect on road users and farmers in the area.

Wind farms proposed north-east and east of the Čibuk (Kosava, La Piccolina and Plandište) are located on the far side of the Deliblato Sands and over 25 km from Čibuk. They are considered unlikely to increase cumulative effects and are not included in this analysis.

Assuming the remaining five wind farms are constructed (Čibuk 2, Alibunar 1, Alibunar 2, Kovačica and Bela Anta) a cumulative visual effect is likely to be expected. In addition to Čibuk, there would be distant views of the wind farms from the edges of Dolovo, Mramorak and Vladimirovac. From the edges of Vladimirovac, the Alibunar, Čibuk and Bela Anta wind farms would be seen in mid-range to close proximity. From the edges of Dolovo, Deliblato and Bavanište, the Čibuk and Čibuk 2 wind farms would be seen in direct proximity. A cumulative change would mainly affect a small number of houses on the edges of settlements, vehicle users on roads and farmers working in the open countryside.

D5.3 Cumulative impact of construction

Cumulative effects may arise where heavy vehicles and transport construction equipment take place at the same time. However, this is one of the hardest cumulative impacts to assess as it cannot be predicted accurately if the construction periods will overlap.

Construction of the Čibuk wind farm is expected to start during Q2/Q3 2015 and to run for approximately 18- 21 months. Developments which appear to have the potential to use the same access routes as Čibuk are Alibunar 1 and Alibunar 2. It can be assumed that the port in Pančevo will be used for the supply of components for Alibunar wind farms. The main road connecting Pančevo and Vladimirovac (E-70) which is planned to be used for Čibuk transport is likely to be used for Alibunar wind farms as well. Although Čibuk 2 and Bela Anta wind farms also have potential to utilise same construction routes as the Čibuk, construction of those two wind farms is not likely to occur in the next 3 to 5 years. At the time of writing, no information has been available related to construction programme of Alibunar 1 and Alibunar 2 wind farms and was reported as uncertain by the representatives of Alibunar Municipality. It can be assumed that construction of both Čibuk and Alibunar wind farms is not likely to occur simultaneously during 2015, therefore cumulative construction impacts are not considered likely to pose a significant effect.

D5.4 Socio-economic impacts

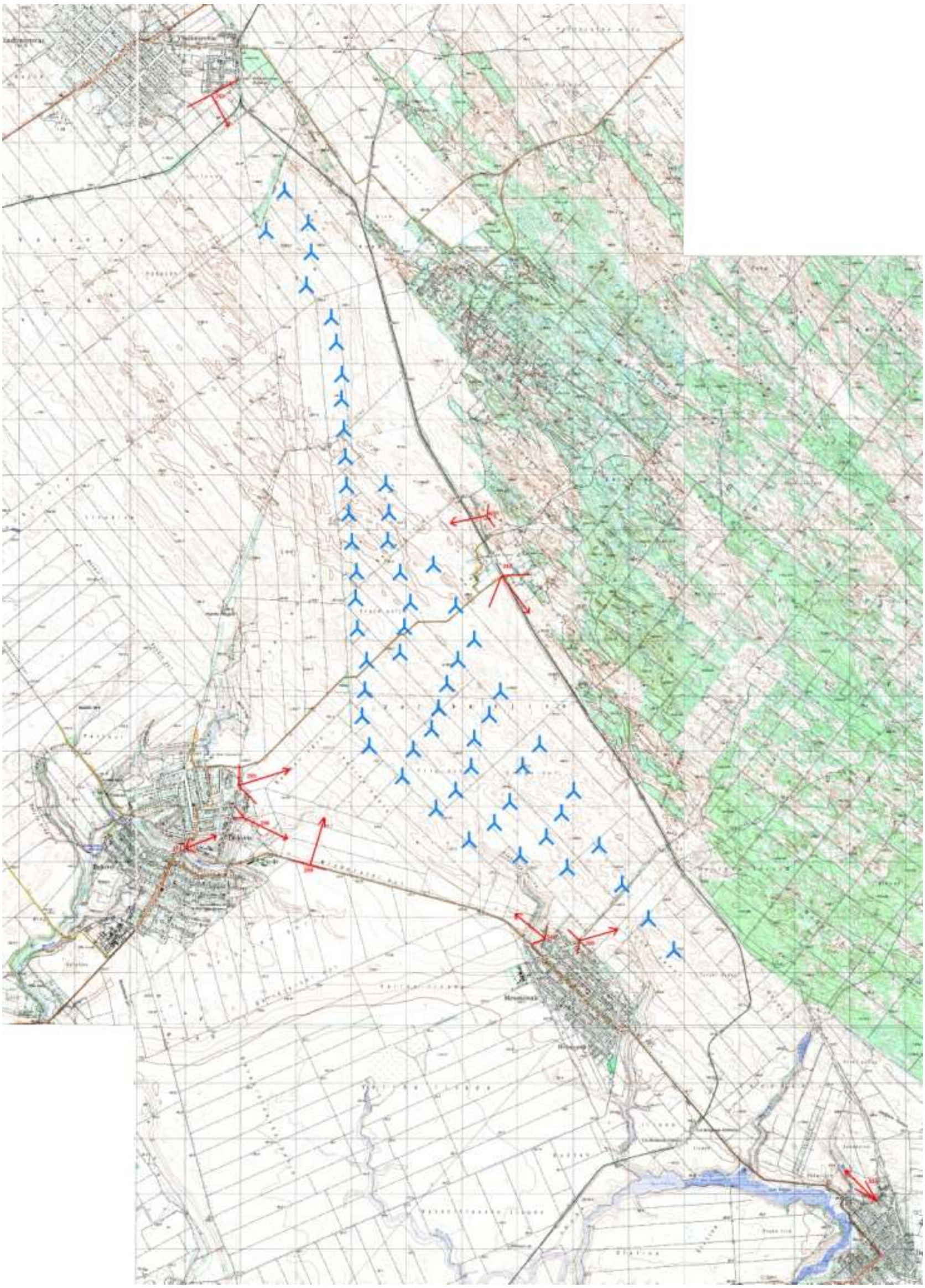
Planned wind farm developments cover the area of South Banat region, one of the economically least developed areas of Vojvodina province. Although the individual contribution of a single wind farm may not represent a significant socio-economic effect, the cumulative effect of all developments is likely to represent a significant positive change in respect to local economy, infrastructure and tourism opportunities in the communities of Alibunar, Kovačica, Kovin, Plandište and Vršac.

The construction of wind farms is expected to create both direct and indirect employment opportunities. For instance, approximately 400 workers are required for construction of a wind farm of the Čibuk size. In addition, materials needed for civil works and infrastructure improvements will be procured in the local municipalities creating opportunities for local contractors. Construction of wind farms will require the upgrading and widening of access roads which will have a beneficial impact on infrastructure in the area. At the operational phase, presence of two or more wind farms may support the growth of local industry for service and maintenance.

Municipal budgets are likely be increased as a results of agreements between the wind farm operators and local municipalities (e.g. profit sharing agreements or similar) and social investment programmes. Operation of wind farms could also have an effect on increased tourism opportunities, especially in the communities close to the Deliblato Sands. It is difficult to assess whether wind farms alone will be enough of a stimulus to trigger tourism in the area but being the first wind farms to be constructed in Serbia, they may attract visitors to the area to see them.

DI Appendix Photomontages and Supporting Data

DI.I Photomontage Picture Locations



DI.II Photomontages

Photomontage A: Proposed view looking North to north eastwards from the fringe of Dolovo village settlement towards the proposed development site

Photomontage B: Proposed view looking eastwards from the fringe of Dolovo village settlement towards the proposed development site

Photomontage C: Proposed view looking eastwards from the central area of Dolovo village

Photomontage D: Proposed view looking south from the fringe of Vladimirovac village towards the proposed development site

Photomontage E: Proposed view looking north east from the fringe of Mramorak village settlement towards the proposed development site

Photomontage F: Proposed view looking north from the fringe of Mramorak village settlement towards the proposed development site

Photomontage I: Proposed view looking northwest from the fringe of Deliblato village towards the development site

Photomontage J: Proposed view looking west from residential properties and track road located east of the development site

Photomontage N: Proposed view taken from the road linking Dolovo and Mramorak villages

DI.III Additional Bird Survey and Collision Risk Assessment Data Diagrams and Tables

Survey details

Survey type	Location	Survey No.	Date	Start Time	Weather
Vantage Point	VP1	1	22/01/2012	08:00	3°C, overcast (100%), light W wind, light rain/snow stopped after 1 hour, good visibility.
Vantage Point	VP1	2	22/01/2012	12:55	6°C, 20% cloud cover, light NW wind, dry, good visibility.
Vantage Point	VP1	3	23/01/2012	08:00	5°C, 10% cloud cover, dry, clear visibility.
Vantage Point	VP1	4	23/01/2012	10:15	5°C, 20% cloud cover, dry, clear visibility.
Vantage Point	VP2	1	15/01/2012	11:48	1°C, 90% cloud, NW strong wind, dry, good visibility.
Vantage Point	VP2	2	21/01/2012	08:36	0°C, clear sky, dry, clear visibility.
Vantage Point	VP2	3	22/01/2012	10:25	4°C, 40% cloud cover, dry, clear visibility.
Vantage Point	VP2	4	23/01/2012	12:50	7°C, 5% cloud cover, dry, clear visibility.
Vantage Point	VP3	1	21/01/2012	11:00	50% cloud cover, NW wind, dry, clear visibilty.
Vantage Point	VP3	2	21/01/2012	13:15	0°C, 30% visibility, NW wind, dry, clear visibility.
Vantage Point	VP3	3	22/01/2012	08:16	5°C, 80% cloud cover, dry, clear visibility.
Vantage Point	VP3	4	29/01/2012	07:49	5°C, 20% cloud cover, dry, clear visibility.
Vantage Point	VP4	1	15/01/2012	09:35	-1°C, 20% cloud cover, strong NW wind, dry, clear visibility.
Vantage Point	VP4	2	21/01/2012	11:25	4°C, 70% cloud cover, strong NW wind, dry, clear visibility.
Vantage Point	VP4	3	21/01/2012	13:40	4°C, 50% cloud cover, strong NW wind, dry, clear visibility.
Vantage Point	VP4	4	23/01/2012	07:30	2-3°C, 7 okta cloud cover, still, dry, clear visibility.
Vantage Point	VP5	1	21/01/2012	08:05	0°C, 20% cloud cover, NW wind, dry, clear visibility.
Vantage Point	VP5	2	22/01/2012	11:00	5°C, 80% cloud cover, dry, clear visibility.
Vantage Point	VP5	3	22/01/2012	13:10	5°C, 5% cloud cover, dry, clear visibility.
Vantage Point	VP5	4	29/01/2012	10:15	0°C, 10% cloud cover, dry, clear visibility.
Vantage Point	VP6	1	15/01/2012	07:14	-3°C, 80% cloud cover, later 50%, strong NWwind, dry, clear visibility.
Vantage Point	VP6	2	23/01/2012	09:55	5-6°C, 5 okta cloud cover, still, dry, clear visibility.
Vantage Point	VP6	3	23/01/2012	12:10	5°C, 1 okta cloud cover, NW wind, dry, clear visibility.
Vantage Point	VP6	4	29/01/2012	12:33	-3°C, 20% cloud cover, dry, clear visibility.
Vantage Point	VP1	1	28/02/2012	06:55	2-3°C, overcast (100%), NE strong wind, dry, good visibility.
Vantage Point	VP1	2	28/02/2012	09:10	4-5°C, 60% cloud cover, 30% in the second hour, NE strong wind, dry, good visibility.
Vantage Point	VP1	3	29/02/2012	10:00	5-6°C, clear, NW light wind, dry, good visibility.
Vantage Point	VP1	4	29/02/2012	12:15	7-8°C, clear, NW light wind, dry, good visibility.
Vantage Point	VP2	1	25/02/2012	10:00	5-6°C, 70% cloud cover, 20% in second hour, NW moderate wind, dry, good visibility.
Vantage Point	VP2	2	25/02/2012	12:15	7-8°C, clear, NW light wind, dry, good visibility.
Vantage Point	VP2	3	26/02/2012	08:05	-1°C, over cast (100%), NW light wind, dry, good visibility (2km).
Vantage Point	VP2	4	26/02/2012	10:20	3-4°C, overcast (100%), mist, NW light wind, dry, good visibility (2km).
Vantage Point	VP3	1	23/02/2012	08:20	-3°C, cloud cover 2 okta, moderate NW wind, clear visibility.
Vantage Point	VP3	2	27/02/2012	10:05	0°C, cloud cover 0 okta, clear visibility.
Vantage Point	VP3	3	28/02/2012	12:48	5°C, cloud cover 1 okta, clear visibility.
Vantage Point	VP3	4	29/02/2012	08:38	0°C, cloud cover 5 okta, clear visibility.

Vantage Point	VP4	1	25/02/2012	07:05	5°C, 70% cloud cover, NW moderate wind, dry, good visibility.
Vantage Point	VP4	2	26/02/2012	12:55	3°C, 90% cloud cover, calm, light NW wind, dry, good visibility.
Vantage Point	VP4	3	28/02/2012	12:15	7°C, clear, moderate N wind, dry, good visibility.
Vantage Point	VP4	4	29/02/2012	07:05	-1°C, clear with mist, calm with light W wind later, dry, good visibility (2km).
Vantage Point	VP5	1	23/02/2012	10:45	0°C, cloud cover 3 okta, moderate NW wind, clear visibility.
Vantage Point	VP5	2	27/02/2012	12:32	3°C, clear, clear visibility.
Vantage Point	VP5	3	28/02/2012	08:10	2°C, cloud cover 3 okta,clear visibility.
Vantage Point	VP5	4	29/02/2012	13:17	°C, cloud cover okta,clear visibility.
Vantage Point	VP6	1	23/02/2012	13:04	0°C, clear, moderate NW wind, clear visibility.
Vantage Point	VP6	2	27/02/2012	07:38	-2°C, clear, clear visibility.
Vantage Point	VP6	3	28/02/2012	10:23	5°C, cloud cover 4 okta, clear visibility.
Vantage Point	VP6	4	29/02/2012	11:00	0°C, cloud cover 5 okta, clear visibility.
Vantage Point	VP1	1	18/03/2012	09:00	15°C, clear, dry, clear visibility
Vantage Point	VP1	2	18/03/2012	11:15	20°C, clear, dry, strong wind, clear visibility
Vantage Point	VP1	3	24/03/2012	07:15	11°C, clear, dry, still, clear visibility
Vantage Point	VP1	4	25/03/2012	11:55	20°C, cloud cover 1 okta, moderate breeze, clear visibility, dry
Vantage Point	VP2	1	13/03/2012	08:46	15°C, clear, dry, clear visibility
Vantage Point	VP2	2	18/03/2012	11:02	20°C, clear, dry, moderate breeze, clear visibility
Vantage Point	VP2	3	24/03/2012	09:30	20°C, clear, dry, moderate breeze, clear visibility
Vantage Point	VP2	4	24/03/2012	11:45	20°C, cloud cover 1 okta, moderate breeze, clear visibility, dry
Vantage Point	VP3	1	18/03/2012	13:55	20°C, clear, moderate breeze, clear visibility, dry
Vantage Point	VP3	2	19/03/2012	08:49	5°C, cloud cover 2 okta, gentle breeze, clear visibility, dry
Vantage Point	VP3	3	27/03/2012	07:25	8°C, cloud cover okta 1, still, clear visibility, dry
Vantage Point	VP3	4	30/03/2012	10:07	10°C, cloud cover okta 8, moderate breeze, clear visibility, dry
Vantage Point	VP4	1	18/03/2012	13:45	20°C, clear, gentle breeze, clear visibility, dry
Vantage Point	VP4	2	19/03/2012	08:13	15°C, cloud cover okta 3, dry, clear visibility
Vantage Point	VP4	3	27/03/2012	12:10	20°C, cloud cover okta 3, dry, still, clear visibility
Vantage Point	VP4	4	30/03/2012	12:18	10°C, cloud cover okta 8, moderate breeze, clear visibility, dry
Vantage Point	VP5	1	19/03/2012	11:39	20°C, cloud cover okta 2, moderate breeze, clear visibility, dry
Vantage Point	VP5	2	19/03/2012	13:54	20°C, cloud cover okta 2, moderate breeze, clear visibility, dry
Vantage Point	VP5	3	27/03/2012	09:43	12°C, cloud cover okta 1, still, clear visibility, dry
Vantage Point	VP5	4	30/03/2012	07:43	7°C, cloud cover okta 7, moderate breeze, clear visibility, dry
Vantage Point	VP6	1	19/03/2012	11:29	5°C, cloud cover 1 okta, gentle breeze, clear visibility, dry
Vantage Point	VP6	2	19/03/2012	13:44	5°C, cloud cover 3 okta, gentle breeze, clear visibility, dry
Vantage Point	VP6	3	25/03/2012	07:10	10°C, clear, still, clear visibility, dry
Vantage Point	VP6	4	25/03/2012	09:25	15°C, clear, dry, clear visibility, dry
Vantage Point	VP1	1	16/04/2012	15:40	20°C, clear, moderate breeze, clear visibility, dry
Vantage Point	VP1	2	21/04/2012	07:10	10°C, cloud cover okta 7, moderate breeze, clear visibility, dry
Vantage Point	VP1	3	21/04/2012	09:25	13°C, cloud cover okta 5, moderate breeze, clear visibility, dry
Vantage Point	VP1	4	30/04/2012	13:20	30°C, clear, moderate breeze, clear visibility, dry
Vantage Point	VP2	1	16/04/2012	13:20	20°C, clear, moderate breeze, clear visibility, dry
Vantage Point	VP2	2	22/04/2012	08:27	12°C, cloud cover okta 7, moderate breeze, clear visibility, dry
Vantage Point	VP2	3	22/04/2012	10:42	15°C, cloud cover okta 7, moderate breeze, clear visibility, dry
Vantage Point	VP2	4	30/04/2012	15:45	30°C, clear, moderate breeze, clear visibility, dry
Vantage Point	VP3	1	06/04/2012	09:32	13°C, cloud cover okta 2, moderate breeze, clear visibility, dry
Vantage Point	VP3	2	09/04/2012	06:50	7°C, cloud cover okta 7, still, clear visibility, dry
Vantage Point	VP3	3	17/04/2012	11:48	15°C, cloud cover okta 4, moderate breeze, clear visibility, dry
Vantage Point	VP3	4	25/04/2012	06:48	7°C, cloud cover okta 5, still, clear visibility, dry
Vantage Point	VP4	1	16/04/2012	11:05	17°C, clear, moderate breeze, clear visibility, dry
Vantage Point	VP4	2	21/04/2012	12:10	15°C, cloud cover okta 5, moderate breeze, clear visibility, dry

Vantage Point	VP4	3	22/04/2012	06:10	7°C, cloud cover okta 4, moderate breeze, clear visibility, dry
Vantage Point	VP4	4	30/04/2012	18:00	27°C, clear, moderate breeze, clear visibility, dry
Vantage Point	VP5	1	06/04/2012	07:10	10°C, cloud cover okta 3, moderate breeze, dry, clear visibility
Vantage Point	VP5	2	09/04/2012	11:15	10°C, cloud cover okta 6, still, dry, clear visibility
Vantage Point	VP5	3	17/04/2012	09:20	10°C, cloud cover okta 4, moderate breeze, dry, clear visibility
Vantage Point	VP5	4	25/04/2012	11:23	13°C, cloud cover okta 5, still, dry, clear visibility
Vantage Point	VP6	1	06/04/2012	11:55	15°C, cloud cover okta 2, moderate breeze, dry, clear visibility
Vantage Point	VP6	2	09/04/2012	09:07	10°C, cloud cover okta 8, still, dry, clear visibility
Vantage Point	VP6	3	17/04/2012	07:05	10°C, cloud cover okta 2, moderate breeze, dry, clear visibility
Vantage Point	VP6	4	25/04/2012	09:10	10°C, cloud cover okta 5, still, dry, clear visibility
Vantage Point	VP1	1	12/05/2012	06:05	13°C, clear, still, dry, clear visibility
Vantage Point	VP1	2	15/05/2012	08:20	24°C, clear, gentle breeze, dry, clear visibility
Vantage Point	VP1	3	19/05/2012	10:55	20°C, cloud cover okta 1, moderate breeze, dry, clear visibility
Vantage Point	VP1	4	19/05/2012	13:10	20°C, cloud cover okta 1, moderate breeze, dry, clear visibility
Vantage Point	VP2	1	12/05/2012	10:35	29°C, clear, light breeze, dry, clear visibility
Vantage Point	VP2	2	19/05/2012	08:30	15°C, clear, light breeze, dry, clear visibility
Vantage Point	VP2	3	21/05/2012	12:10	20°C, cloud cover okta 8, strong wind, dry, clear visibility
Vantage Point	VP2	4	29/05/2012	07:49	15°C, cloud cover okta 8, moderate breeze, dry, clear visibility
Vantage Point	VP3	1	19/05/2012	11:27	20°C, cloud cover okta 1, moderate breeze, dry, clear visibility
Vantage Point	VP3	2	19/05/2012	13:43	22°C, cloud cover okta 1, gentle breeze, dry, clear visibility
Vantage Point	VP3	3	28/05/2012	07:10	15°C, cloud cover okta 3, dry, clear visibility
Vantage Point	VP3	4	30/05/2012	09:30	20°C,cloud cover okta 3, light breeze, dry, clear visibility
Vantage Point	VP4	1	19/05/2012	11:30	20°C, cloud cover okta 3, dry, still, clear visibility
Vantage Point	VP4	2	19/05/2012	13:30	20°C, cloud cover okta 2, still, dry, clear visibility
Vantage Point	VP4	3	21/05/2012	12:05	20°C, cloud cover okta 7, strong wind, dry, clear visibility
Vantage Point	VP4	4	29/05/2012	10:00	15°C, cloud cover okta 8, moderate breeze, light rain, clear visibility
Vantage Point	VP5	1	19/05/2012	08:46	15°C, clear, still, dry, clear visibility
Vantage Point	VP5	2	20/05/2012	09:36	20°C, cloud cover okta 1, moderate breeze, dry, clear visibility
Vantage Point	VP5	3	20/05/2012	11:51	20°C, cloud cover okta 3, dry, gentle breeze, clear visibility
Vantage Point	VP5	4	28/05/2012	09:25	15°C, cloud cover okta 1, still, dry, clear visibility
Vantage Point	VP6	1	19/05/2012	08:39	17°C, clear, still, dry, clear visibility
Vantage Point	VP6	2	20/05/2012	09:45	20°C, clear, still, dry, clear visibility
Vantage Point	VP6	3	20/05/2012	12:00	29°C, cloud okta 3, light breeze, dry, clear visibility
Vantage Point	VP6	4	28/05/2012	11:39	15°C, cloud okta 1, still dry, clear visibility
Vantage Point	VP1	1	09/06/2012	18:10	22°C, cloud cover okta 3, moderate breeze, dry, clear visibility
Vantage Point	VP1	2	24/06/2012	06:30	24°C, clear, gentle breeze, dry, clear visibility
Vantage Point	VP1	3	29/06/2012	14:15	33°C, clear, still, dry, clear visibility
Vantage Point	VP1	4	29/06/2012	16:30	32°C, clear, still, dry, clear visibility
Vantage Point	VP2	1	09/06/2012	15:55	24°C, cloud cover okta 5, moderate breeze, dry, clear visibility
Vantage Point	VP2	2	23/06/2012	09:45	29°C, clear, light breeze, dry, clear visibility
Vantage Point	VP2	3	23/06/2012	12:00	31°C, clear, light breeze, dry, clear visibility
Vantage Point	VP2	4	29/06/2012	07:25	22°C, clear, light breeze, dry, clear visibility
Vantage Point	VP3	1	12/06/2012	07:10	22°C, cloud cover okta 2, moderate breeze, dry, clear visibility
Vantage Point	VP3	2	15/06/2012	11:13	30°C, clear, still, dry, clear visibility
Vantage Point	VP3	3	20/06/2012	09:21	24°C, cloud cover okta 1, still, dry, clear visibility
Vantage Point	VP3	4	22/06/2012	11:04	30°C, cloud cover okta 1, still, dry, clear visibility
Vantage Point	VP4	1	09/06/2012	13:40	25°C, cloud cover okta 3, strong wind, dry, clear visibility
Vantage Point	VP4	2	23/06/2012	07:30	24°C, clear, gentle breeze, dry, clear visibility
Vantage Point	VP4	3	24/06/2012	09:00	28°C, clear, moderate breeze, dry, clear visibility
Vantage Point	VP4	4	24/06/2012	11:15	34°C, clear, light breeze, dry, clear visibility

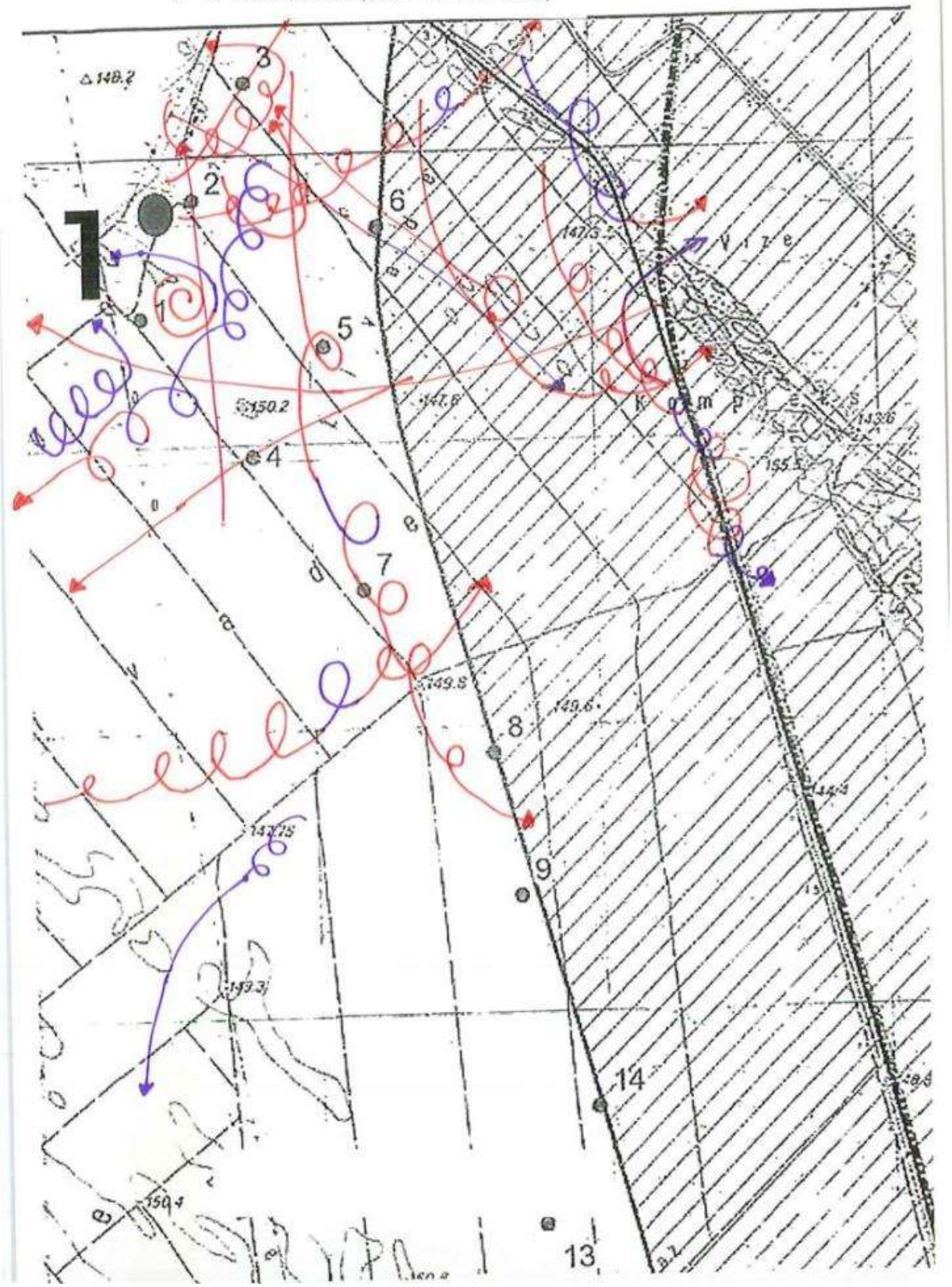
Vantage Point	VP5	1	12/06/2012	09:27	27°C, clear, moderate breeze, clear visibility
Vantage Point	VP5	2	15/062012	06:47	25°C, cloud cover okta 3, still, dry, clear visibility
Vantage Point	VP5	3	20/06/2012	11:43	30°C, cloud cover okta 2, still, dry, clear visibility
Vantage Point	VP5	4	22/06/2012	08:45	25°C, cloud cover okta 1, still, dry, clear visibility
Vantage Point	VP6	1	12/06/2012	11:35	30°C, clear, moderate breeze, dry, clear visibility
Vantage Point	VP6	2	15/06/2012	08:55	25°C, cloud cover okta 1, still, dry, clear visibility
Vantage Point	VP6	3	20/06/2012	07:03	20°C, cloud cover okta 4, still, dry, clear visibility
Vantage Point	VP6	4	22/06/2012	06:37	23°C, clear, still, dry, clear visibility
Vantage Point	VP1	1	07/07/2012	07:30	25°C, cloud cover okta 1, gentle breeze, dry, clear visibility
Vantage Point	VP1	2	07/07/2012	09:45	30°C, clear, gentle breeze, dry, clear visibility
Vantage Point	VP1	3	08/07/2012	10:32	30°C, clear, gentle breeze, dry, clear visibility
Vantage Point	VP1	4	14/07/2012	06:40	22°C, clear, still, dry, clear visibility
Vantage Point	VP2	1	07/07/2012	07:50	25°C, clear, moderate breeze, dry, clear visibility
Vantage Point	VP2	2	07/07/2012	10:05	27°C, clear, light breeze, clear visibility
Vantage Point	VP2	3	14/07/2012	09:05	26°C, clear, still, dry, clear visibility
Vantage Point	VP2	4	27/07/2012	18:20	26°C, cloud cover okta 4, still, dry, clear visibility
Vantage Point	VP3	1	06/07/2012	09:20	30°C, cloud cover okta 1, gentle breeze, dry, clear visibility
Vantage Point	VP3	2	06/07/2012	11:35	30°C, cloud cover okta 1, gentle breeze, dry, clear visibility
Vantage Point	VP3	3	07/07/2012	07:32	30°C, cloud cover okta 2, still, dry, clear visibility
Vantage Point	VP3	4	07/07/2012	12:35	35°C, clear, gentle breeze, dry, clear visibility
Vantage Point	VP4	1	07/07/2012	12:40	32°C, clear, light breeze, dry, clear visibility
Vantage Point	VP4	2	08/07/2012	10:40	30°C, clear, still, dry, clear visibility
Vantage Point	VP4	3	10/07/2012	11:21	32°C, cloud cover okta 4, still, dry, clear visibility
Vantage Point	VP4	4	16/07/2012	06:43	25°C, cloud cover okta 2, still, dry, clear visibility
Vantage Point	VP5	1	06/07/2012	09:25	32°C, cloud cover okta 1, gentle breeze, dry, clear visibility
Vantage Point	VP5	2	06/07/2012	11:25	35°C, clear, still, dry, clear visibility
Vantage Point	VP5	3	16/07/2012	08:43	25°C, cloud cover okta 2, still, dry, clear visibility
Vantage Point	VP5	4	16/07/2012	11:08	30°C, cloud cover okta 3, still, dry, clear visibility
Vantage Point	VP6	1	07/07/2012	09:48	35°C, cloud cover okta 1, still, dry, clear visibility
Vantage Point	VP6	2	07/07/2012	11:48	35°C, cloud cover okta 1, still, dry, clear visibility
Vantage Point	VP6	3	27/07/2012	13:45	27°C, cloud cover okta 5, light breeze, dry, clear visibility
Vantage Point	VP6	4	27/07/2012	16:00	28°C, cloud cover okta 5, moderate breeze, dry, clear visibility
Breeding bird survey	Survey square 1	1	29/03/2012	10:35	sunny, still, dry
Breeding bird survey	Survey square 1	2	11/04/2012	06:10	sunny, strong wind, dry
Breeding bird survey	Survey square 1	3	28/04/2012	07:35	15°C, sunny, still, dry
Breeding bird survey	Survey square 1	4	18/05/2012	05:30	10°C, cloud cover okta 3, moderate breeze, dry
Breeding bird survey	Survey square 1	5	25/05/2012	08:15	20°C, sunny, light breeze, dry
Breeding bird survey	Survey square 1	6	16/06/2012	08:20	20°C, sunny, still, dry
Breeding bird survey	Survey square 1	7	27/06/2012	05:45	20°C, sunny, still, dry
Breeding bird survey	Survey square 1	8	14/07/2012	05:20	sunny, still, dry
Breeding bird survey	Survey square 1	9	15/07/2012	09:45	sunny, still, dry
Breeding bird survey	Survey square 2	1	29/03/2012	09:10	sunny, still, dry
Breeding bird survey	Survey square 2	2	11/04/2012	07:30	sunny, strong breeze, dry

Breeding bird survey	Survey square 2	3	28/04/2012	06:15	sunny, still, dry
Breeding bird survey	Survey square 2	4	18/05/2012	06:45	10°C, cloud cover okta 2, moderate breeze, dry
Breeding bird survey	Survey square 2	5	25/05/2012	06:50	20°C, sunny, light breeze, dry
Breeding bird survey	Survey square 2	6	16/06/2012	06:10	20°C, sunny, still, dry
Breeding bird survey	Survey square 2	7	27/06/2012	07:15	20°C, sunny, still, dry
Breeding bird survey	Survey square 2	8	08/07/2012	09:05	sunny, still, dry
Breeding bird survey	Survey square 2	9	15/07/2012	06:20	sunny, still, dry
Breeding bird survey	Survey square 3	1	29/03/2012	07:35	sunny, still, dry
Breeding bird survey	Survey square 3	2	11/04/2012	08:50	sunny, strong breeze, dry
Breeding bird survey	Survey square 3	3	28/04/2012	08:55	20°C, sunny, still, dry
Breeding bird survey	Survey square 3	4	18/05/2012	07:40	10°C, cloud cover okta 2, still, dry
Breeding bird survey	Survey square 3	5	20/05/2012	07:45	sunny, still, dry
Breeding bird survey	Survey square 3	6	16/06/2012	07:30	20°C, sunny, still, dry
Breeding bird survey	Survey square 3	7	27/06/2012	08:30	25°C, sunny, still ,dry
Breeding bird survey	Survey square 3	8	08/07/2012	07:30	sunny, still, dry
Breeding bird survey	Survey square 3	9	15/07/2012	08:15	sunny, still, dry
Breeding bird survey	Survey square 4	1	28/03/2012	09:55	sunny, still, dry
Breeding bird survey	Survey square 4	2	04/04/2012	07:00	cloud cover okta 3, moderate breeze, dry
Breeding bird survey	Survey square 4	3	24/04/2012	09:45	cloud cover okta 5, still dry
Breeding bird survey	Survey square 4	4	25/05/2012	07:10	15°C, cloud cover okta 1, still, dry
Breeding bird survey	Survey square 4	5	30/05/2012	09:10	20°C, cloud cover okta 1, still, dry
Breeding bird survey	Survey square 4	6	13/06/2012	09:12	sunny, still, dry
Breeding bird survey	Survey square 4	7	23/06/2012	06:38	sunny, still, dry
Breeding bird survey	Survey square 4	8	06/07/2012	07:13	sunny, still, dry
Breeding bird survey	Survey square 4	9	18/07/2012	08:55	cloud cover okta 2, still, dry
Breeding bird survey	Survey square 5	1	28/03/2012	08:35	sunny, still, dry
Breeding bird survey	Survey square 5	2	04/04/2012	08:25	cloud cover okta 3, moderate breeze, dry
Breeding bird survey	Survey square 5	3	24/04/2012	07:15	cloud cover okta 7, still, dry
Breeding bird survey	Survey square 5	4	21/05/2012	09:55	cloud cover okta 8, strong breeze, dry
Breeding bird survey	Survey square 5	5	30/05/2012	06:47	cloud cover okta 2, moderate breeze, dry
Breeding bird survey	Survey square 5	6	13/06/2012	11:25	sunny, still, dry
Breeding bird survey	Survey square 5	7	23/06/2012	09:05	sunny, still, dry

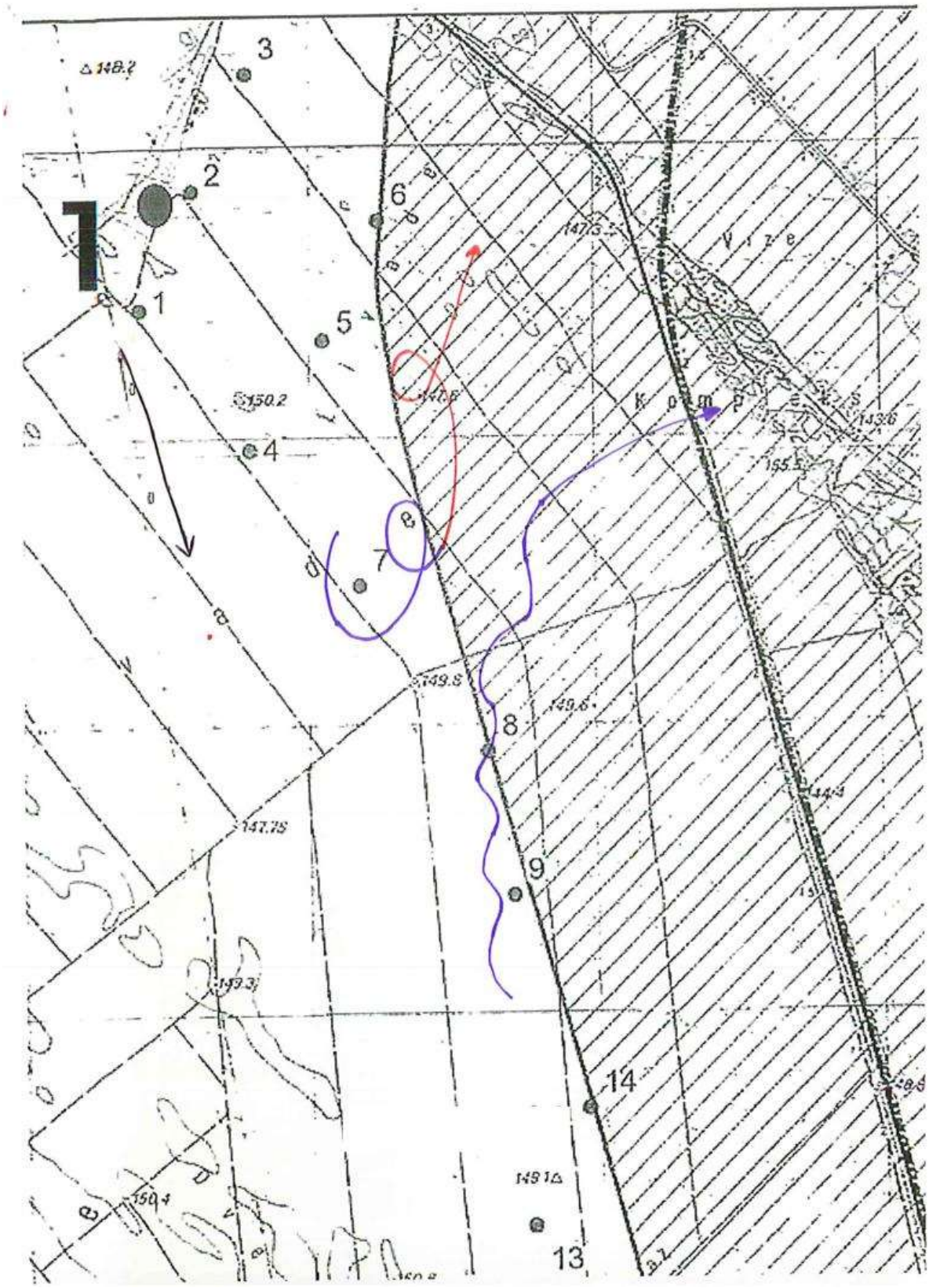
Breeding bird survey	Survey square 5	8	10/07/2012	07:10	cloud cover okta 3, still, dry
Breeding bird survey	Survey square 5	9	18/07/2012	11:02	cloud cover okta 2, still, dry
Breeding bird survey	Survey square 6	1	28/03/2012	07:15	sunny, still, dry
Breeding bird survey	Survey square 6	2	04/04/2012	09:40	cloud cover okta 3,moderate breeze, dry
Breeding bird survey	Survey square 6	3	24/04/2012	08:30	cloud cover okta 7, still, dry
Breeding bird survey	Survey square 6	4	21/05/2012	07:05	cloud cover okta 8, strong breeze, dry
Breeding bird survey	Survey square 6	5	30/05/2012	11:30	sunny, moderate breeze, dry
Breeding bird survey	Survey square 6	6	13/06/2012	06:50	sunny, gentle breeze, dry
Breeding bird survey	Survey square 6	7	23/06/2012	01:12	sunny, still, dry
Breeding bird survey	Survey square 6	8	10/07/2012	09:03	sunny, still, dry
Breeding bird survey	Survey square 6	9	18/07/2012	06:43	sunny, still, dry

Vantage point bird flight maps

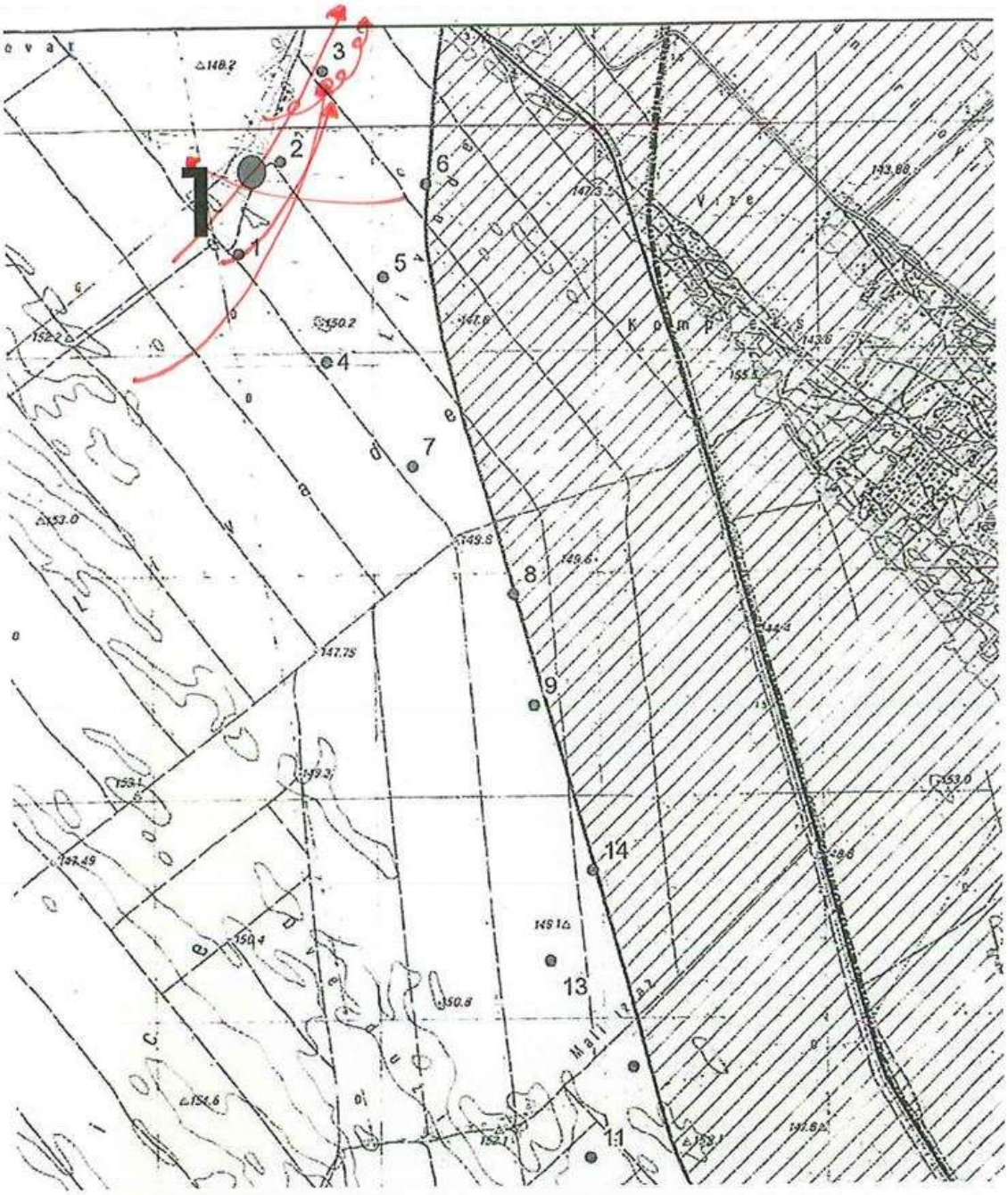
VP1: Buteo Buteo (Common Buzzard)



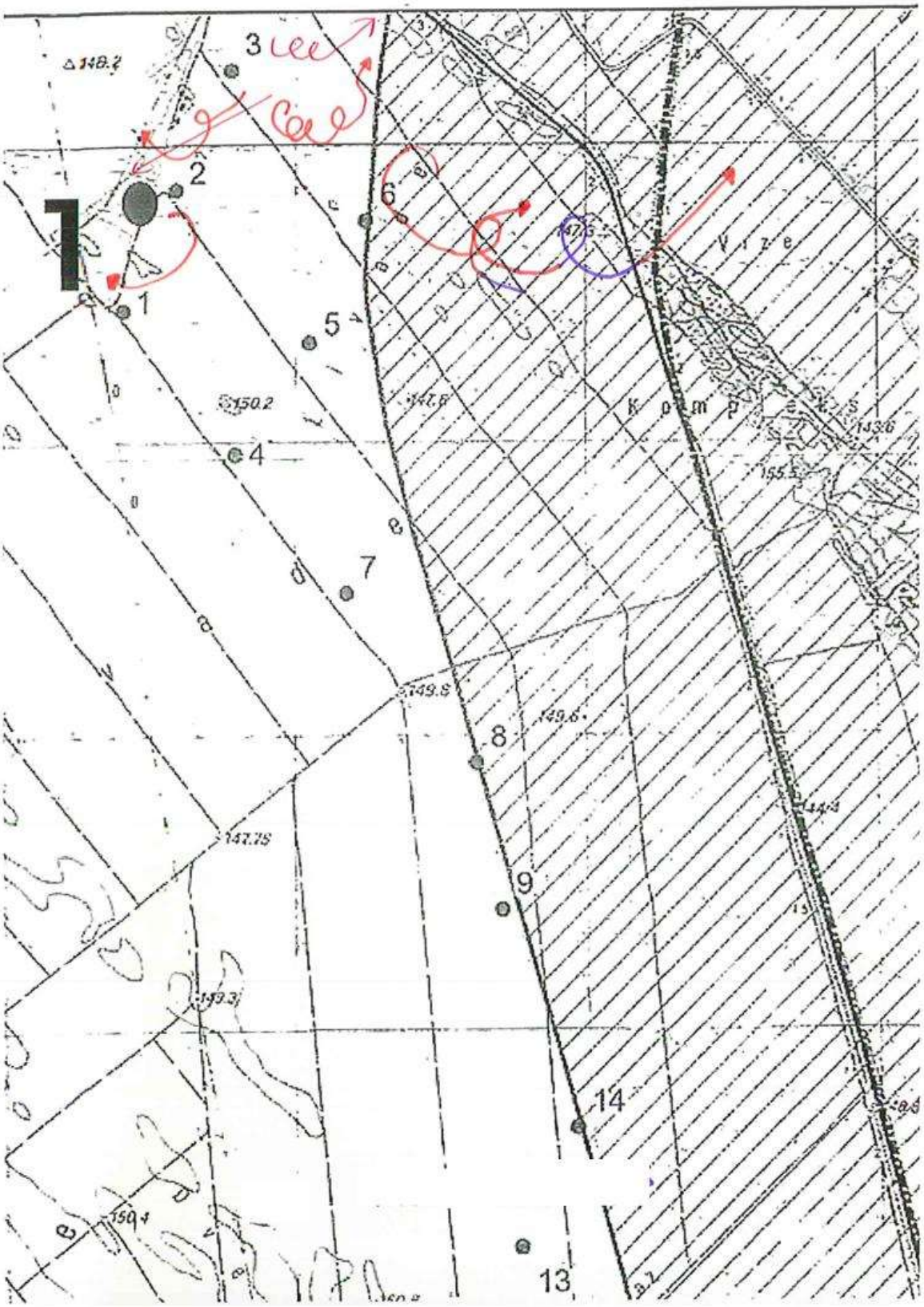
VP1: Grus Grus (Common Crane)



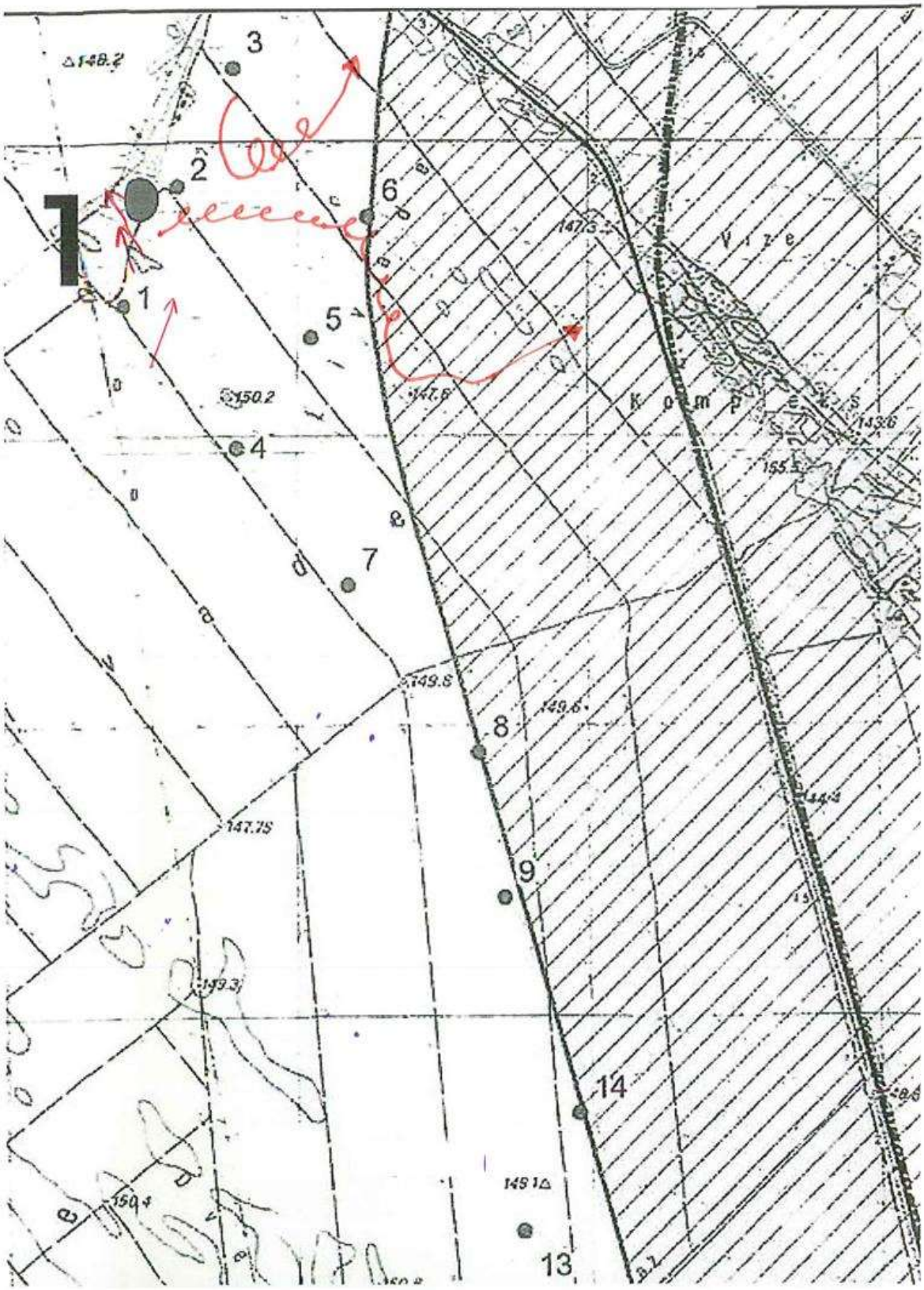
VP1: Falco Subbuteo (Eurasian Hobby)



VP1: Falco Tinnunculus (Eurasian Kestrel)



VP1: Accipiter gentilus (Northern Goshawk)



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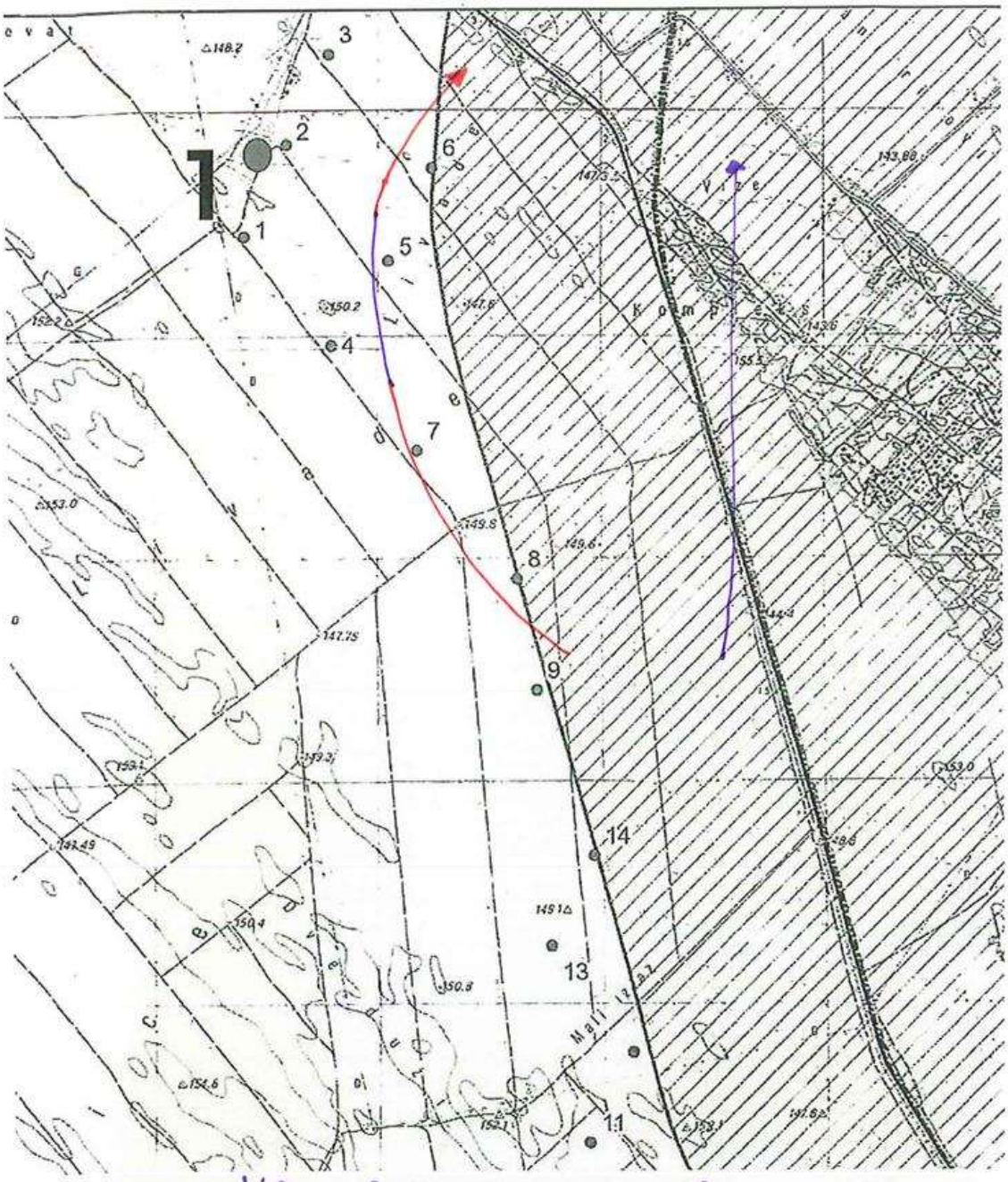

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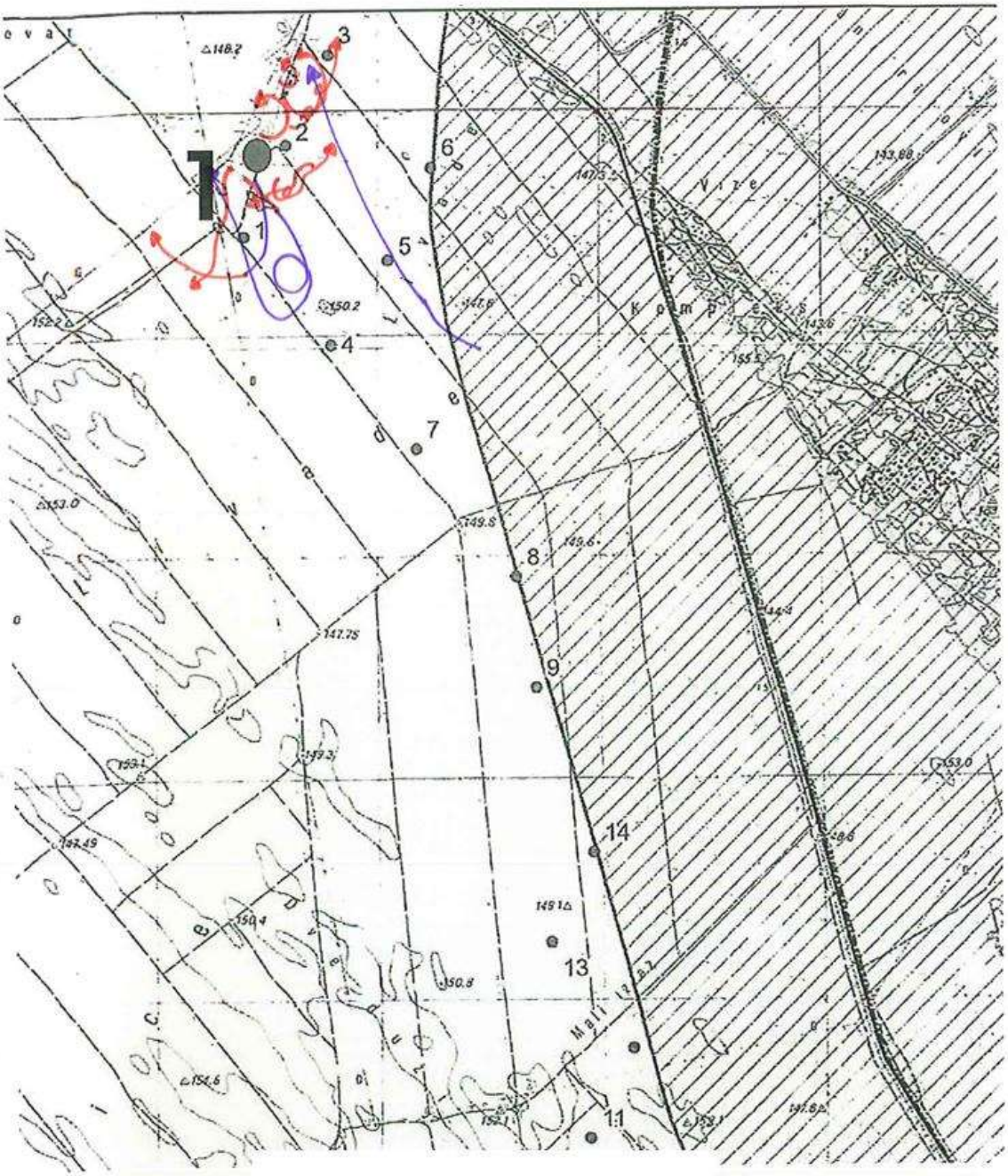
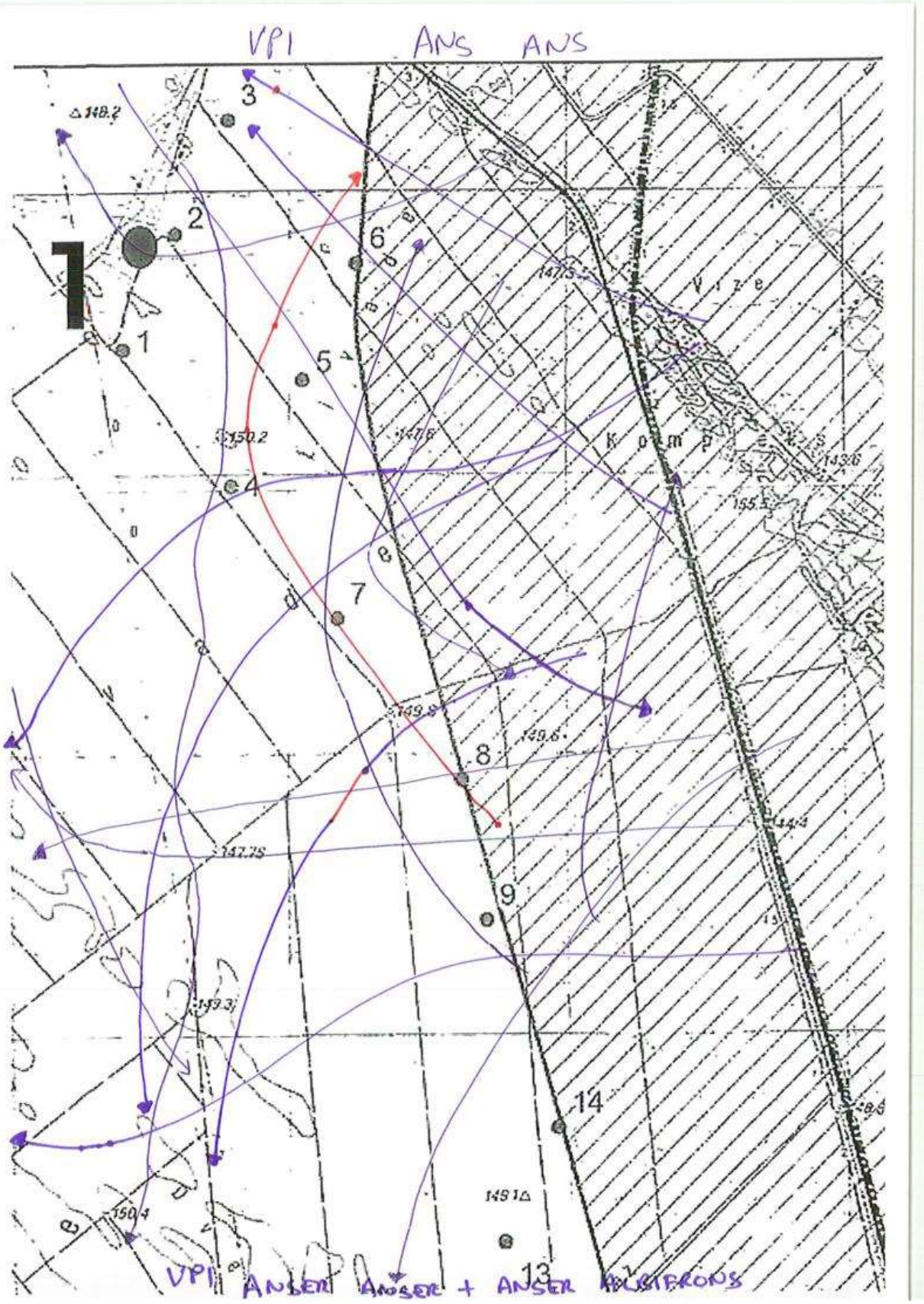
VP1: Merops Apiaster (European Bee-eater)

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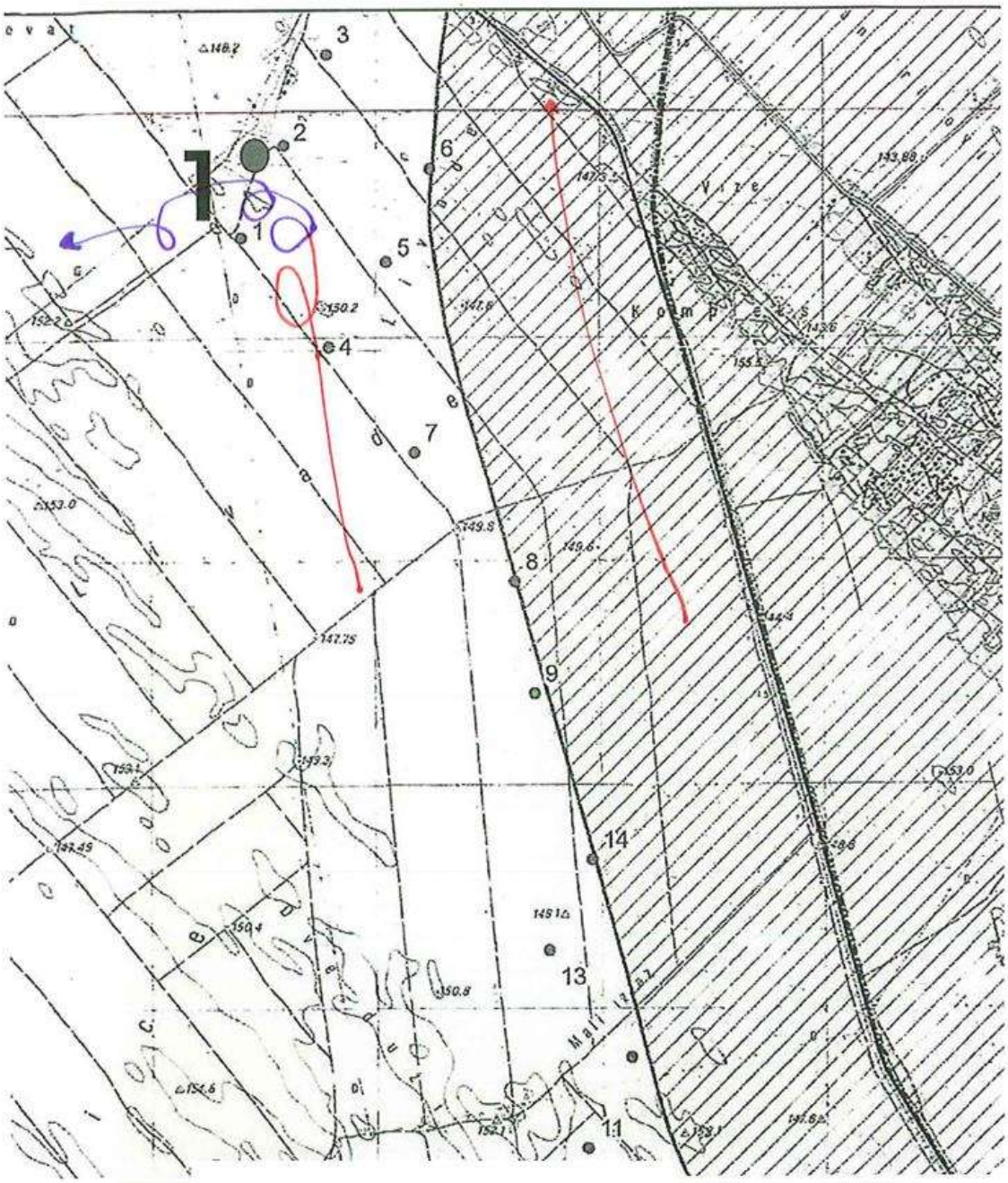
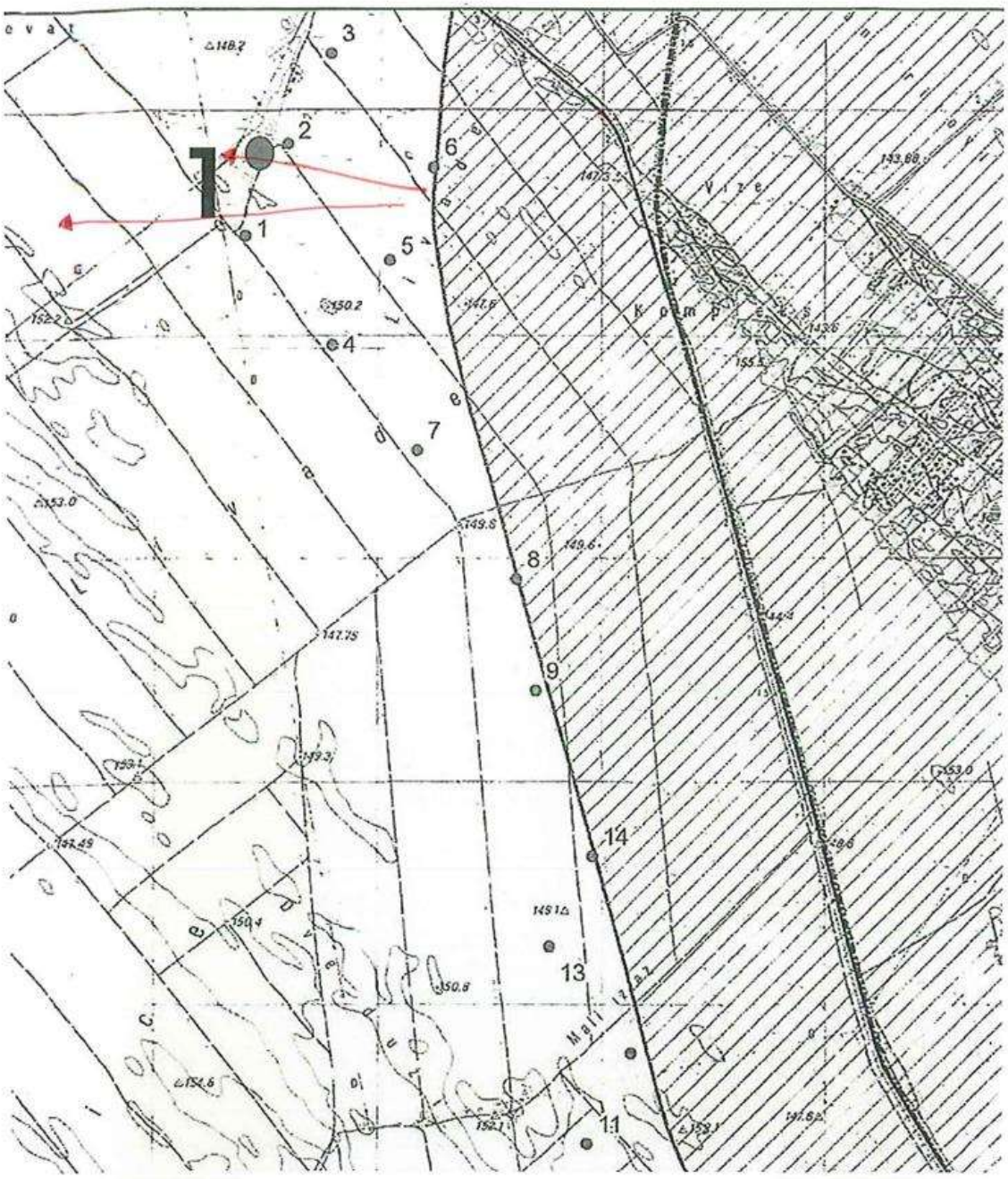
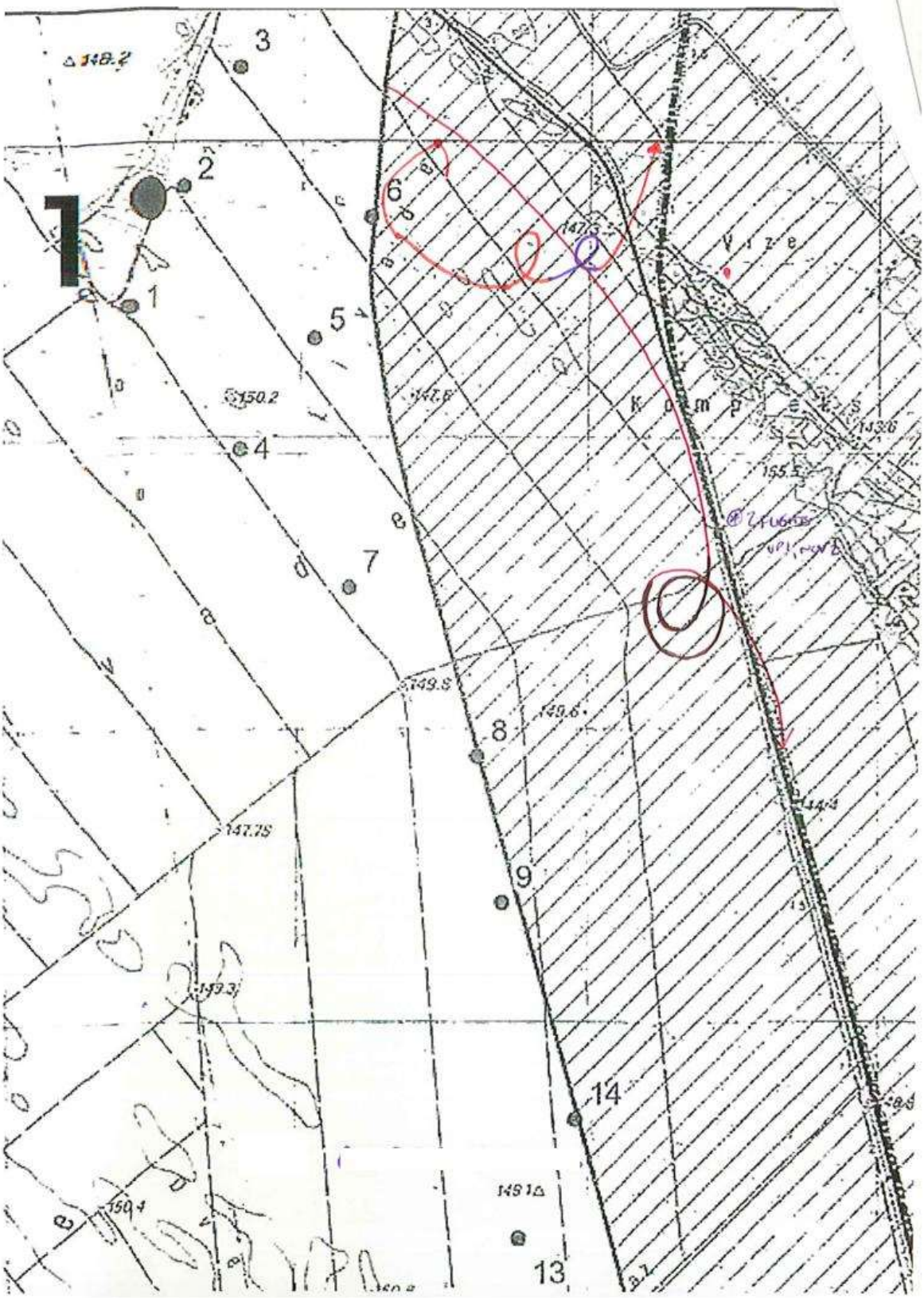
VP1: Circus cyaneus (Hen Harrier)



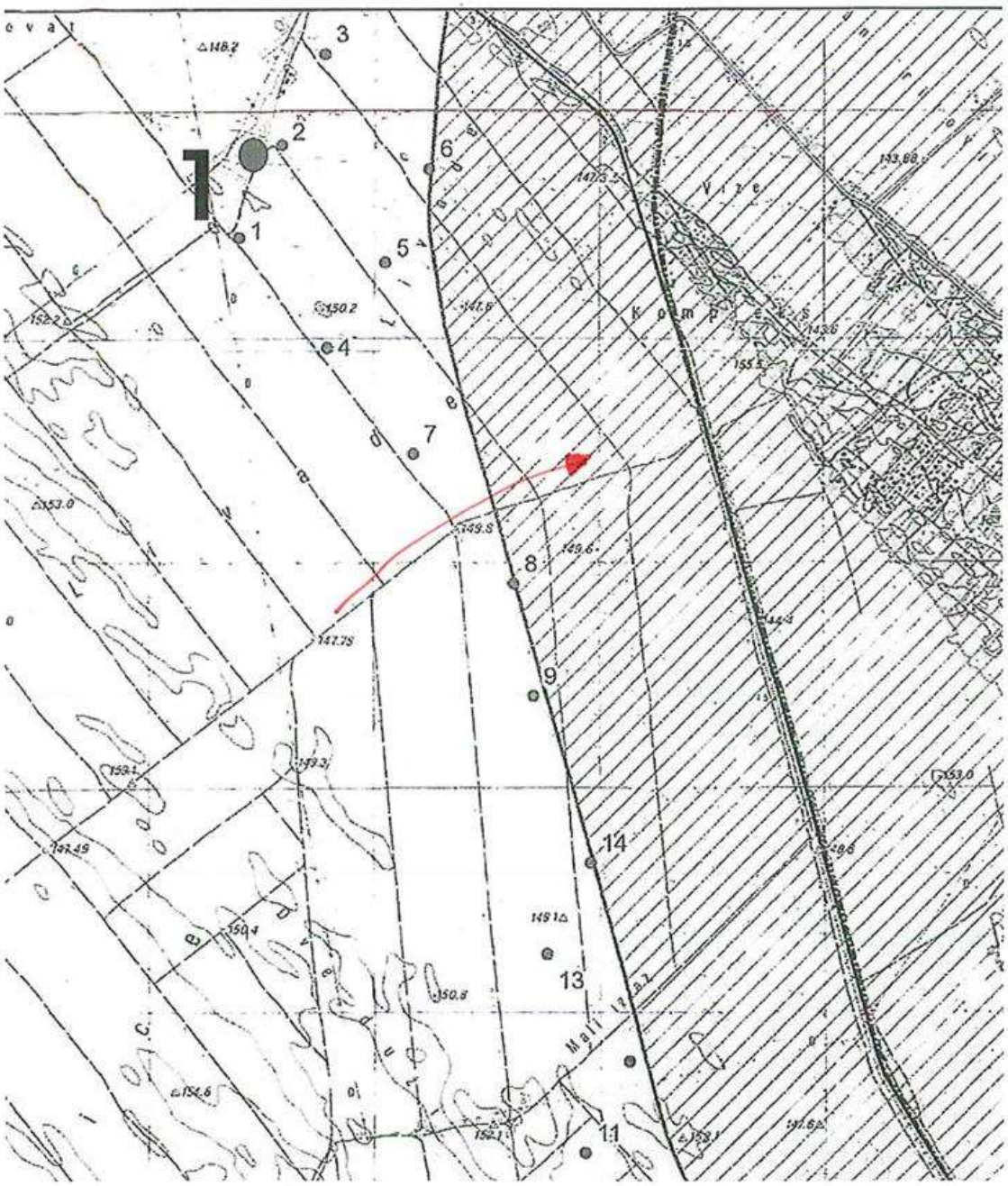
VP1: Falco columbarius (Merlin)



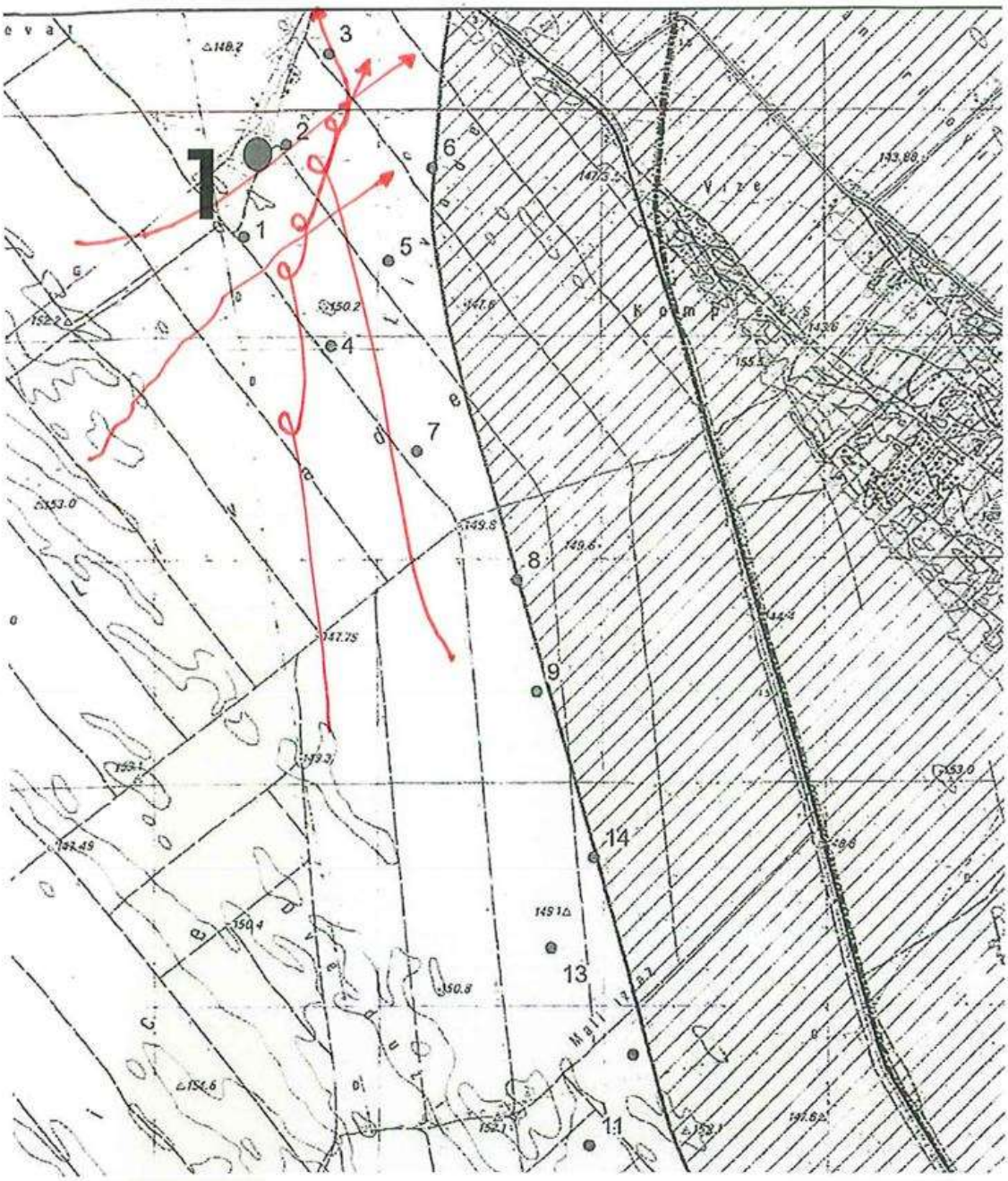
VP1: Accipiter gentilus (Northern Goshawk)



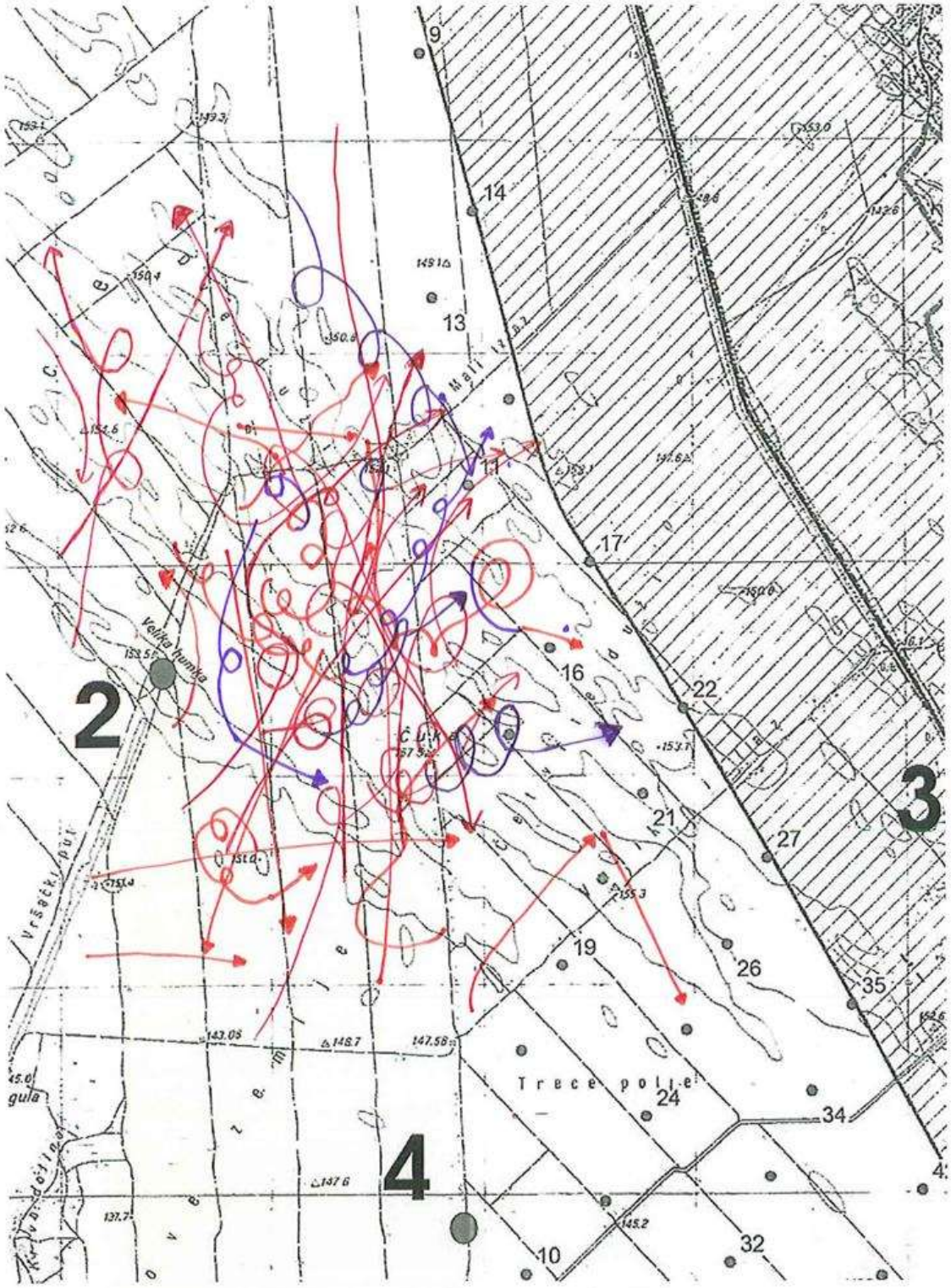
VP1: Falco cherrug (Saker Falcon)



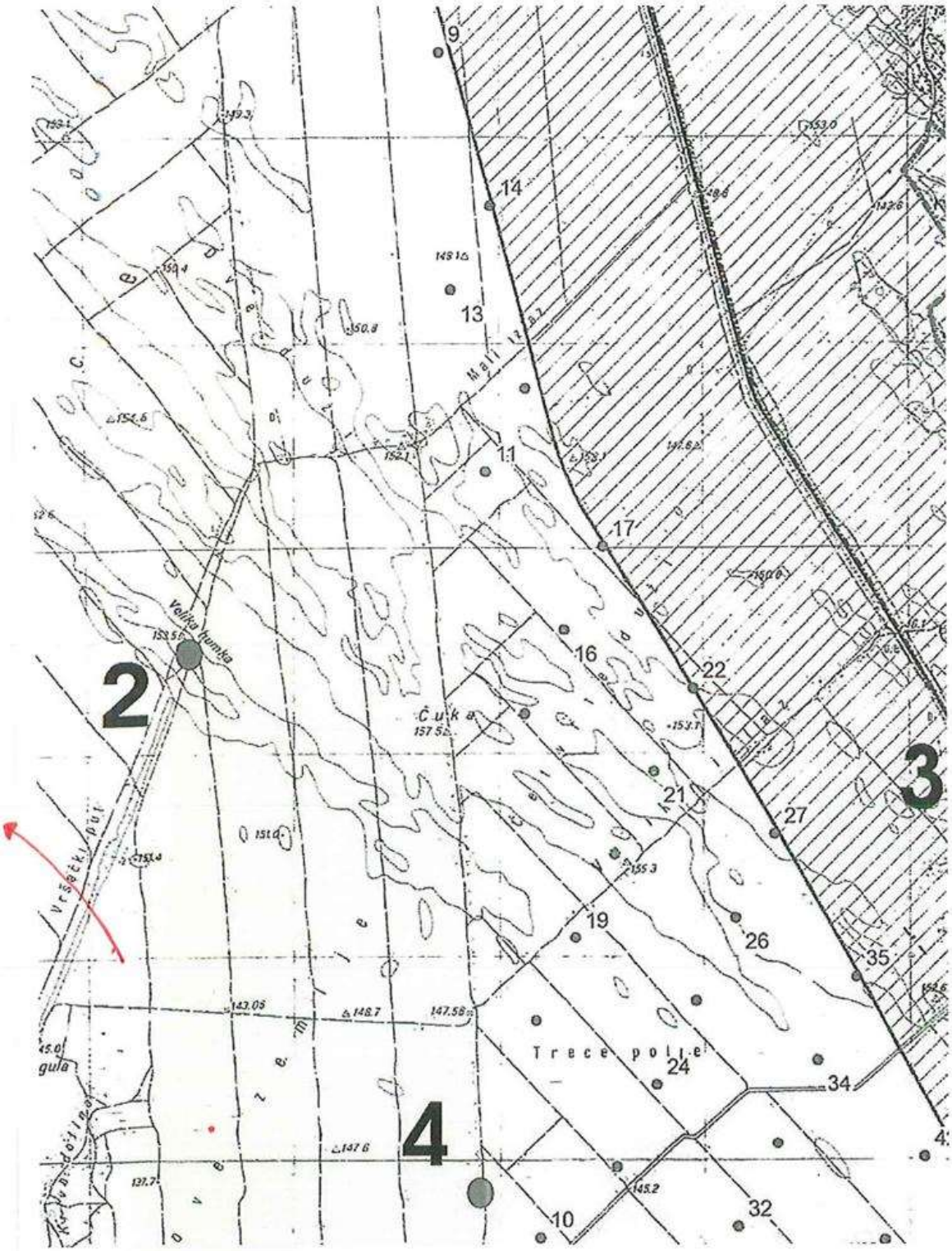
VP1: Circus aeruginosus (Western Marsh Harrier)



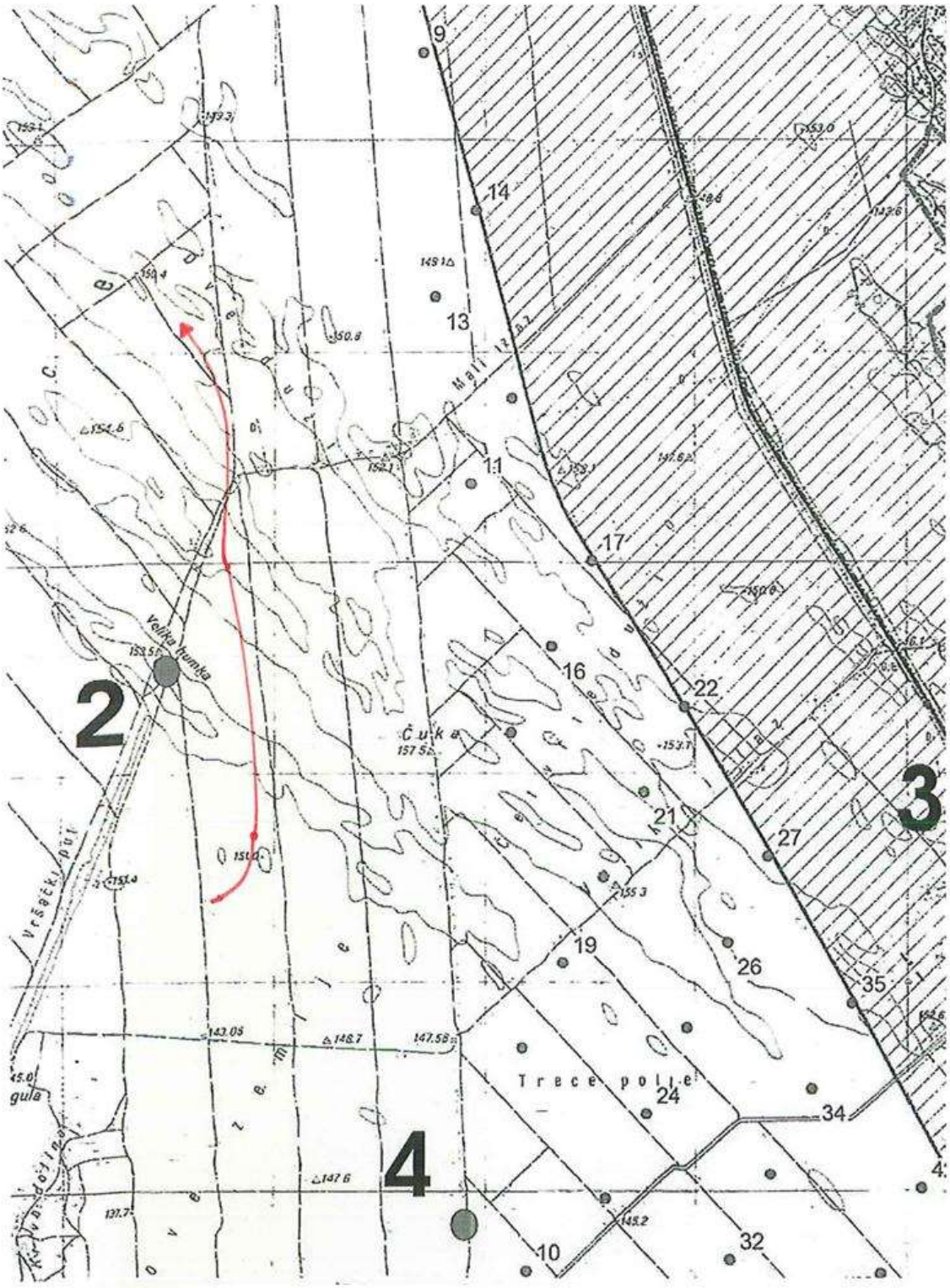
VP2: Buteo buteo (Common Buzzard)



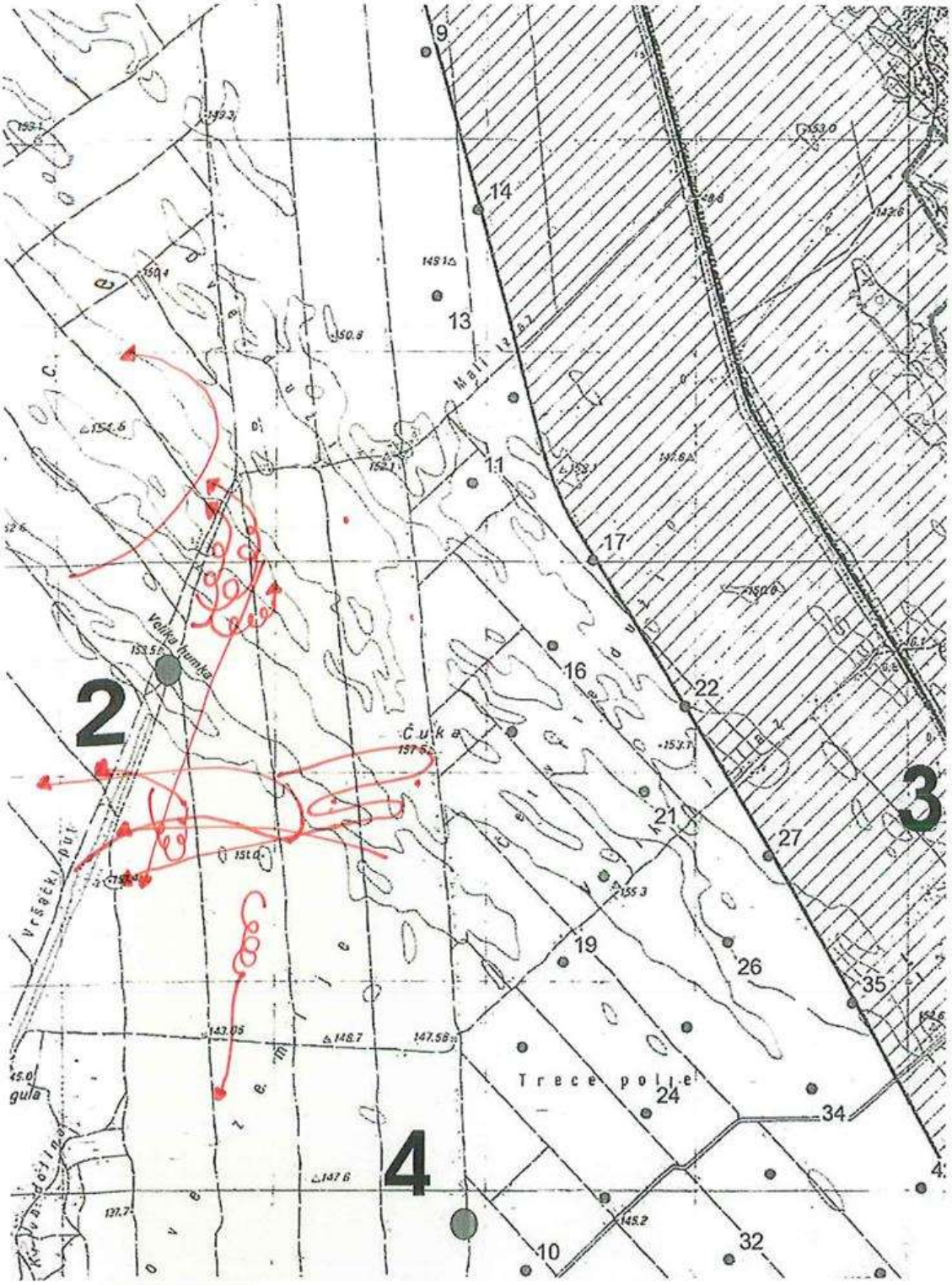
VP2: Grus Grus (Common Crane)



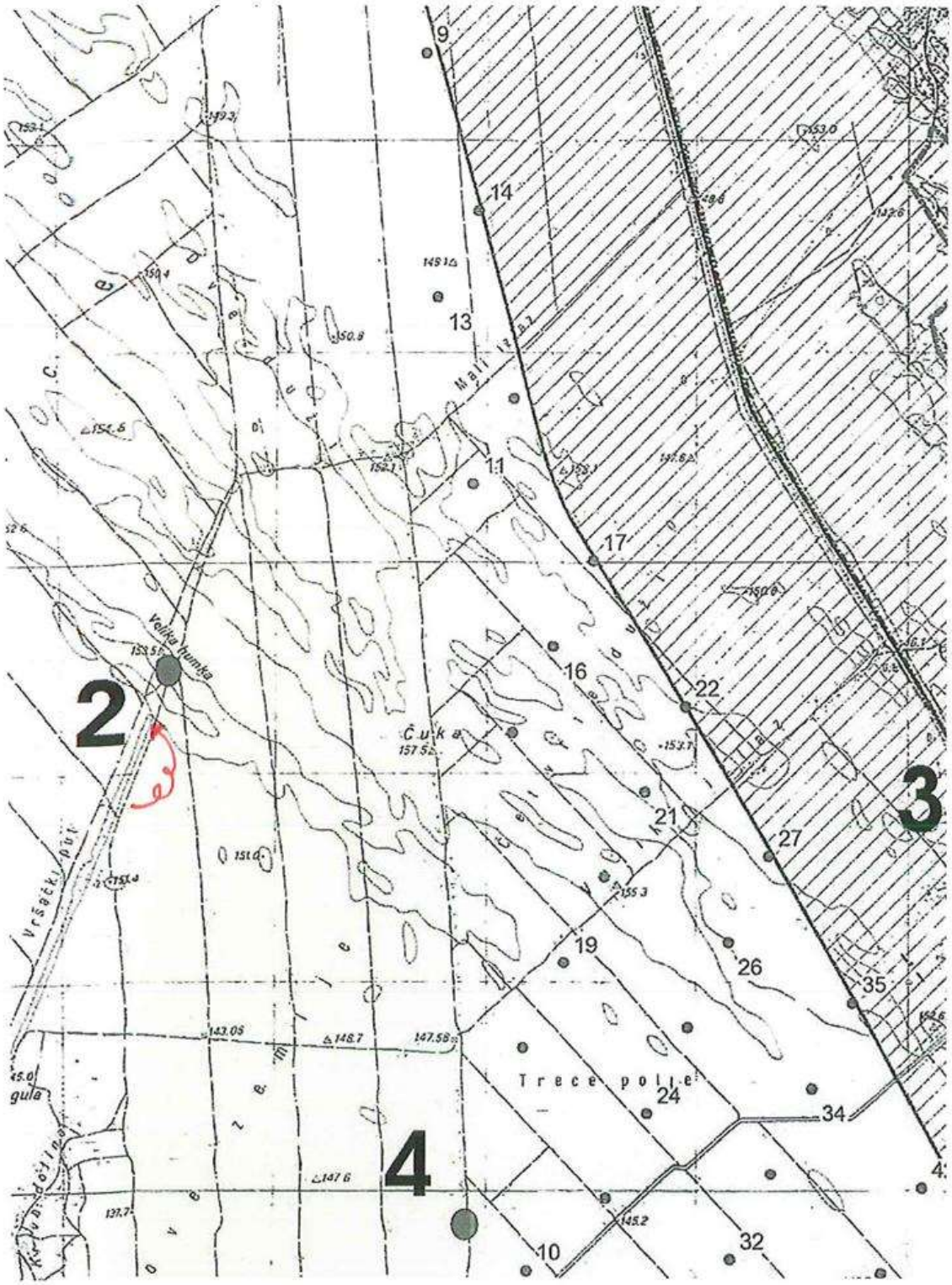
VP2: Falco Subbuteo (Eurasian Hobby)



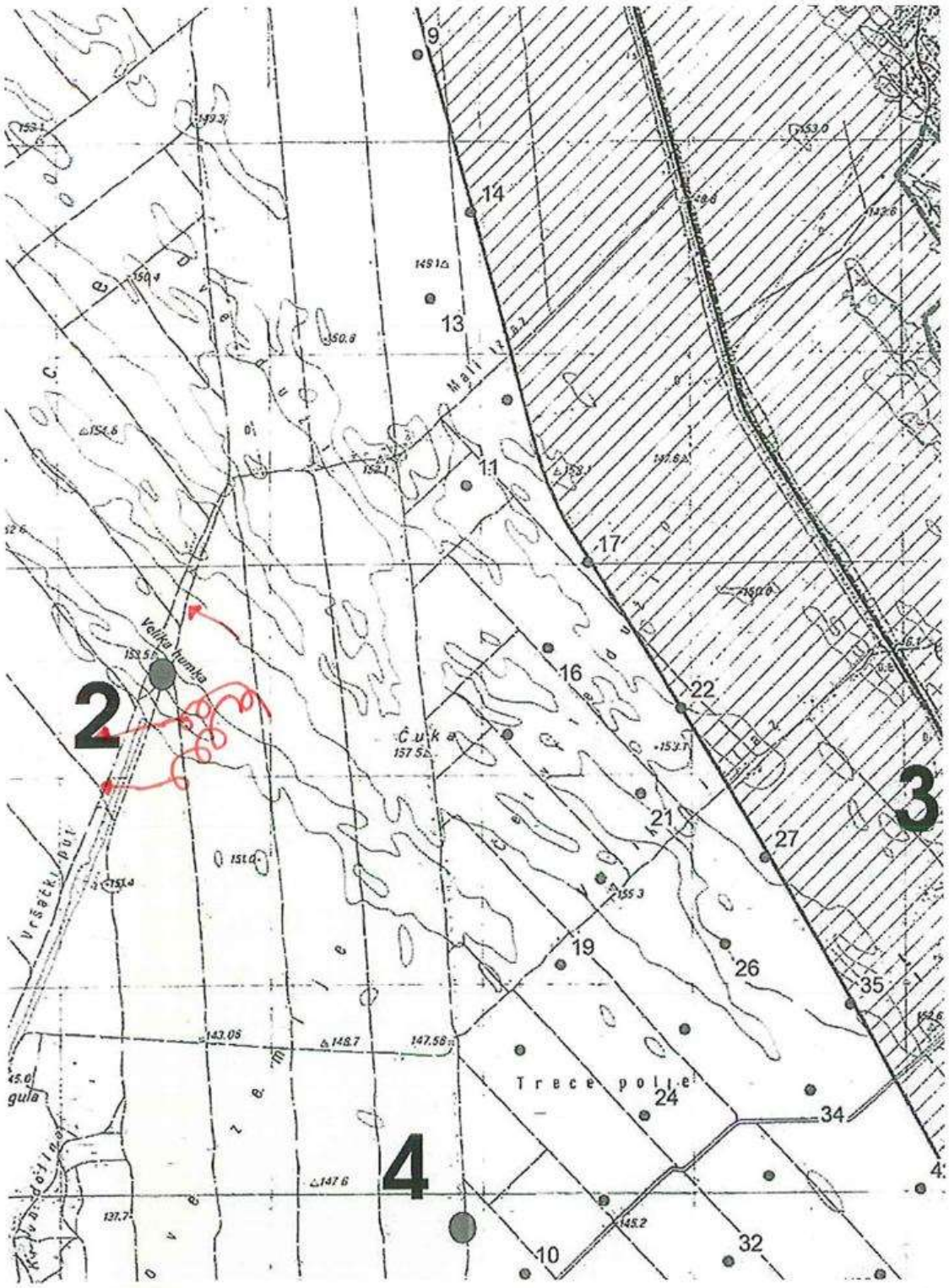
VP2: Falco tinnunculus (Eurasian Kestrel)



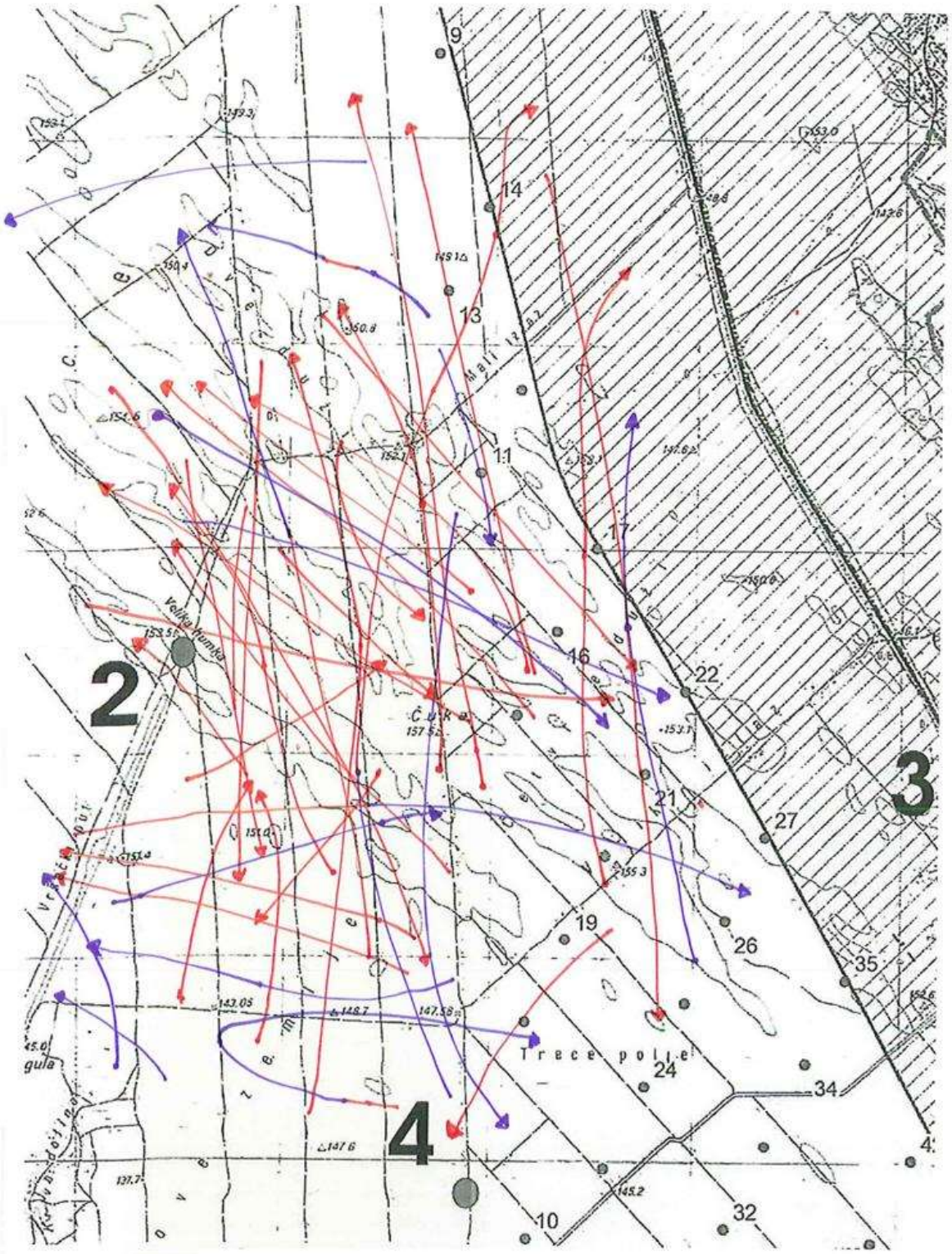
VP2: Accipiter nisus (Eurasian Sparrowhawk)



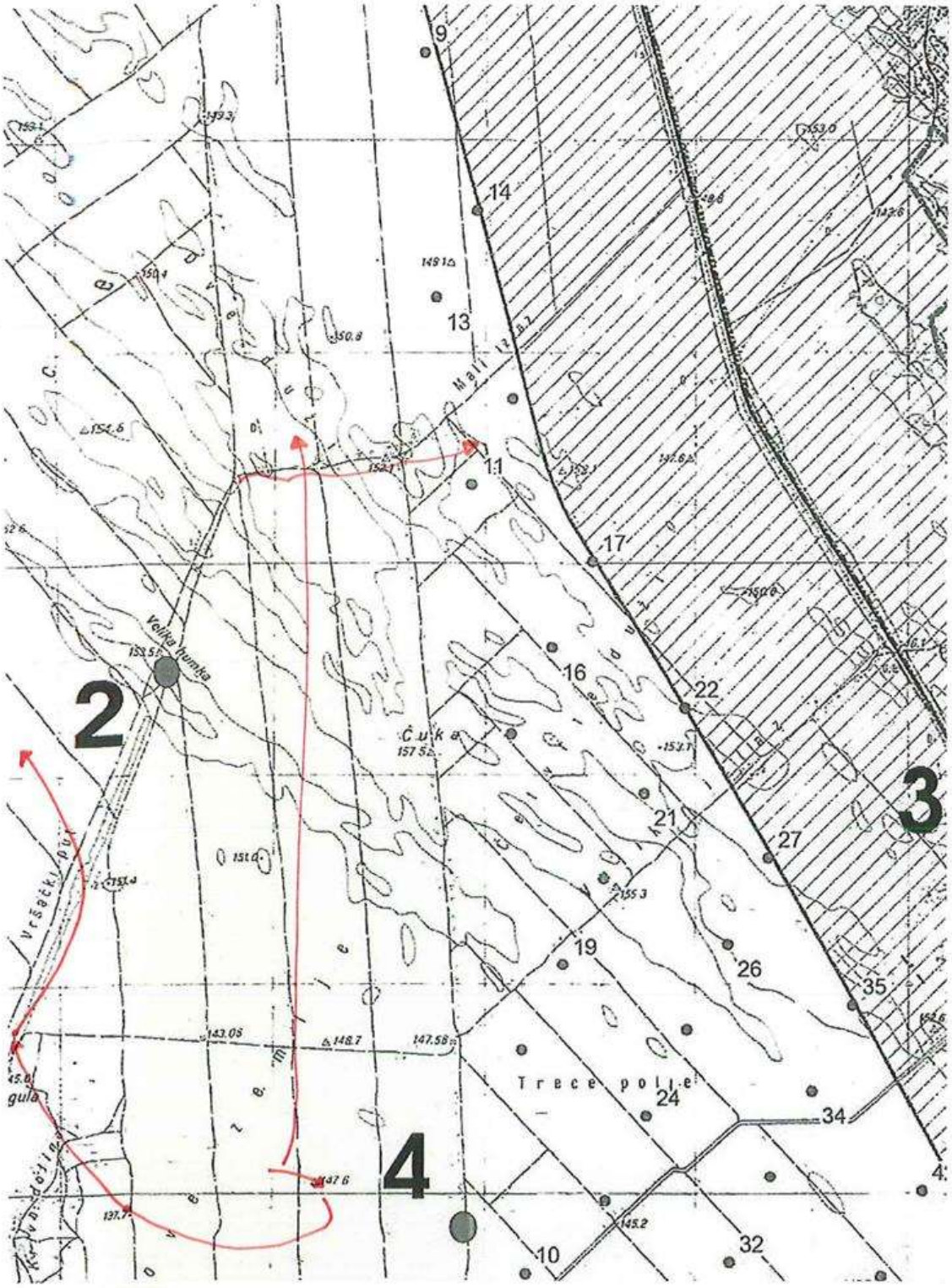
VP2: Merops Apiaster (European Bee-eater)



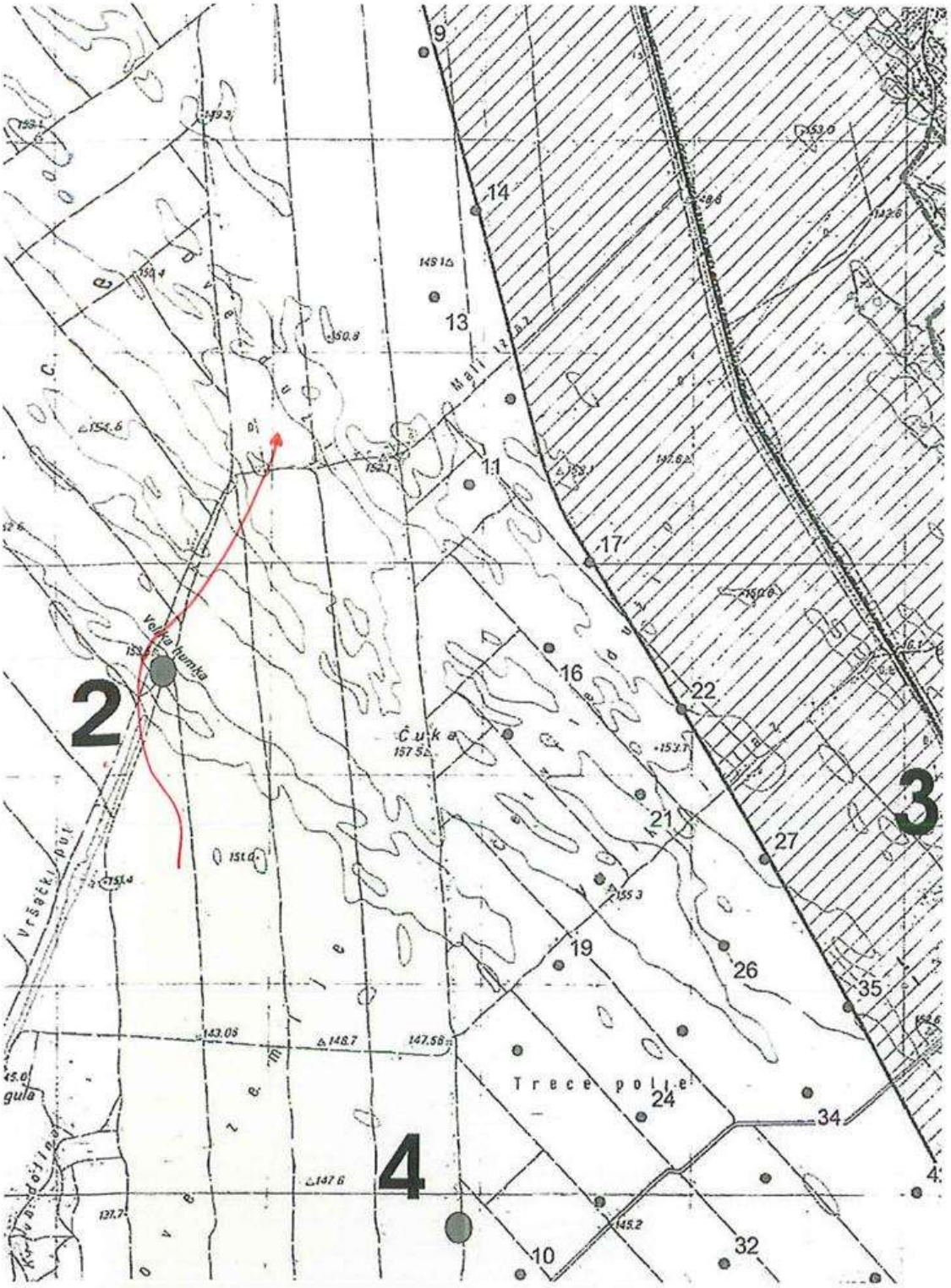
VP2: Anser Anser & Anser Albifrons (Grey geese (greylag goose and greater white-fronted goose))



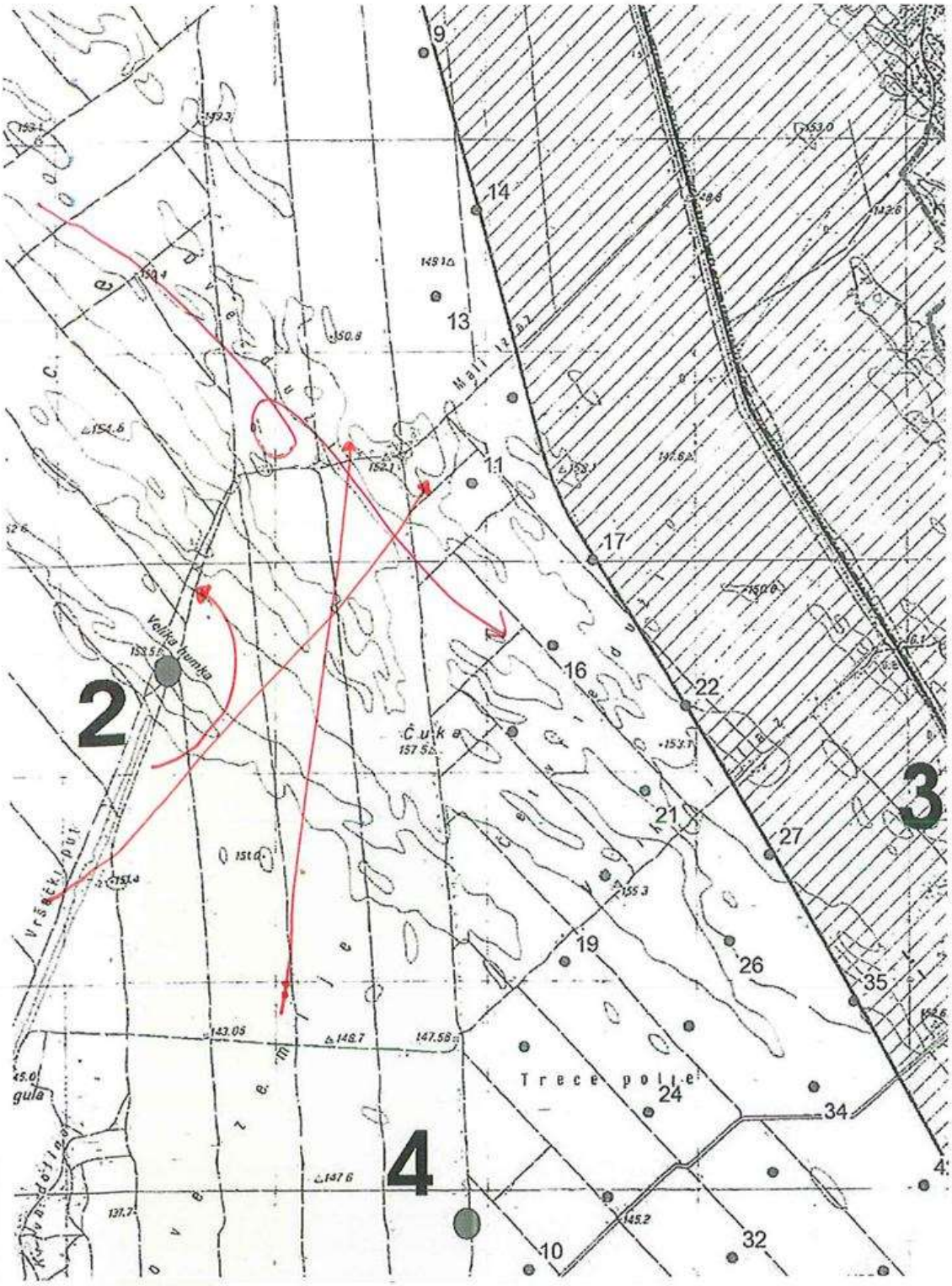
VP2: Circus Cyaneus (Hen Harrier)



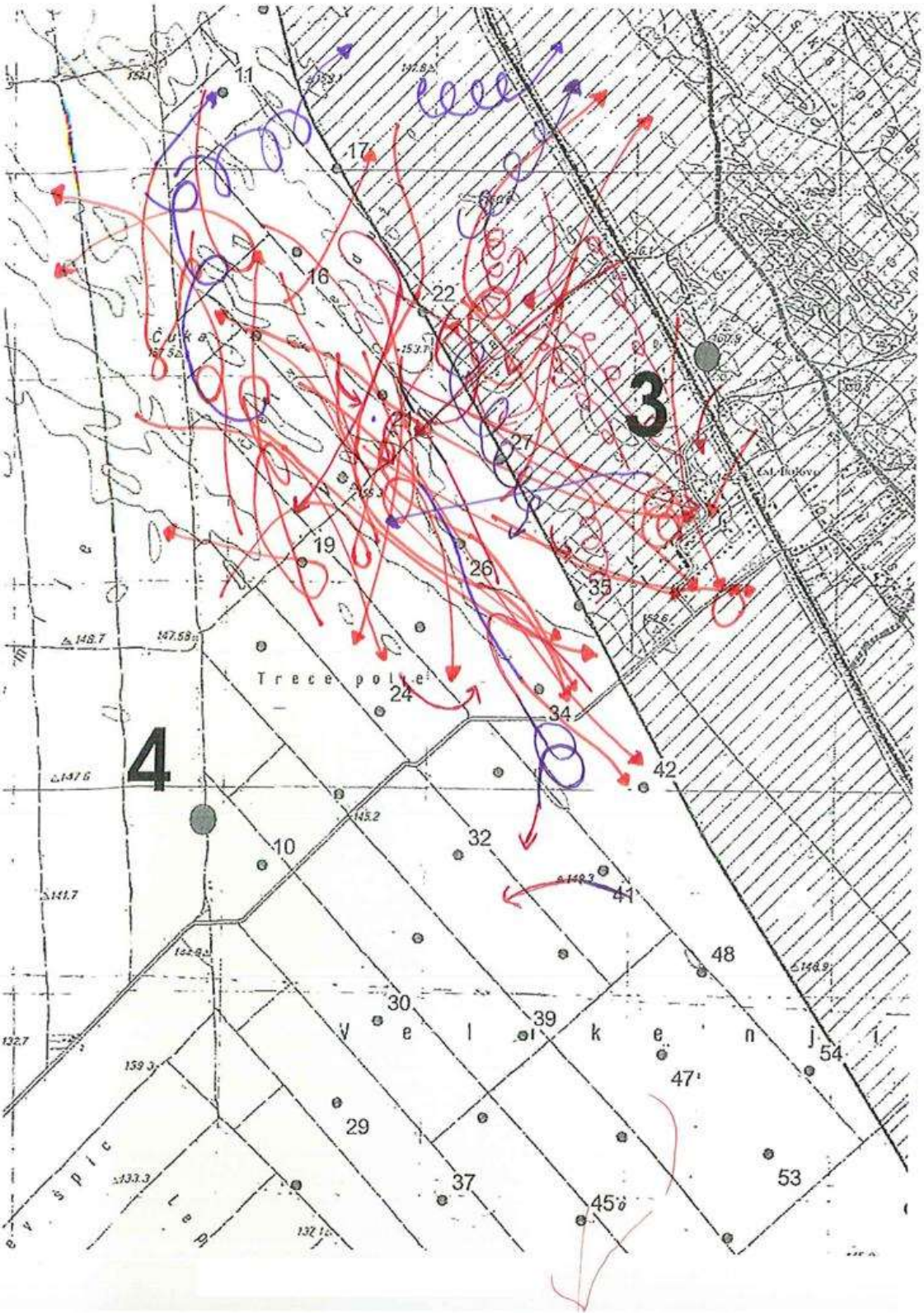
VP2: Circus Macrourus (Montagu's Harrier)



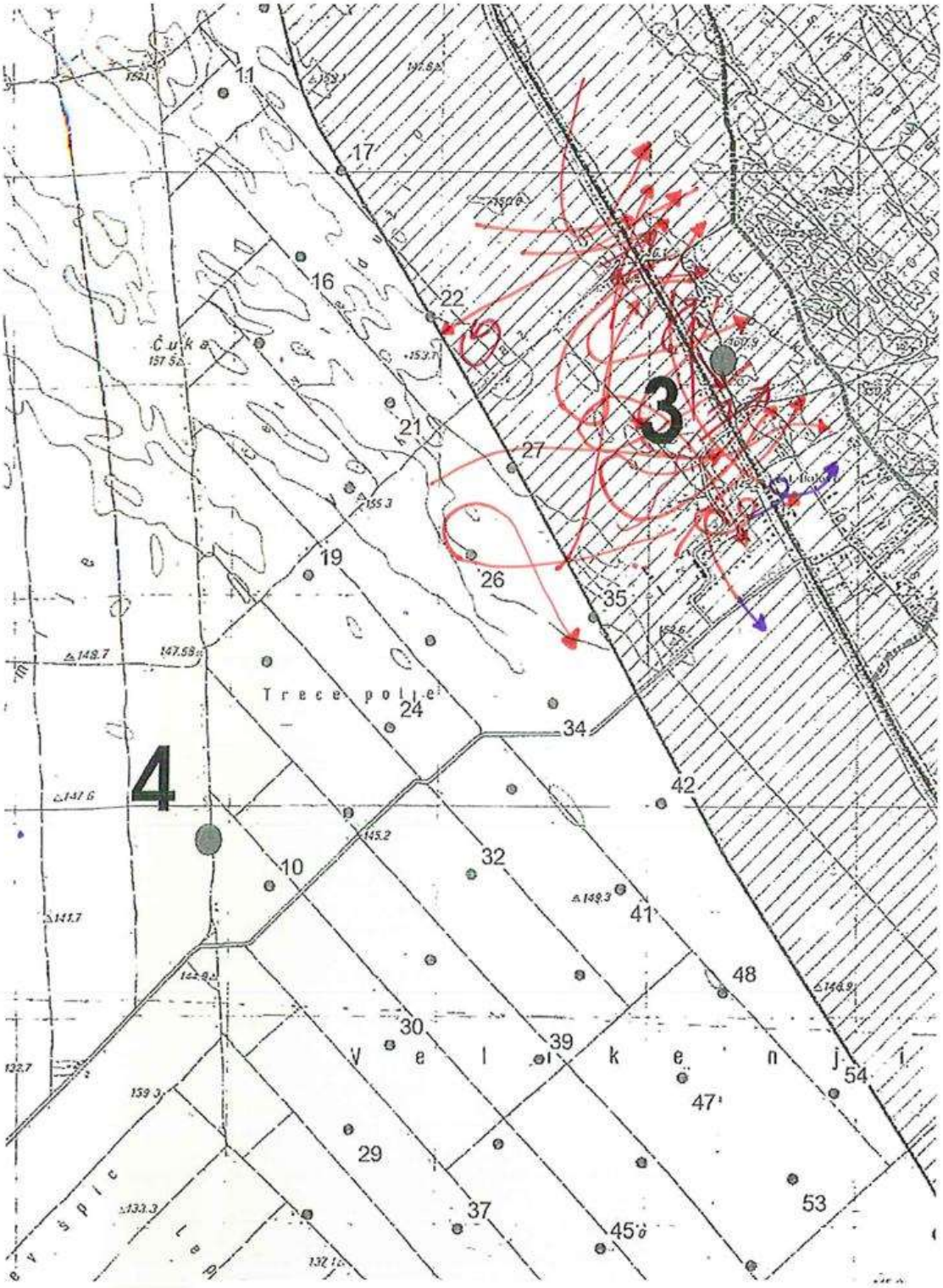
VP2: Circus Aeruginosus (Western Marsh Harrier)



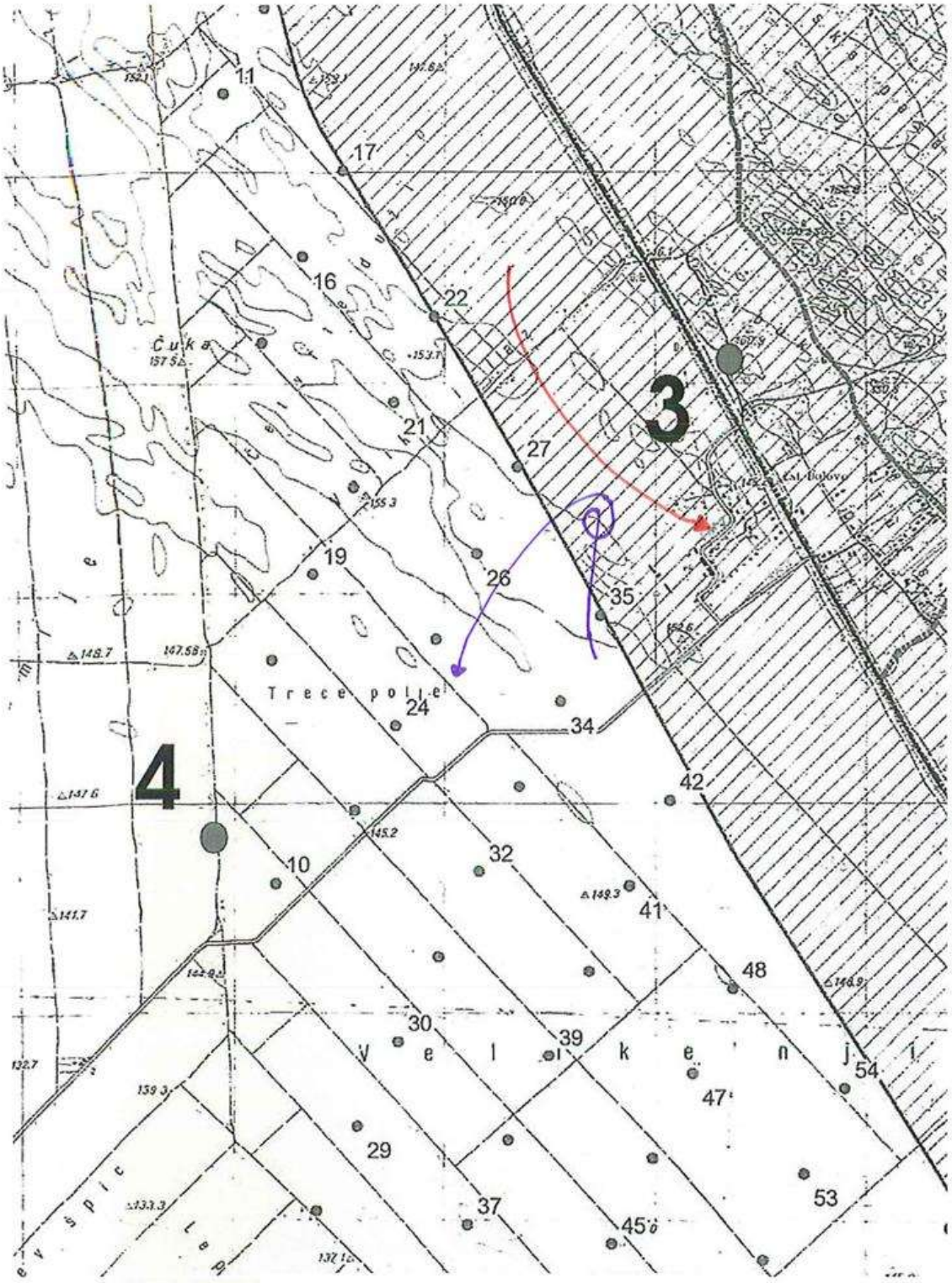
VP3: Buteo Buteo (Common Buzzard)



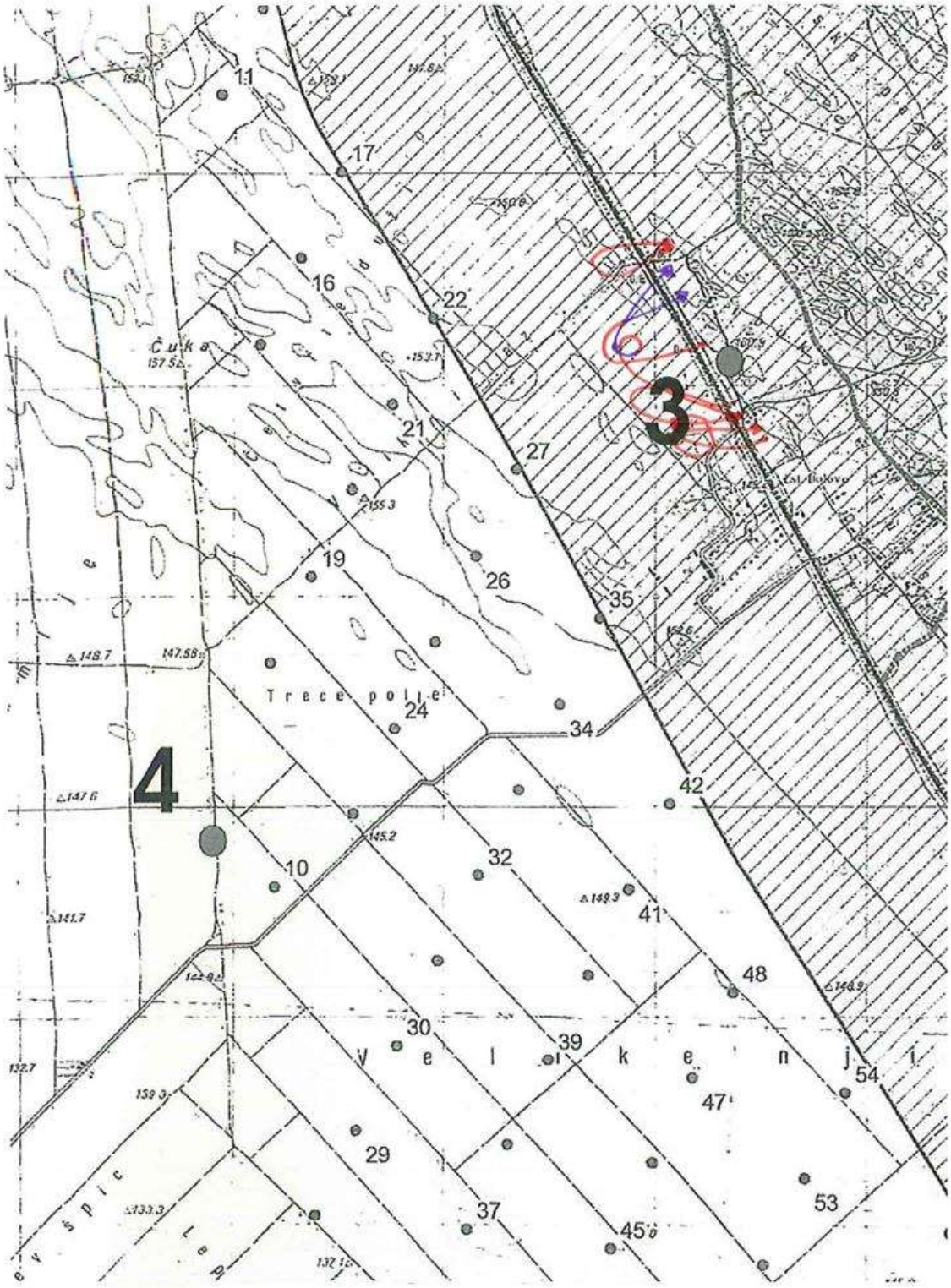
VP3: Falco Tinnunculus (Eurasian Kestrel)



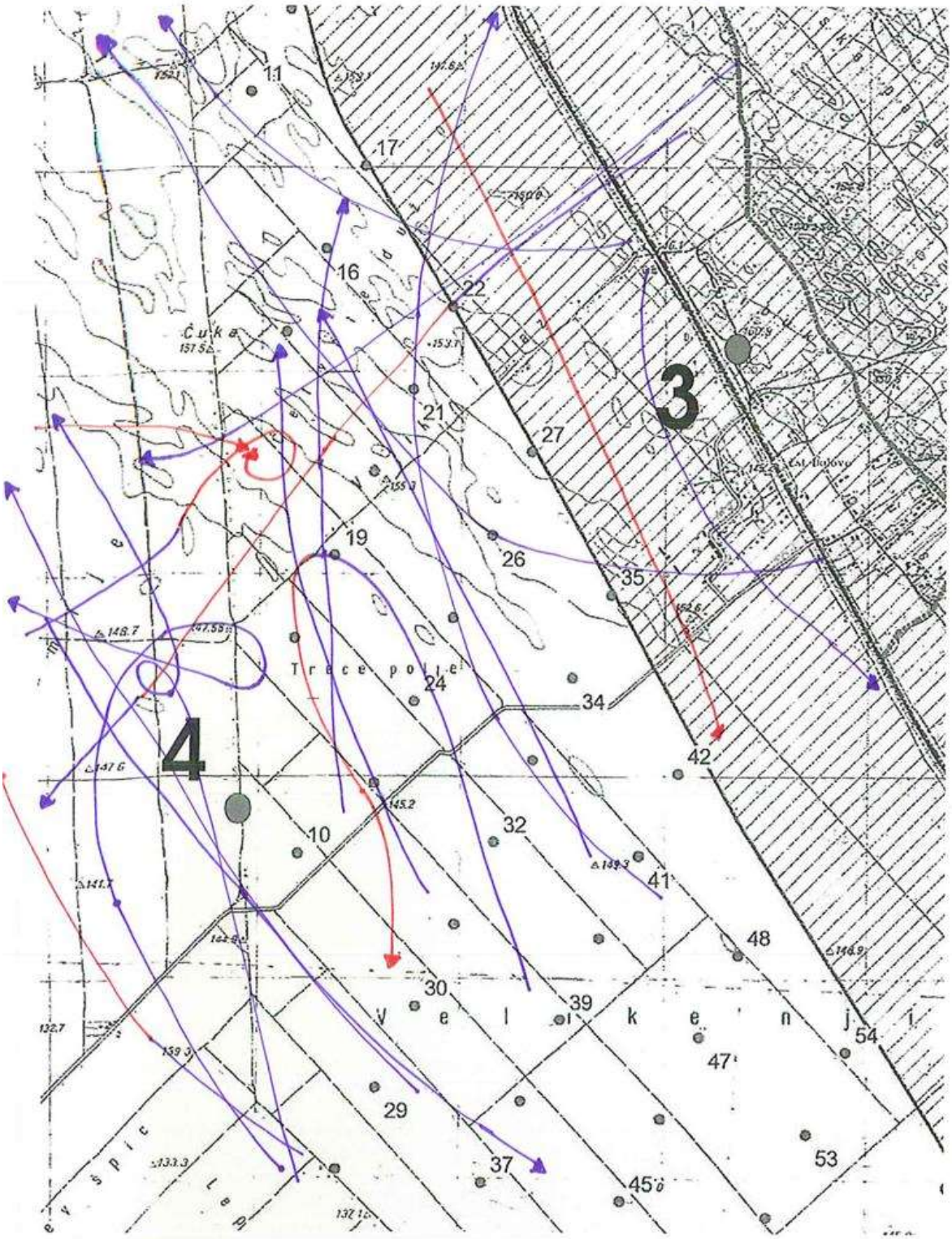
VP3: Accipiter Nisus (Eurasian Sparrowhawk)



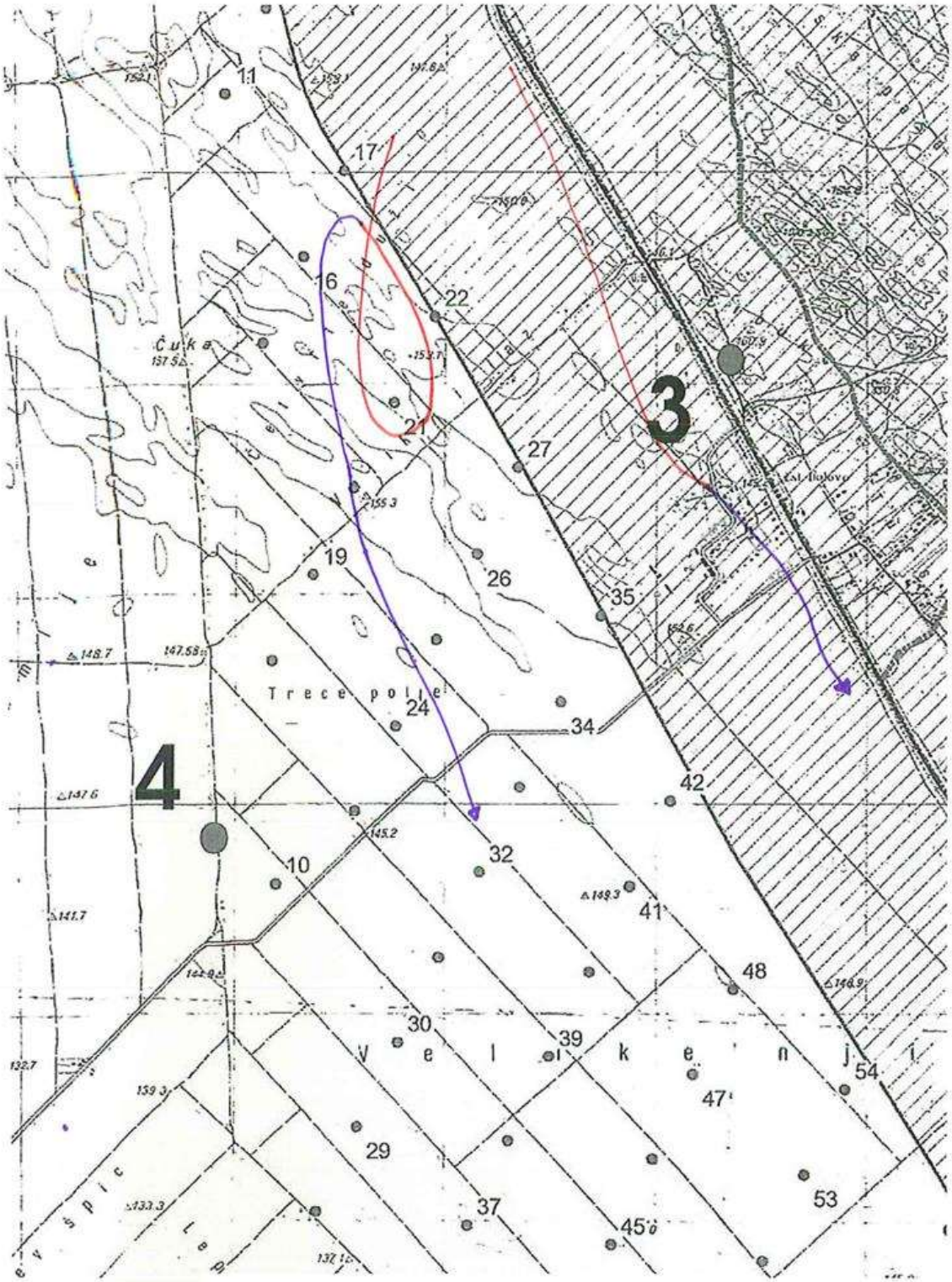
VP3: Merops Apiaster (European Bee-Eater)



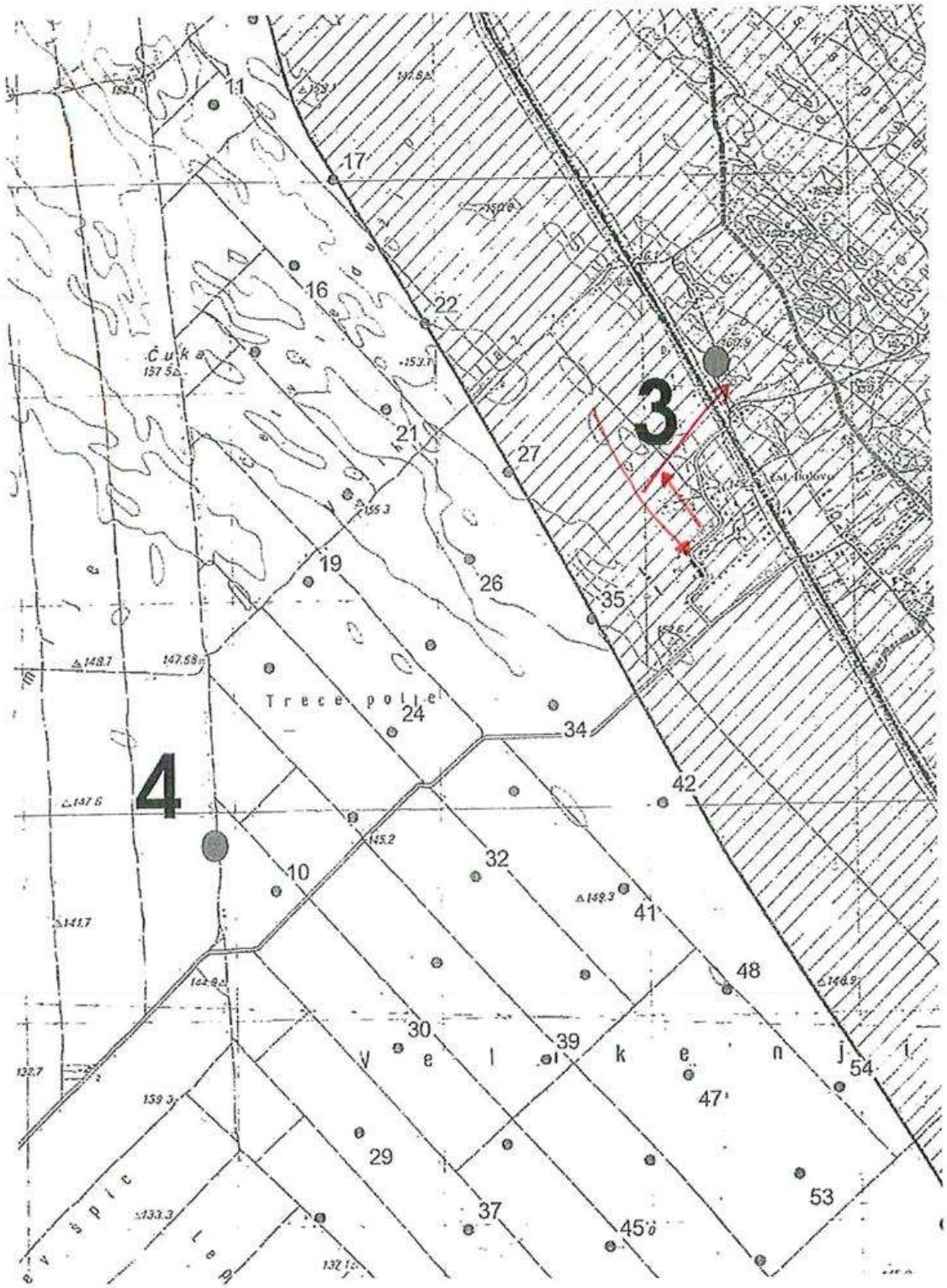
VP3: Anser Anser & Anser Albifron (Grey Geese (greylag goose and greater white-fronted goose)



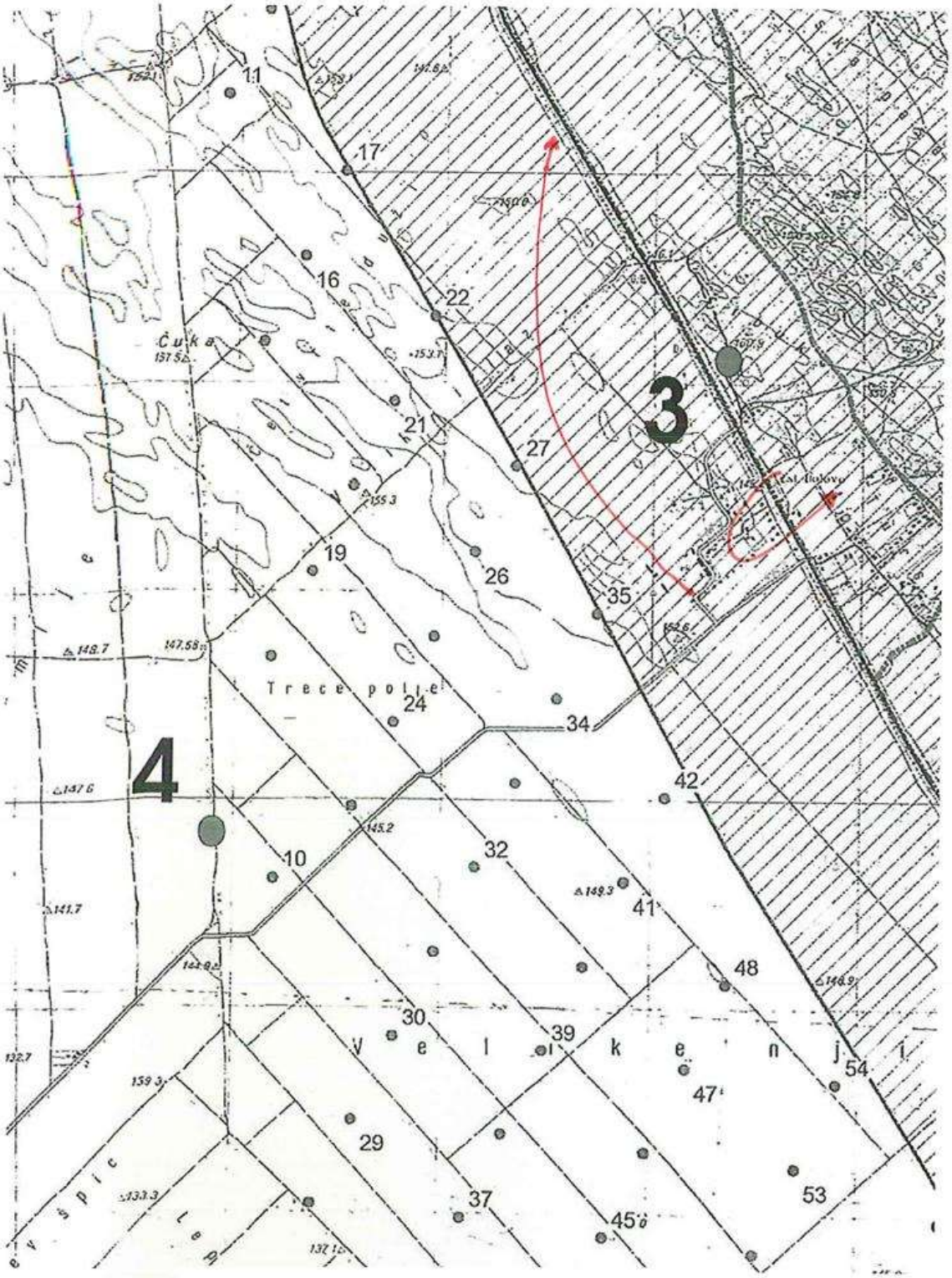
VP3: Circus Cyaneus (Hen Harrier)



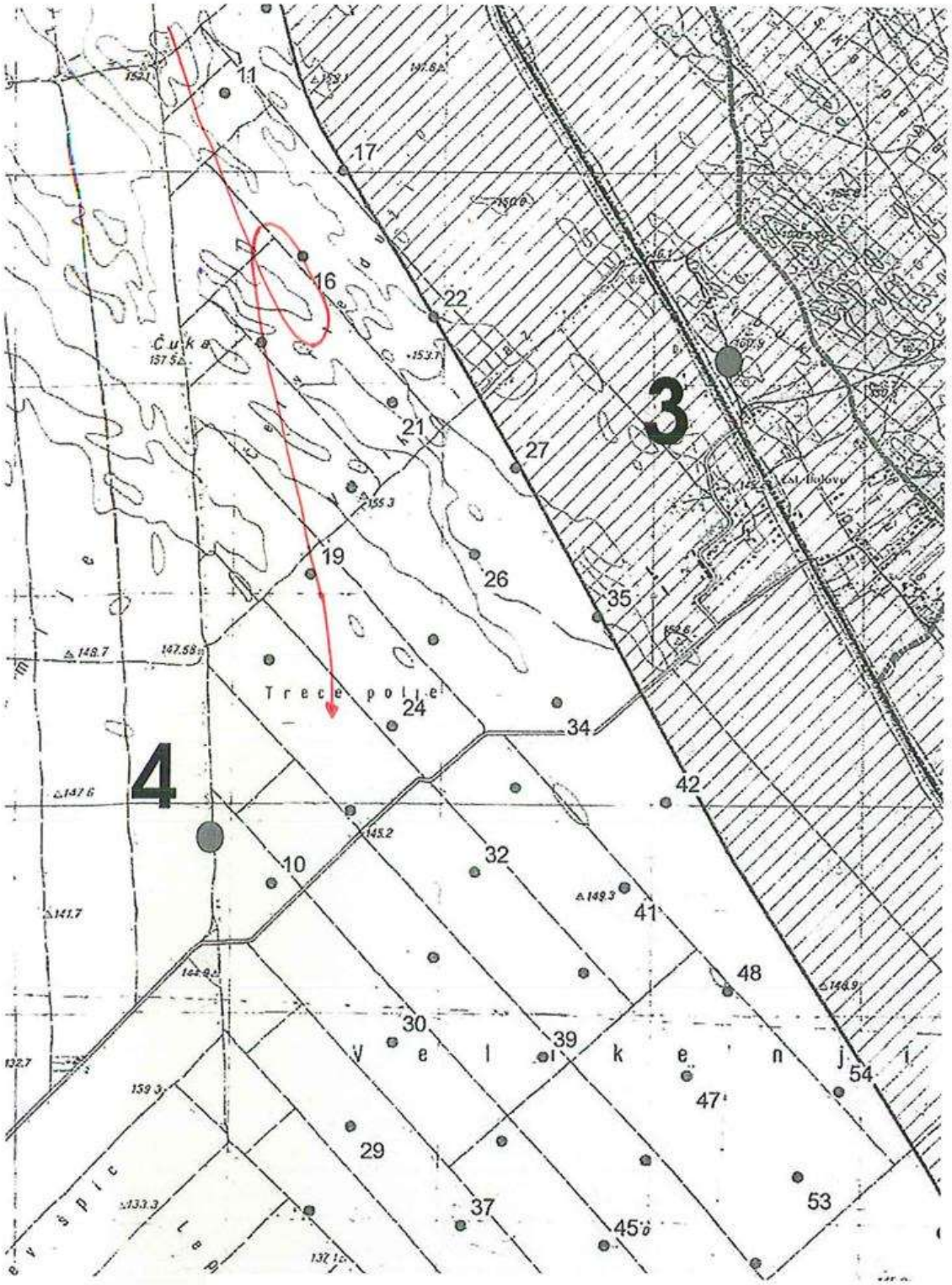
VP3: Falco Columarius (Merlin)



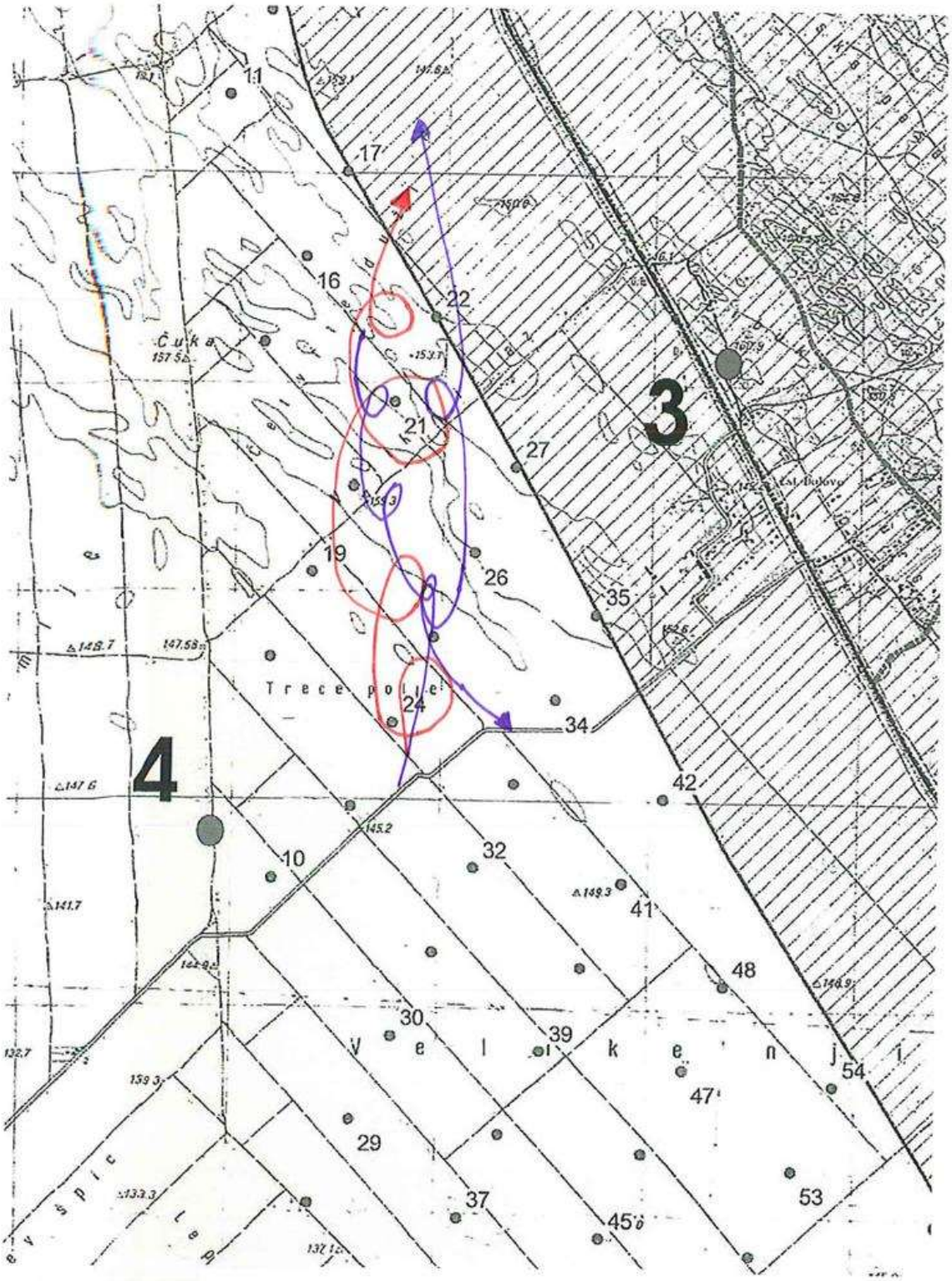
VP3: Accipiter Gentilus (Northern Goshawk)



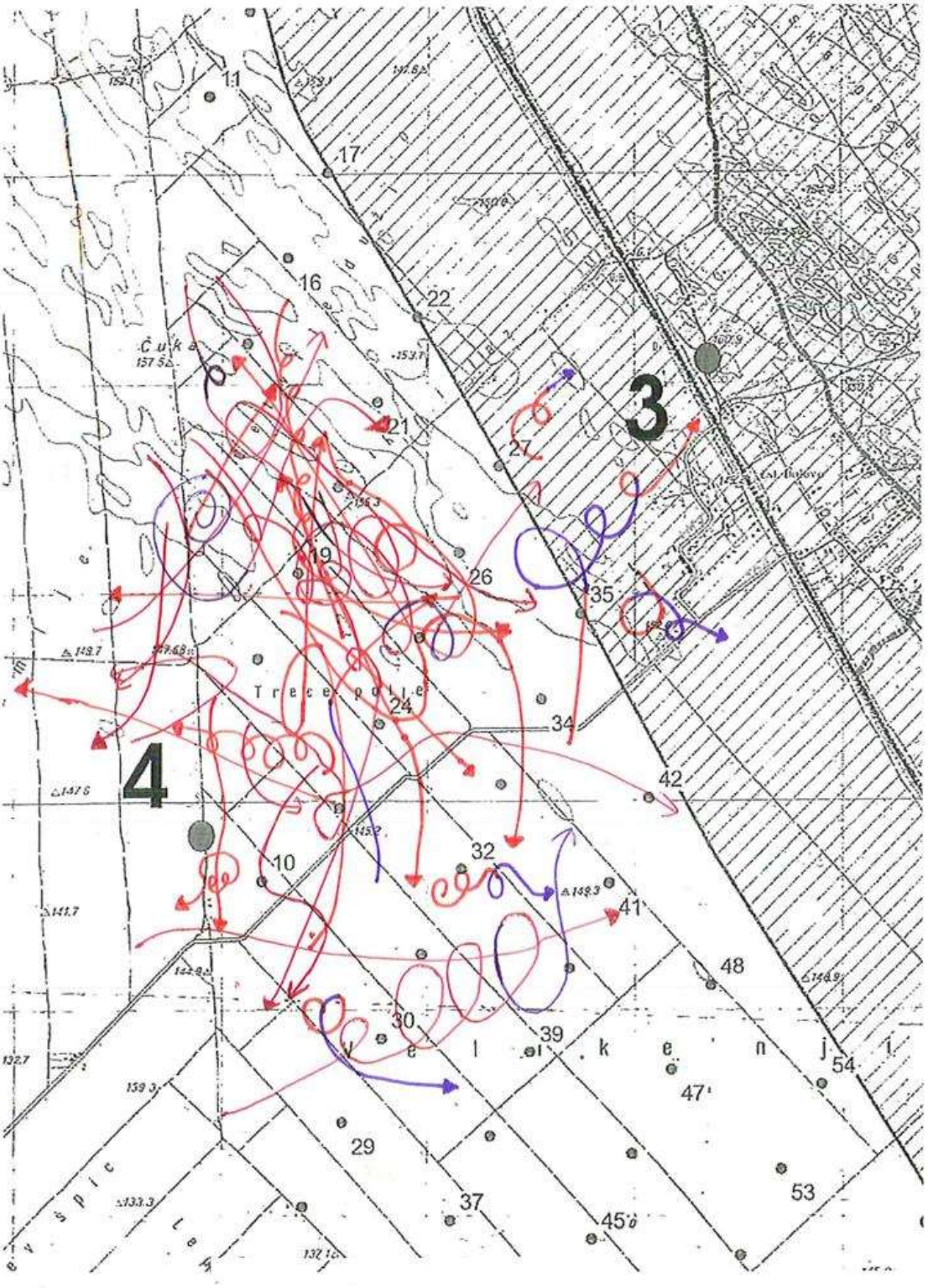
VP3: Circus Aeruginosus (Western Marsh Harrier)



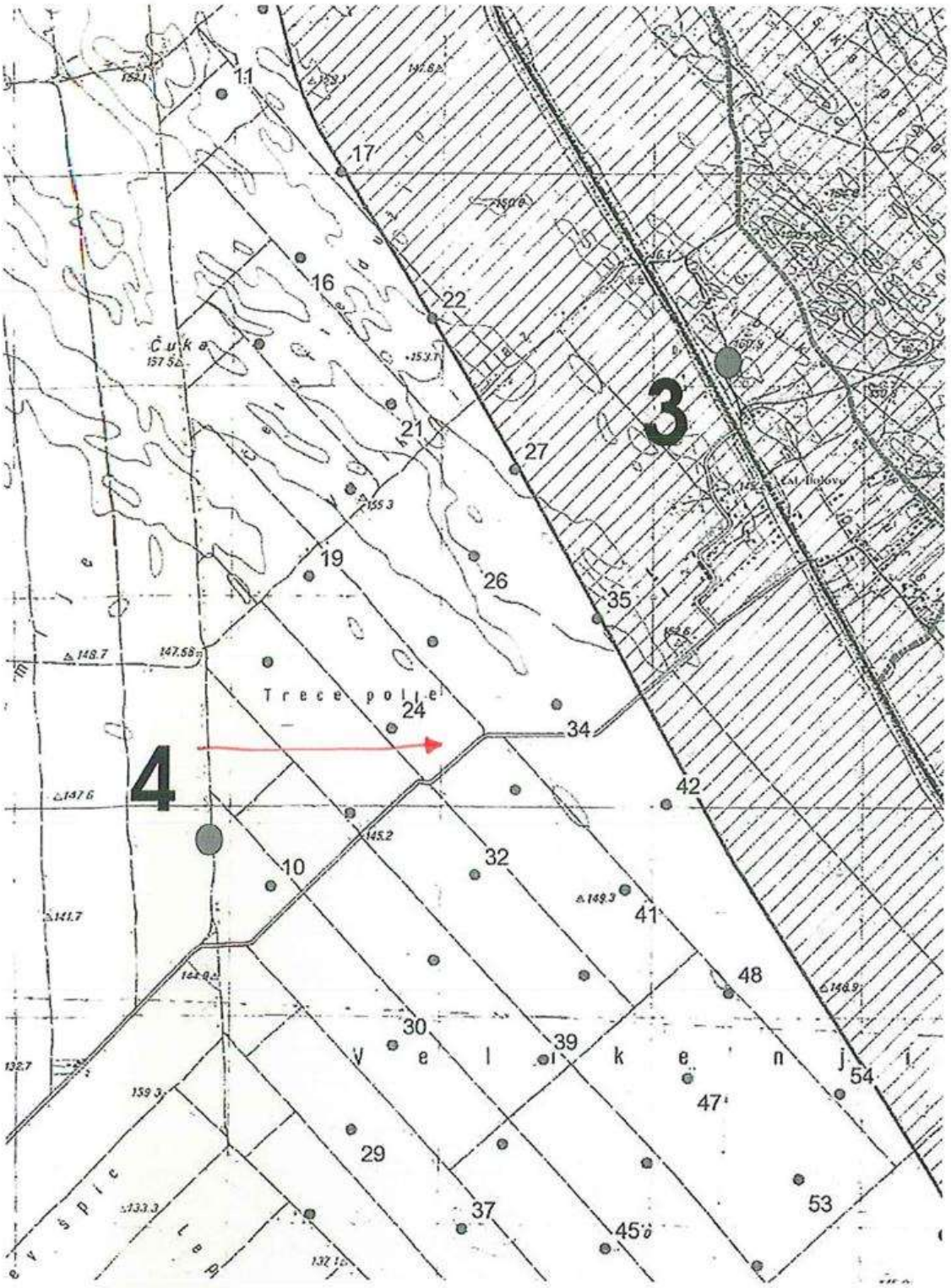
VP3: Ciconia ciconia (White Stork)



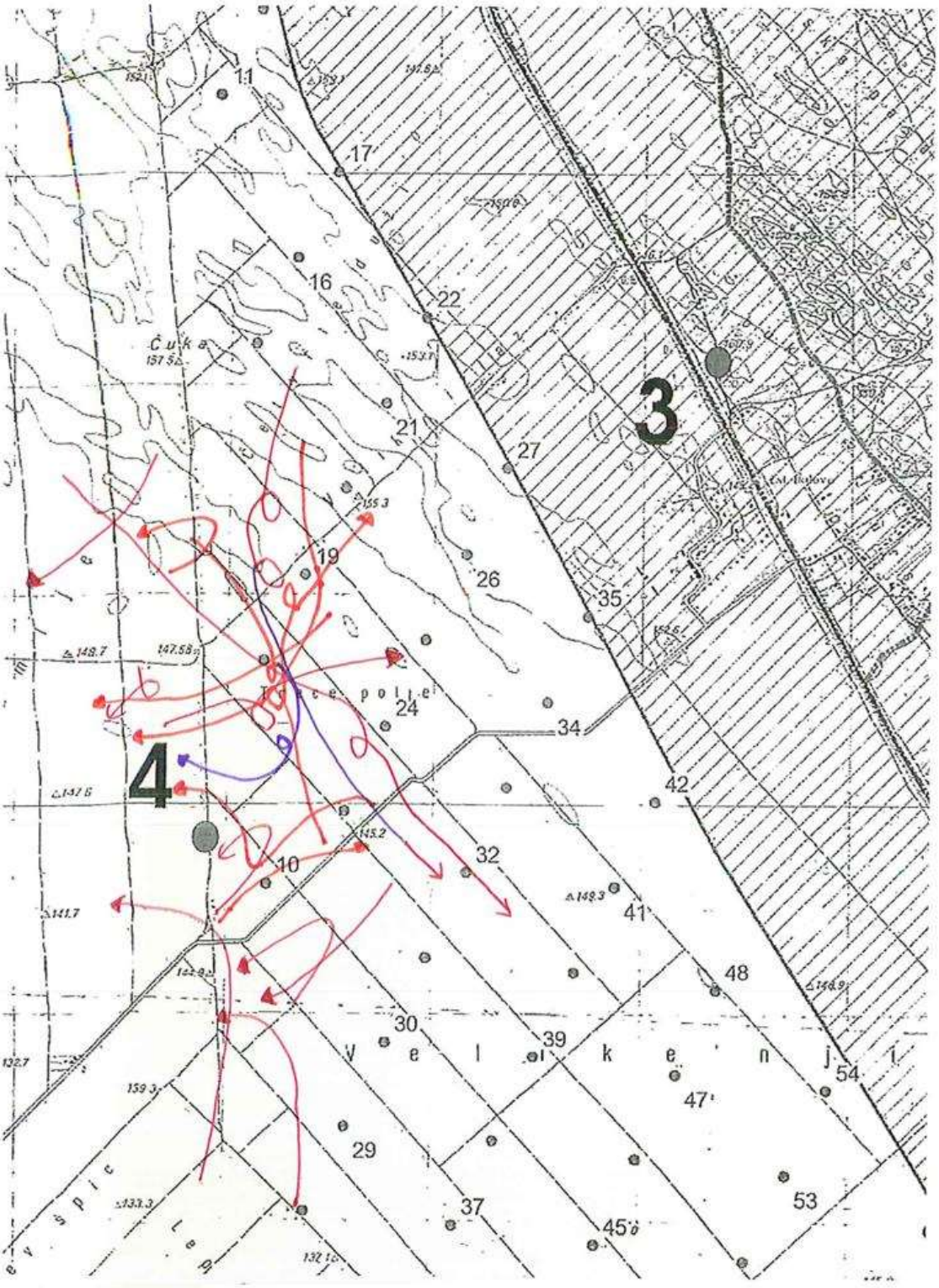
VP4: Buteo Buteo (Common Buzzard)



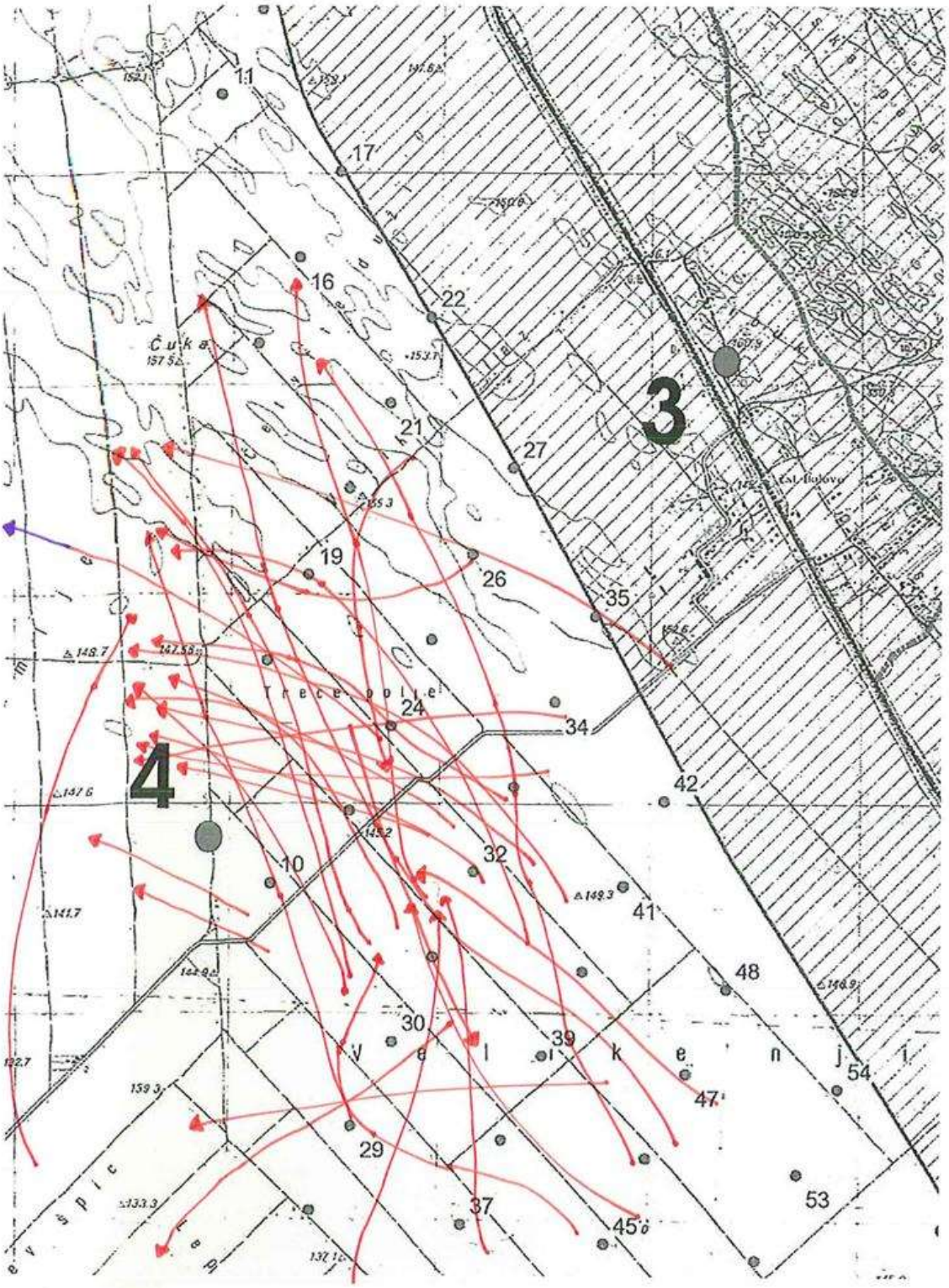
VP4: Falco Subbuteo (Eurasion Hobby)



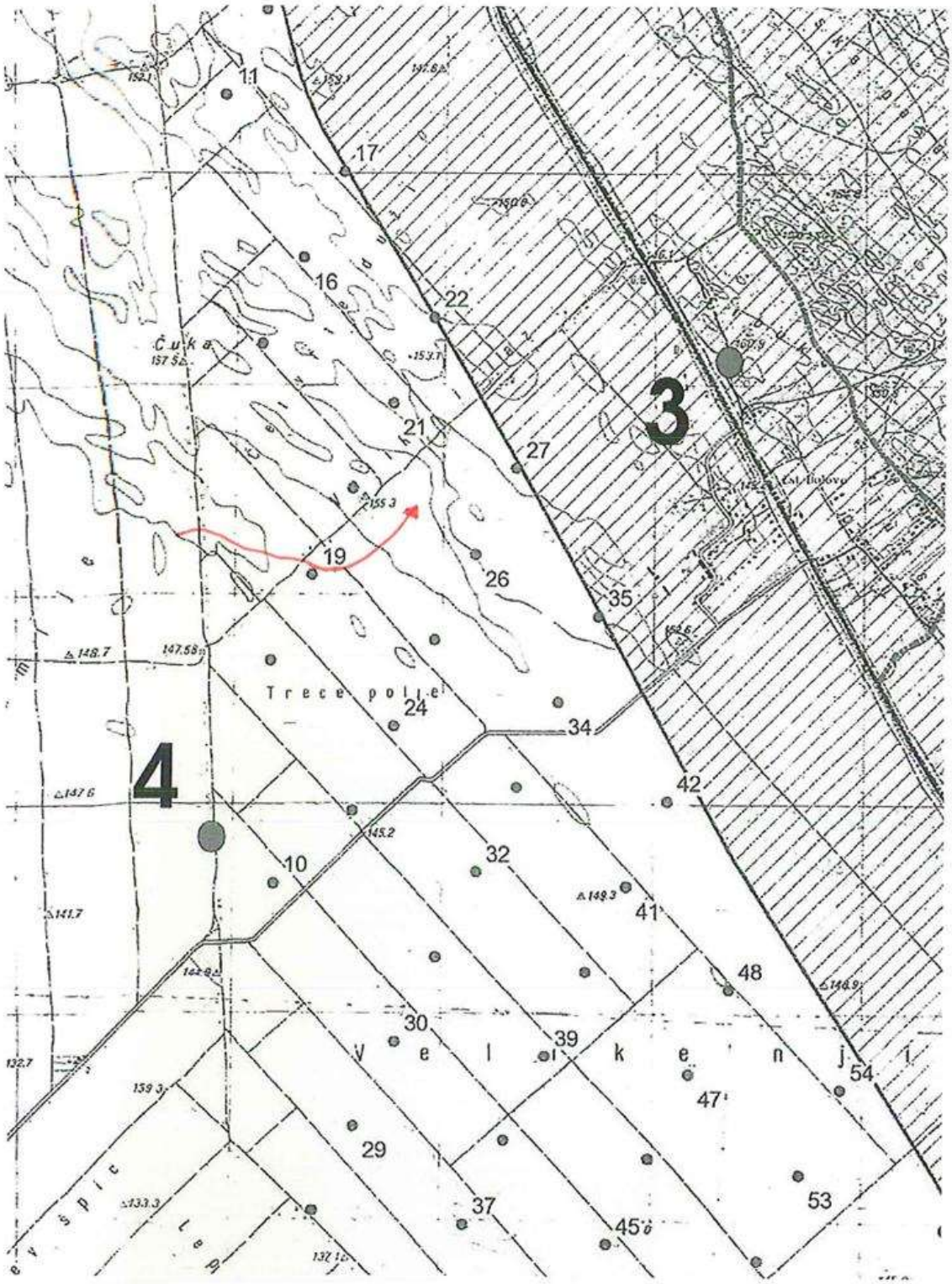
VP4: Falco tinnunculus (European Kestrel)



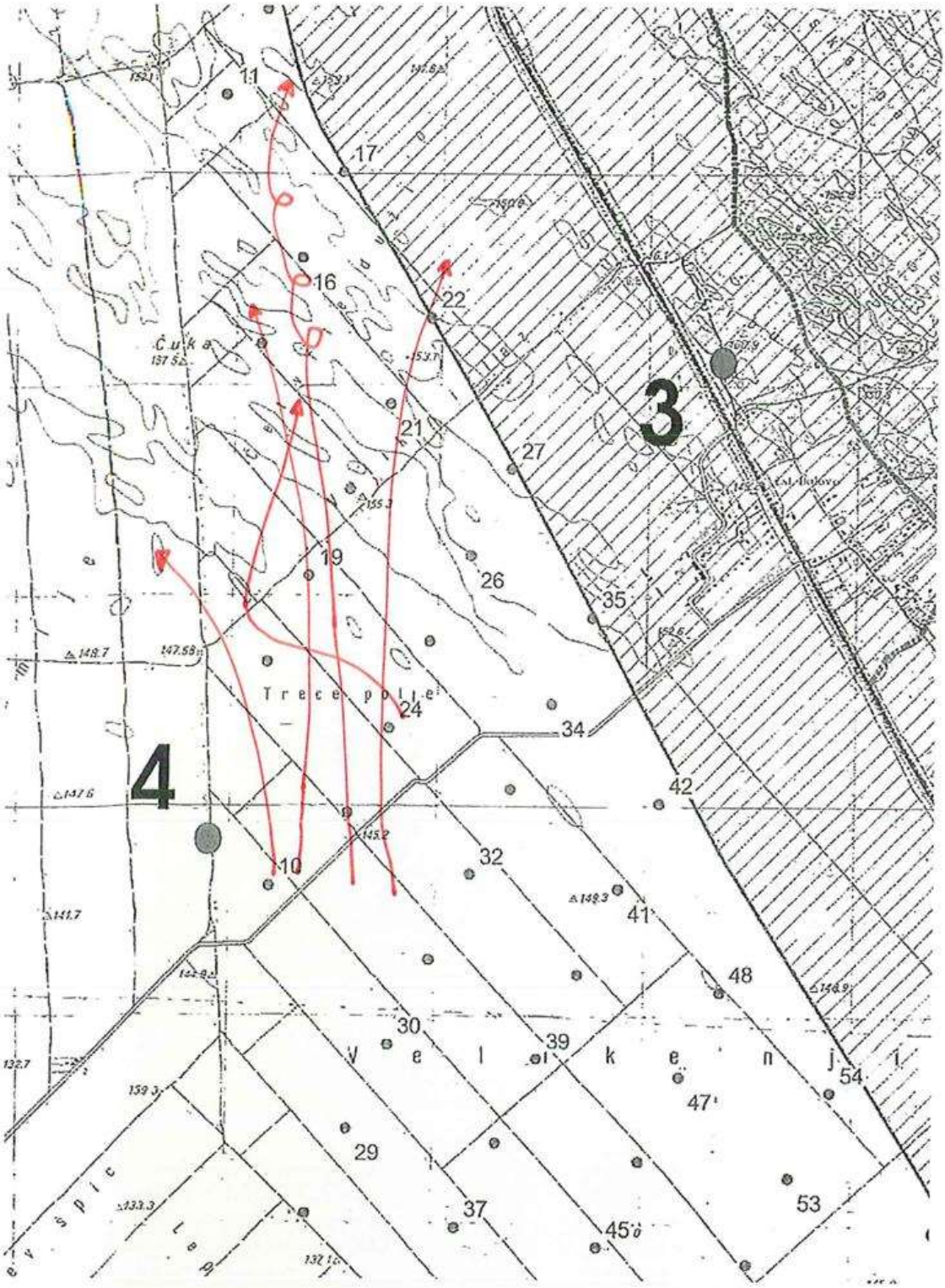
VP4: Anser Anser & Anser Albifrons (Grey Geese (greylag goose and greater white-fronted goose))



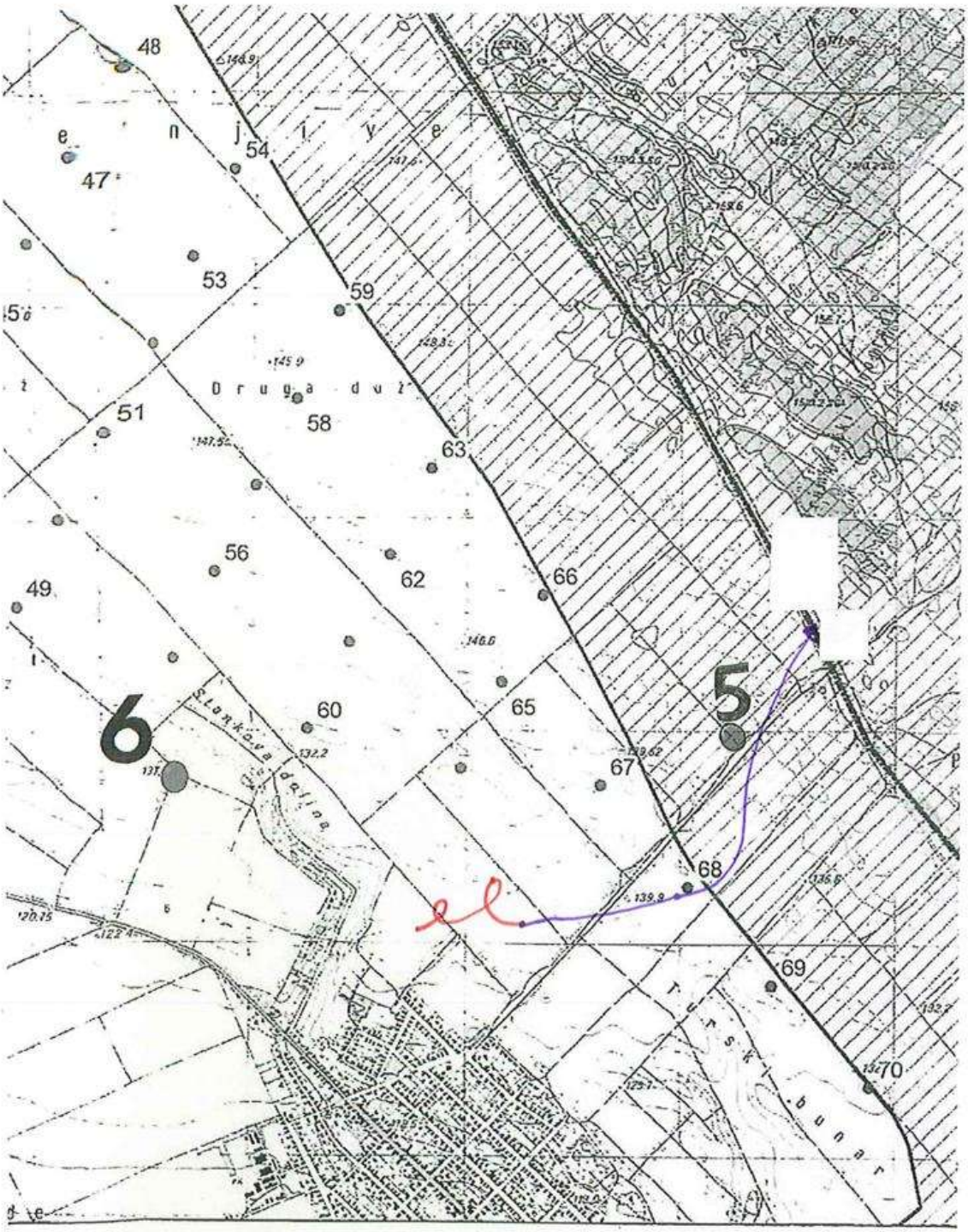
VP4: Falco cherrug (Saker Falcon)



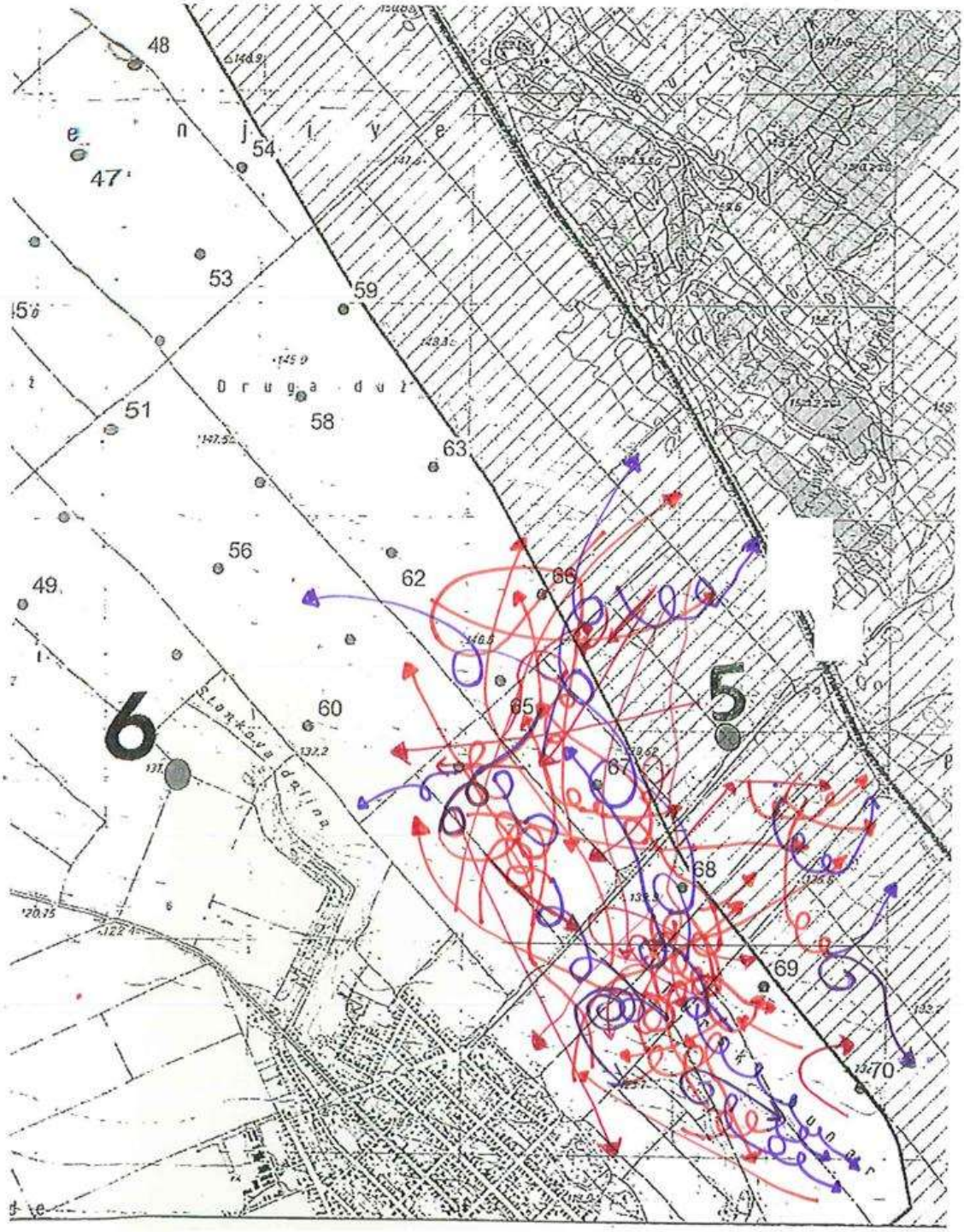
VP4: Circus Aeruginosus (Western Marsh Harrier)



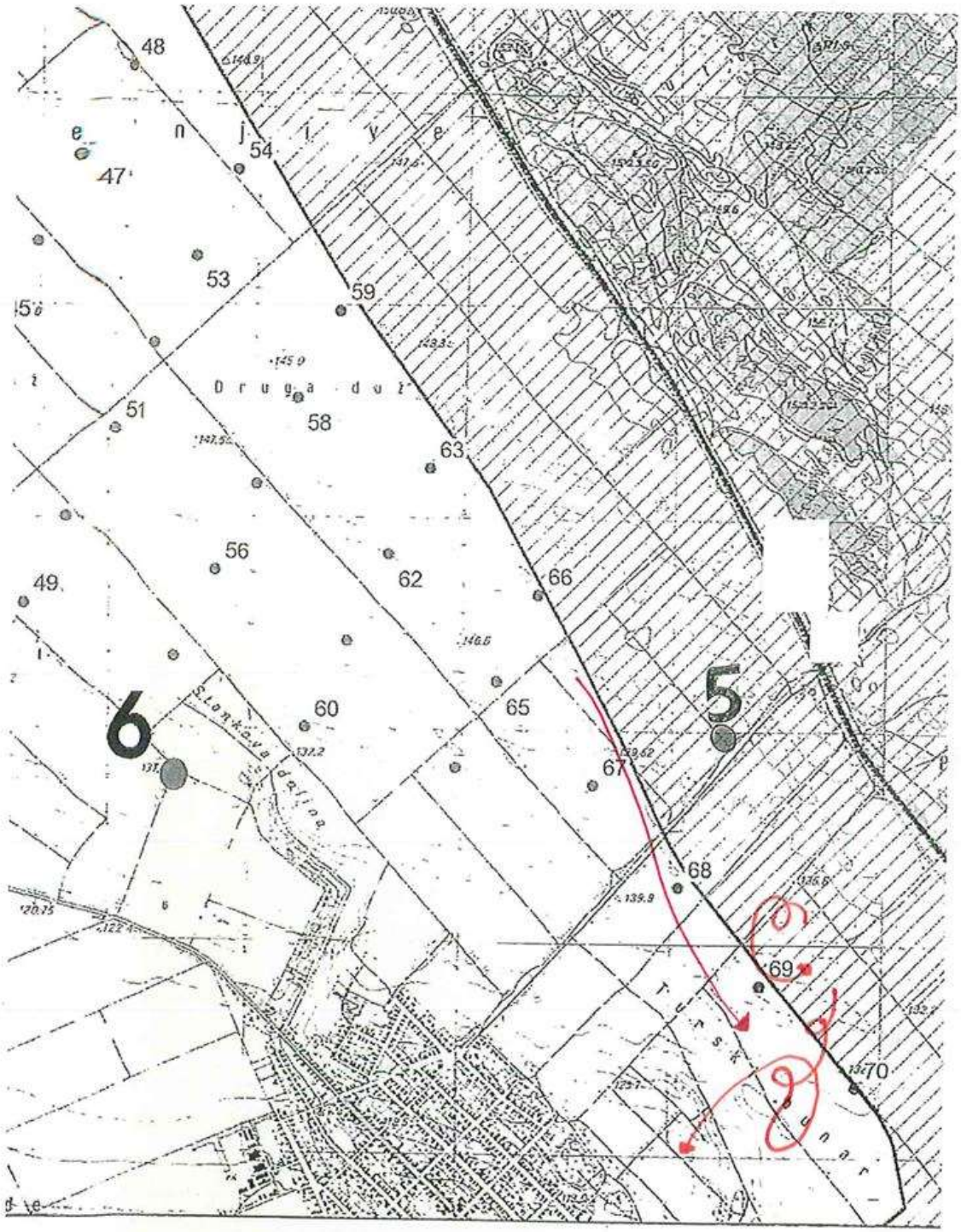
VP5: Milvus Migrans (Black Kite)



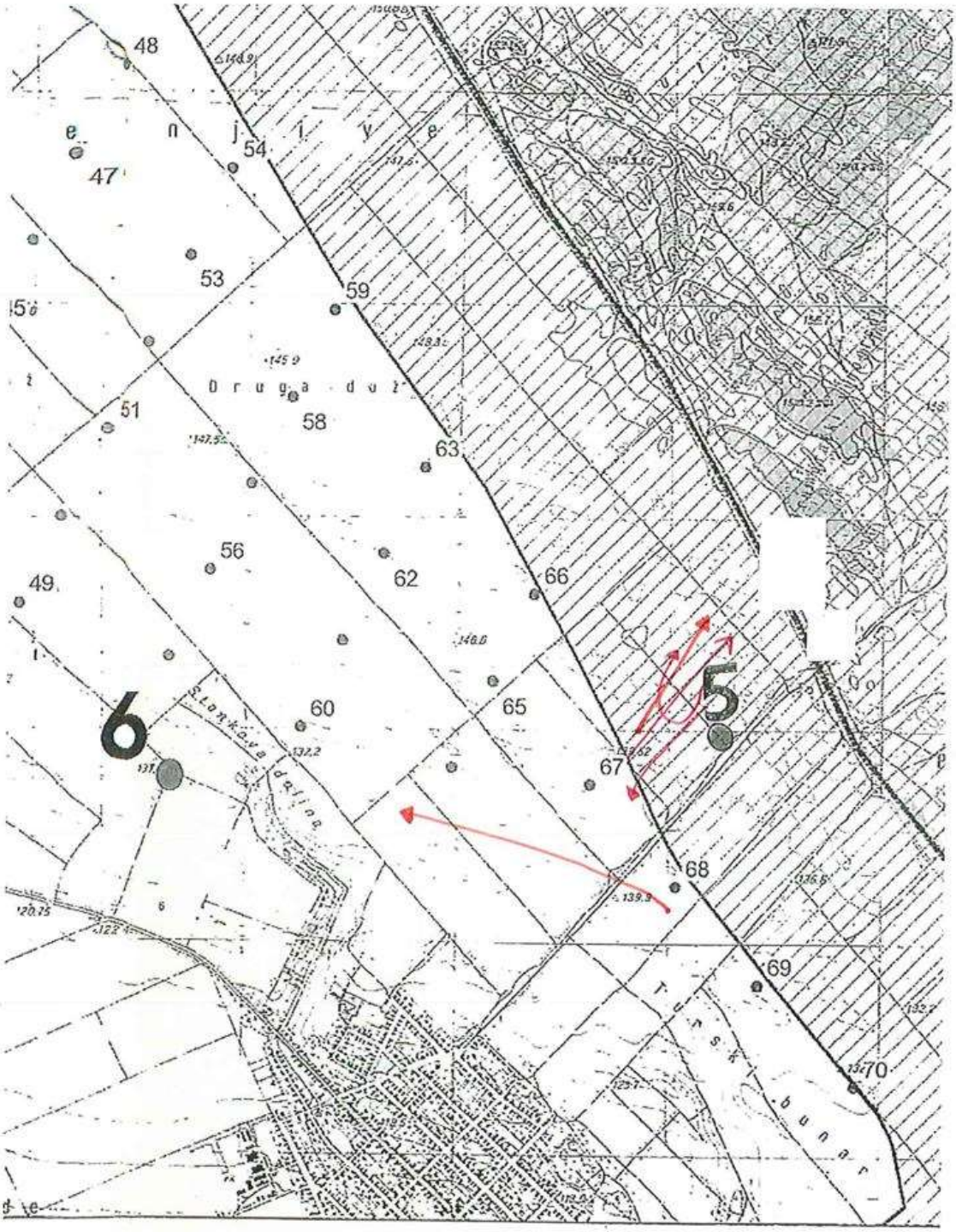
VP5: Buteo Buteo (Common Buzzard)



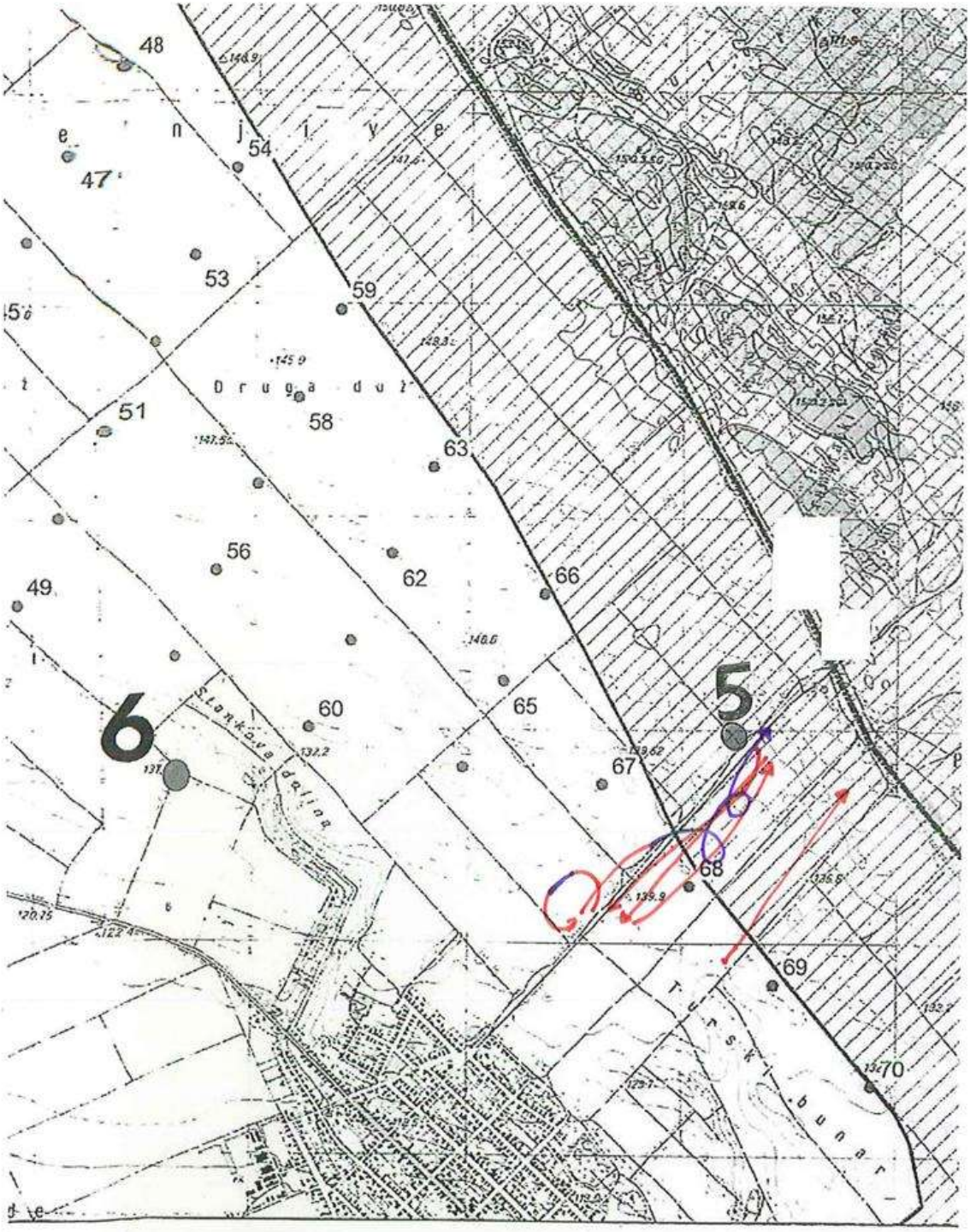
VP5: Falco Tinnunculus (Eurasian Kestrel)



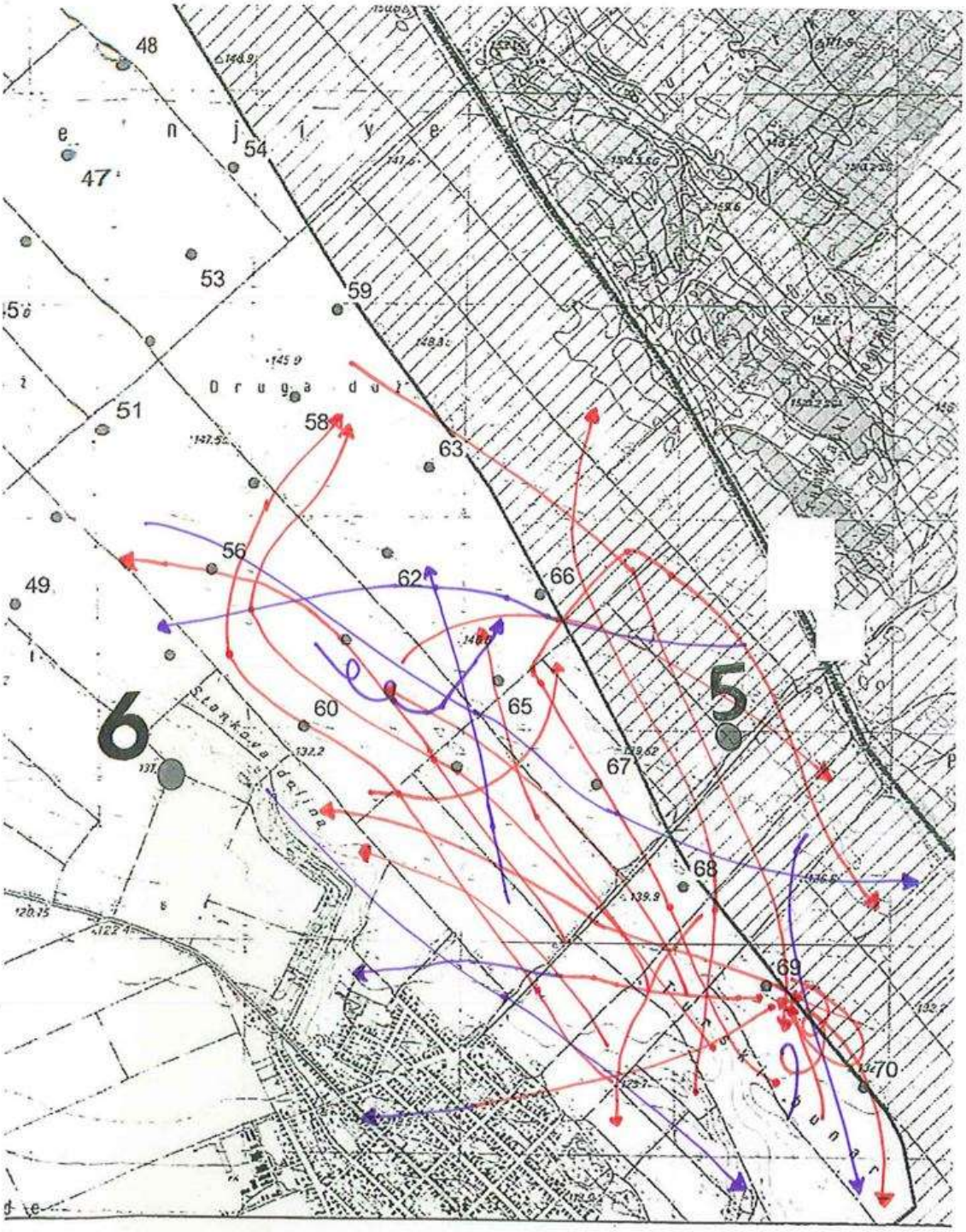
VP5: Accipiter Nisus (Eurasian Sparrowhawk)



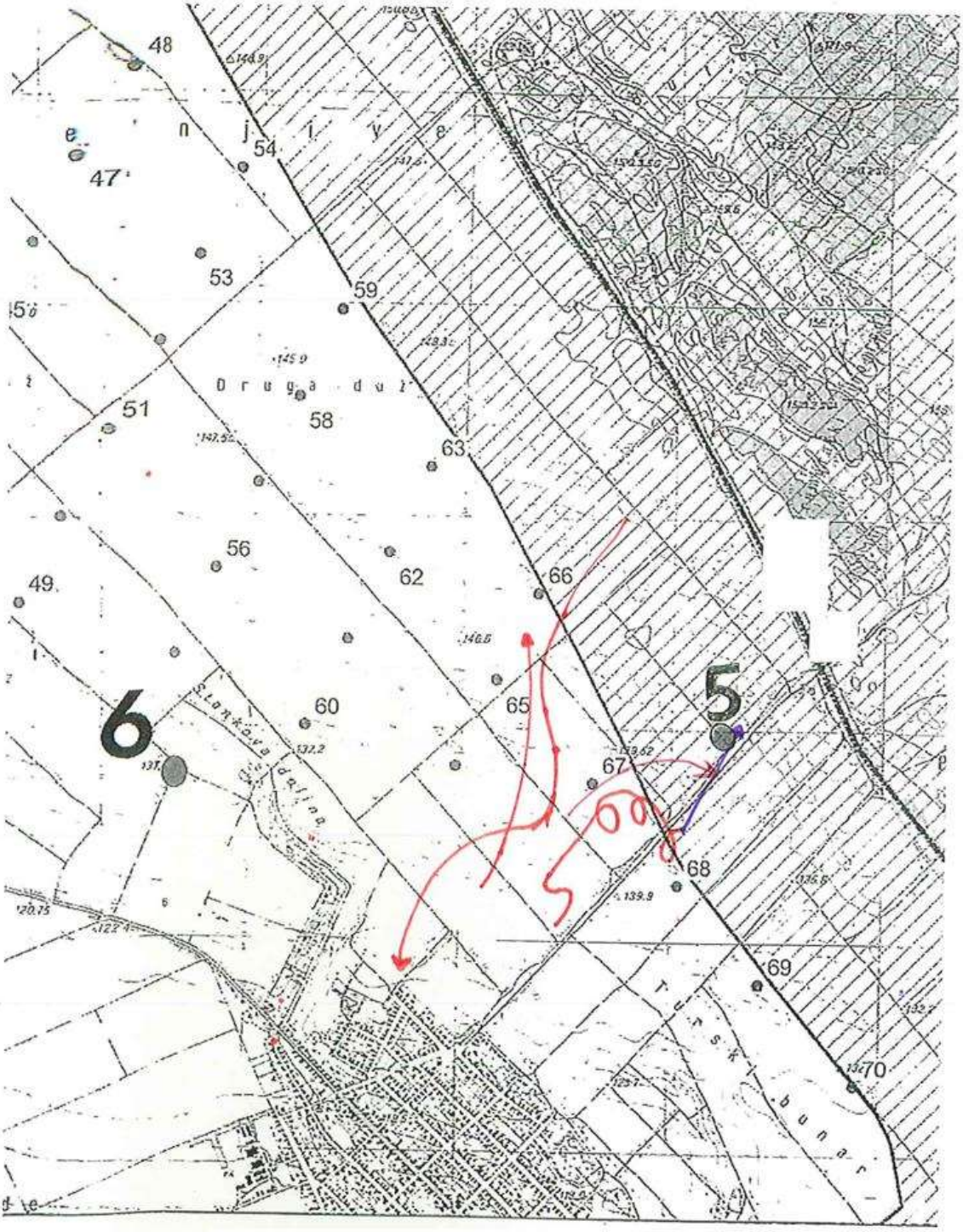
VP5: Merops Apiaster (European Bee-eater)



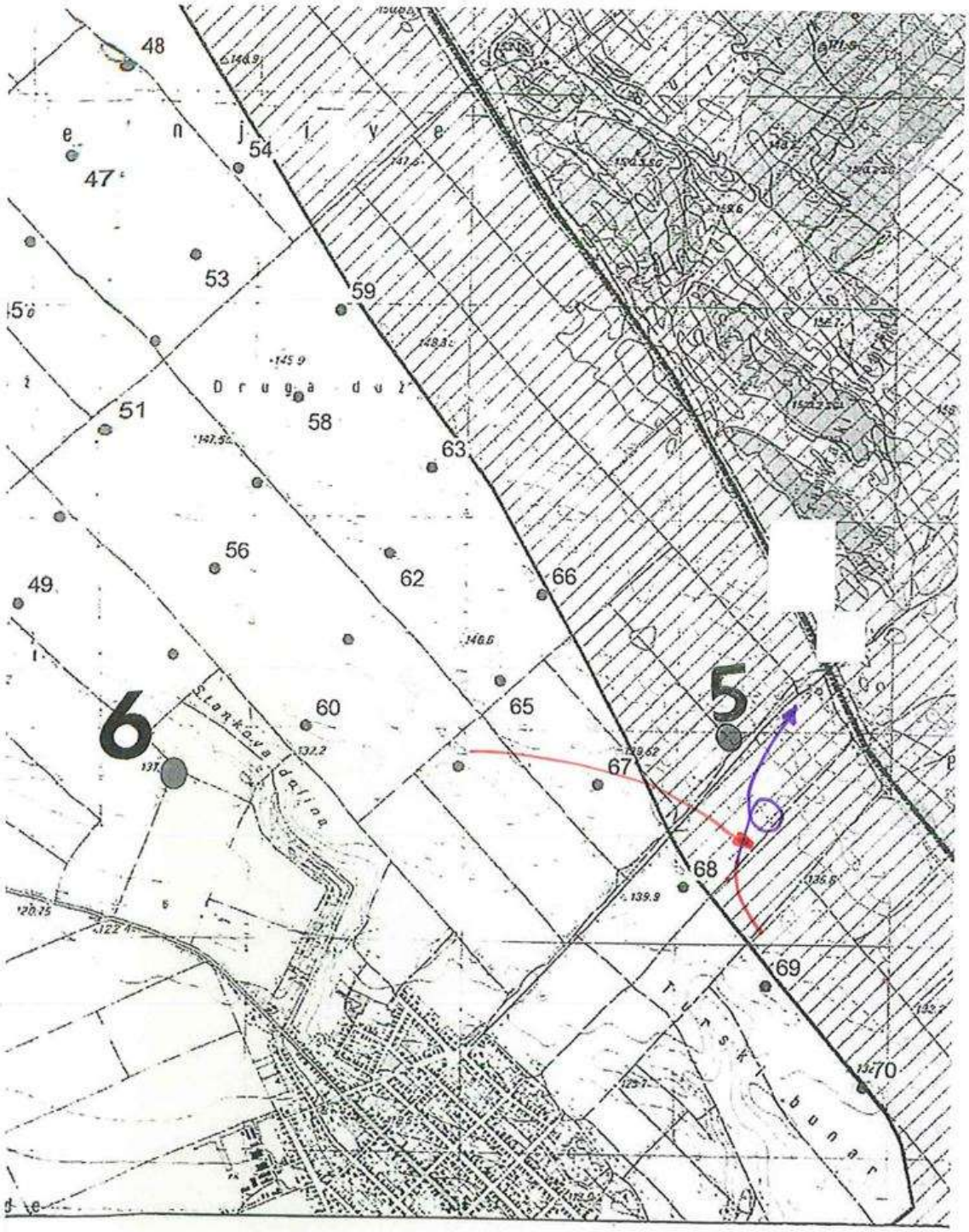
VP5: Anser Anser & Anser Albifrons (Grey Geese (greylag goose and greater white-fronted goose))



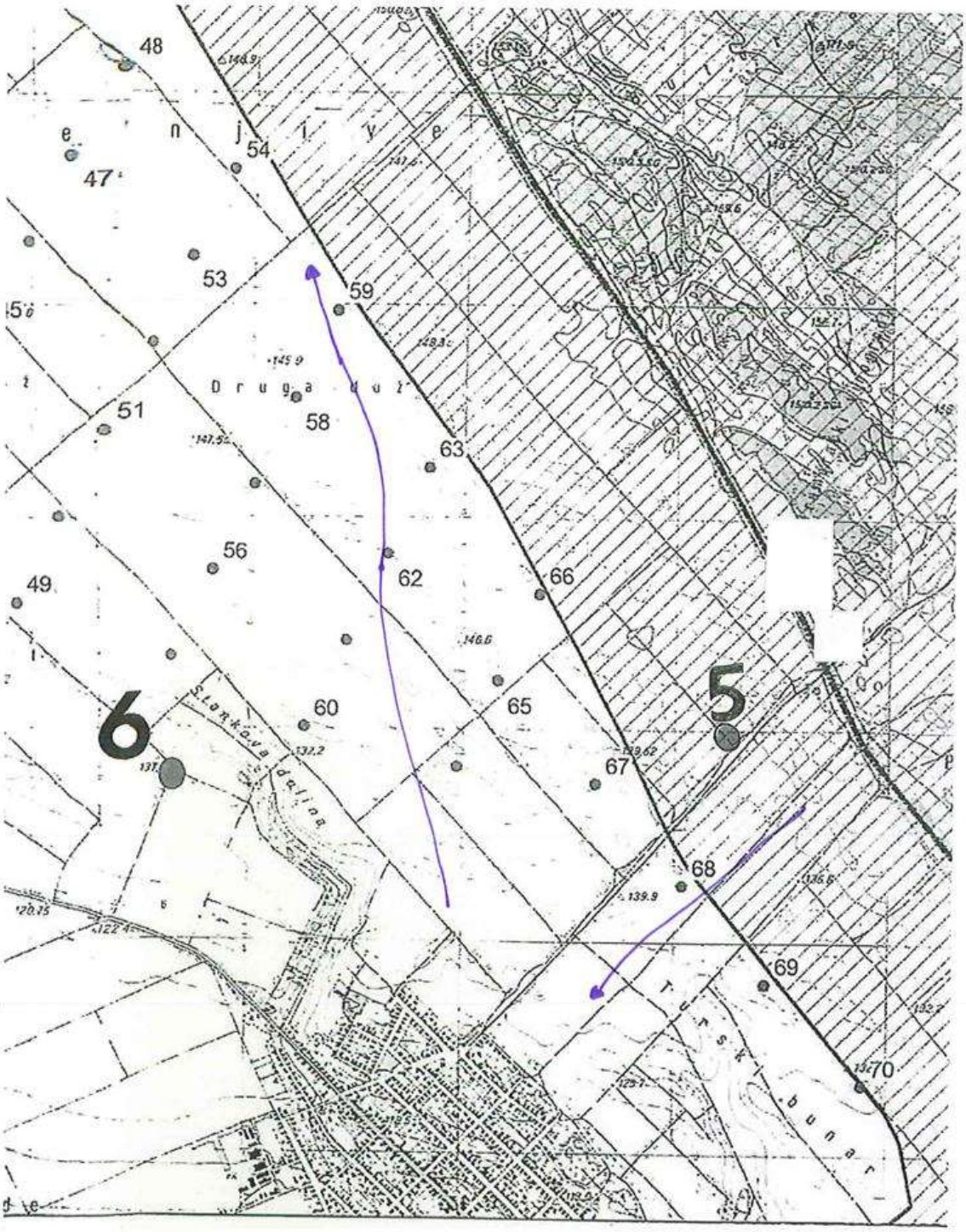
VP5: Accipiter Gentilus (Northern Goshawk)



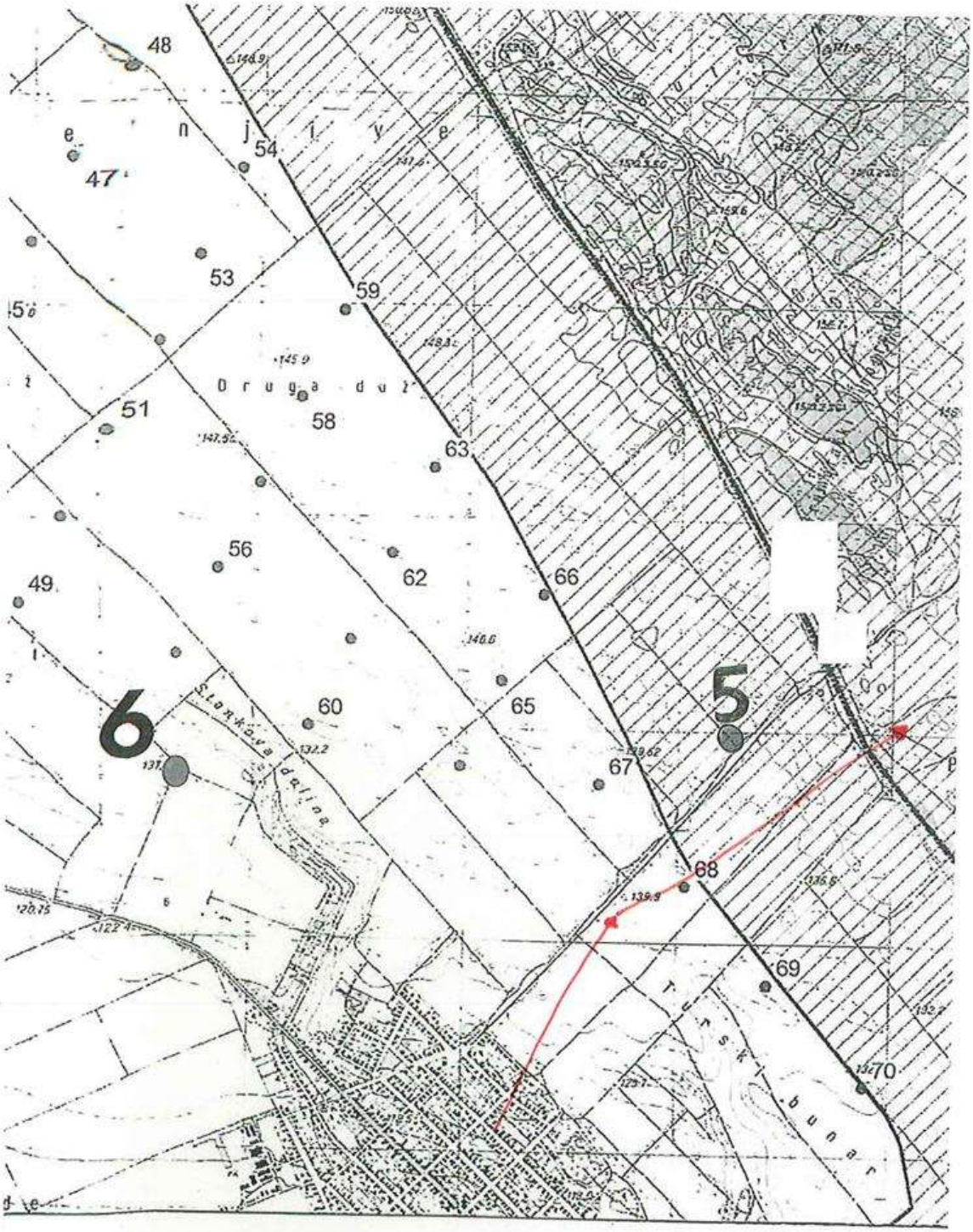
VP5: Falco Cherrug (Saker Falcon)



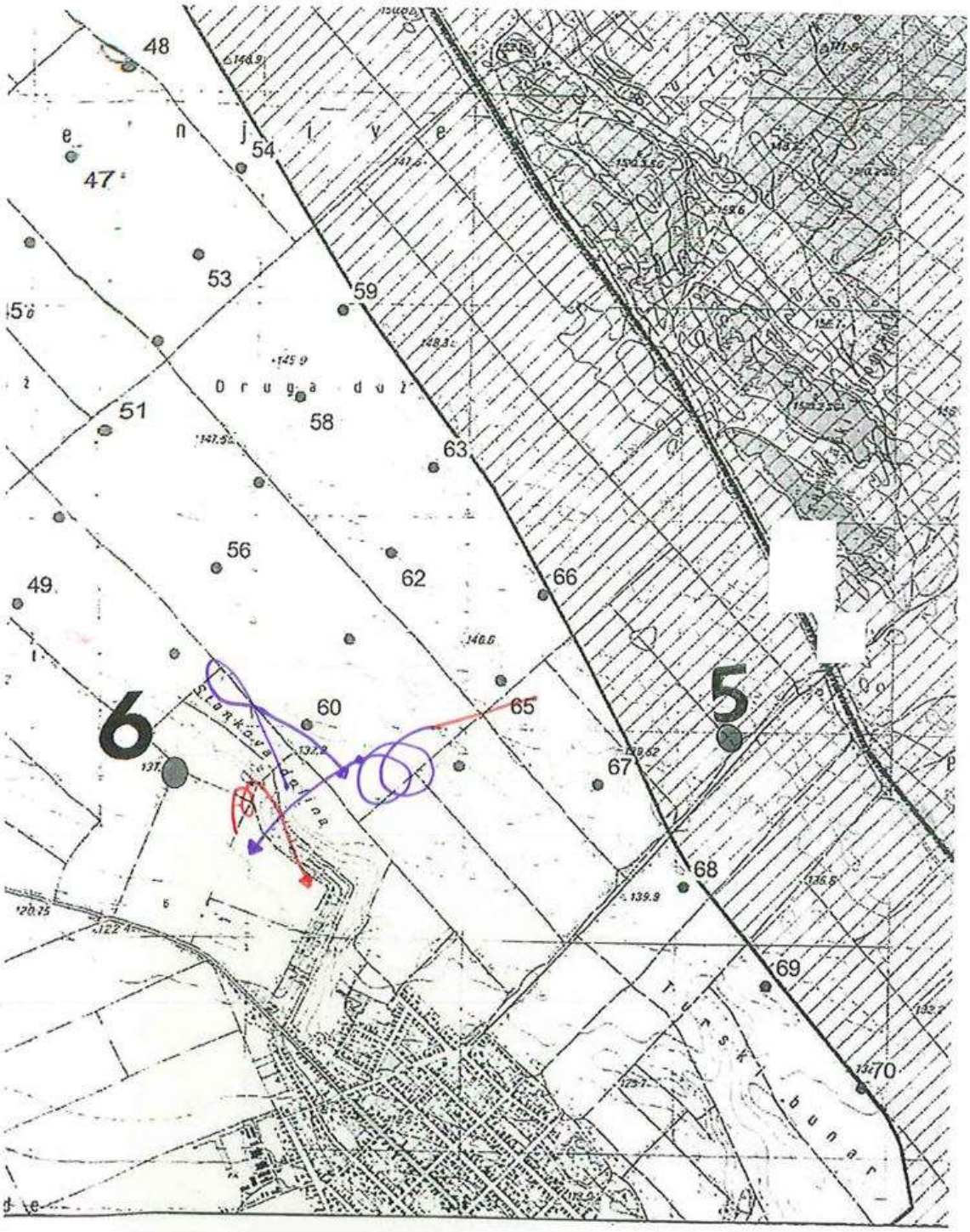
VP5: Ciconia Ciconia (White Stork)



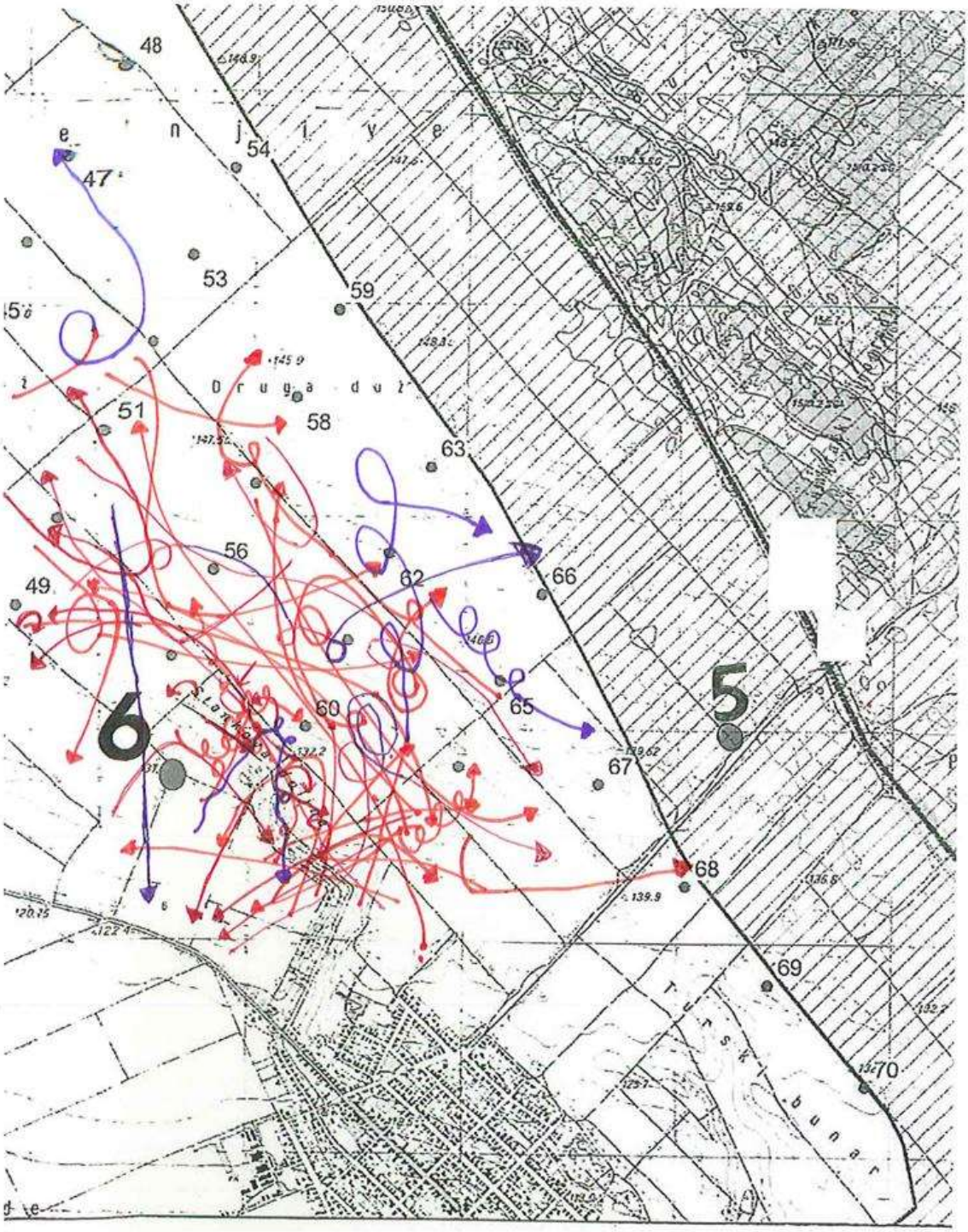
VP5: Haliaeetus alba (White-tailed Eagle)



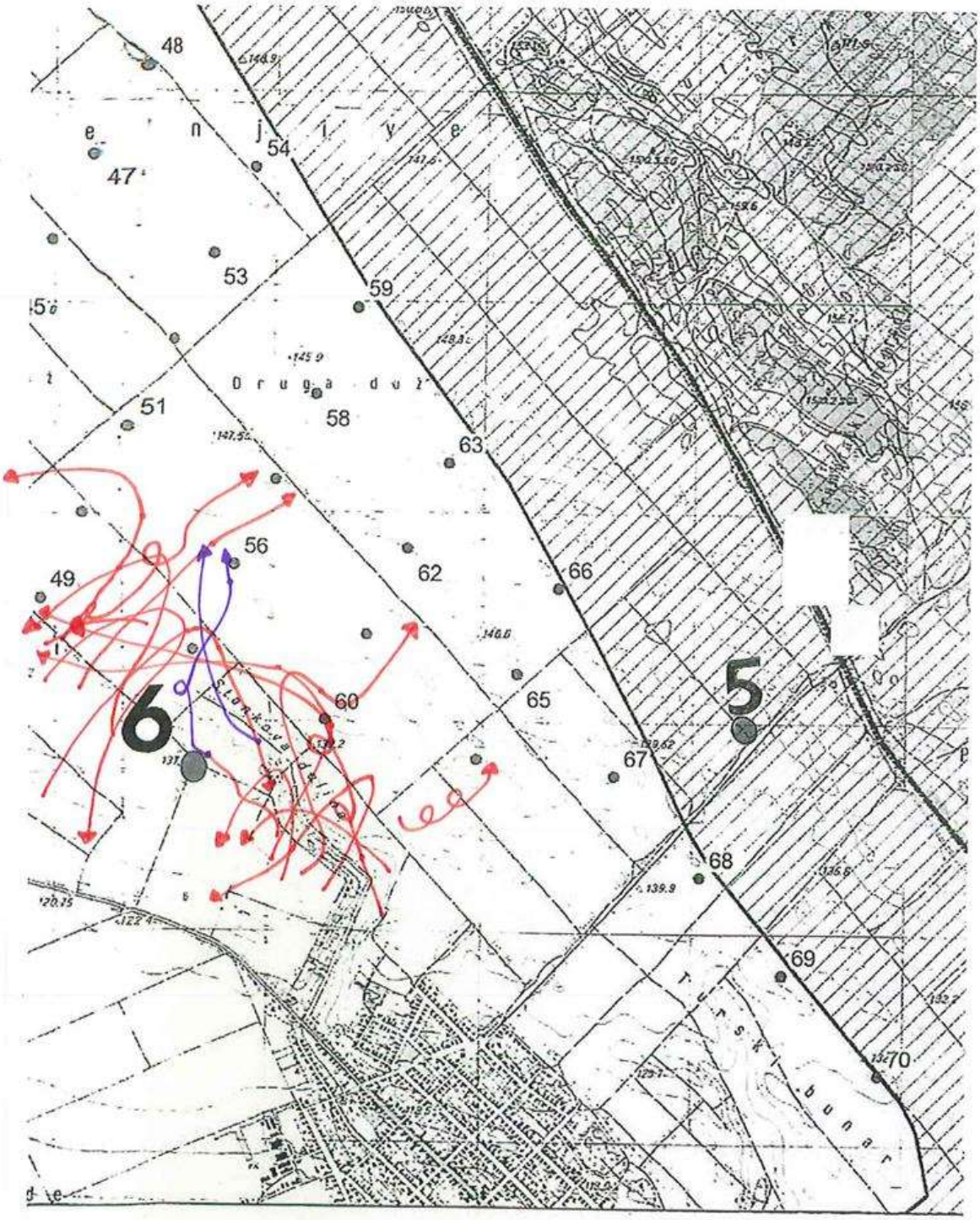
VP6: Ciconia Nigris (Black Stork)



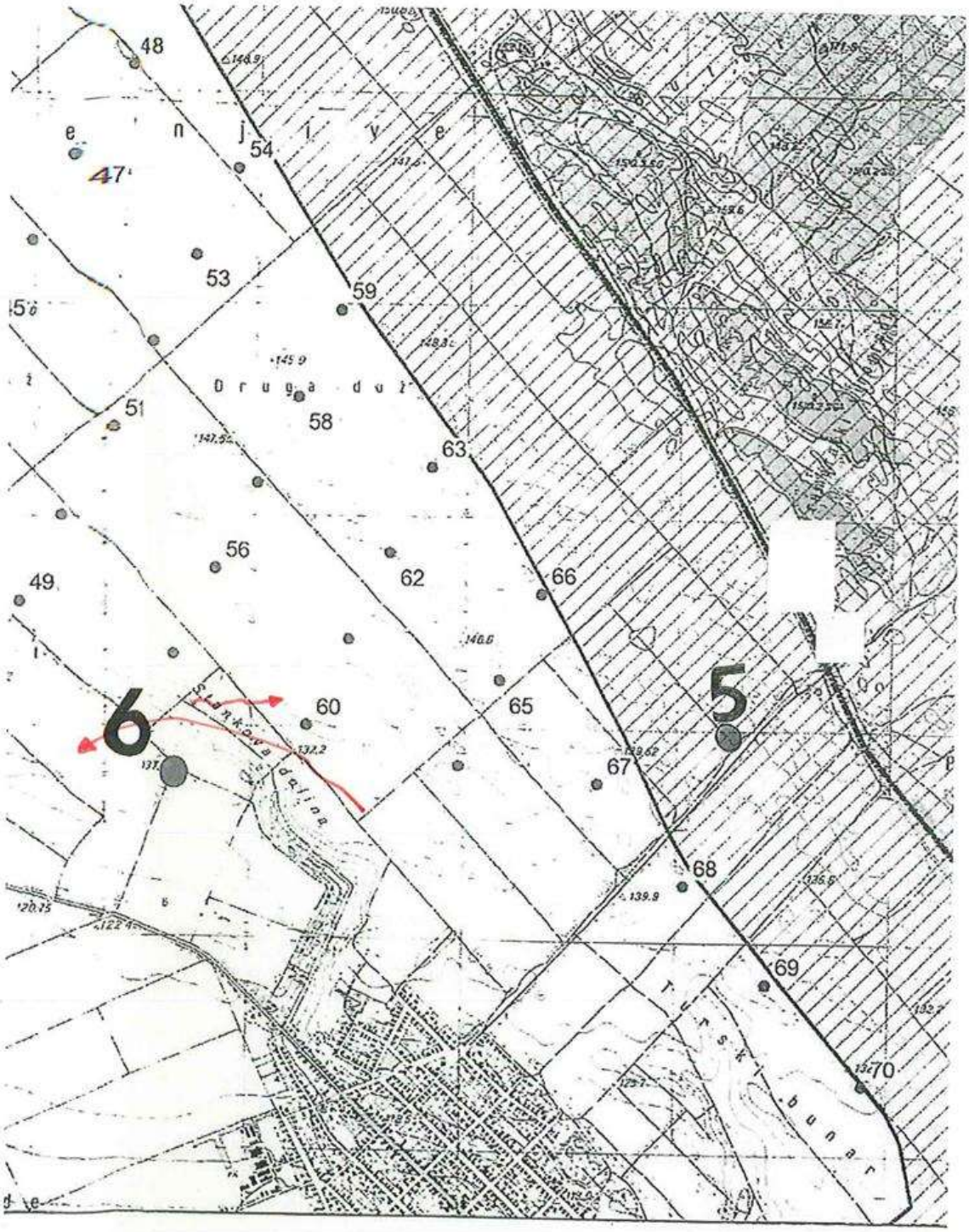
VP6: Buteo Buteo (Common Buzzard)



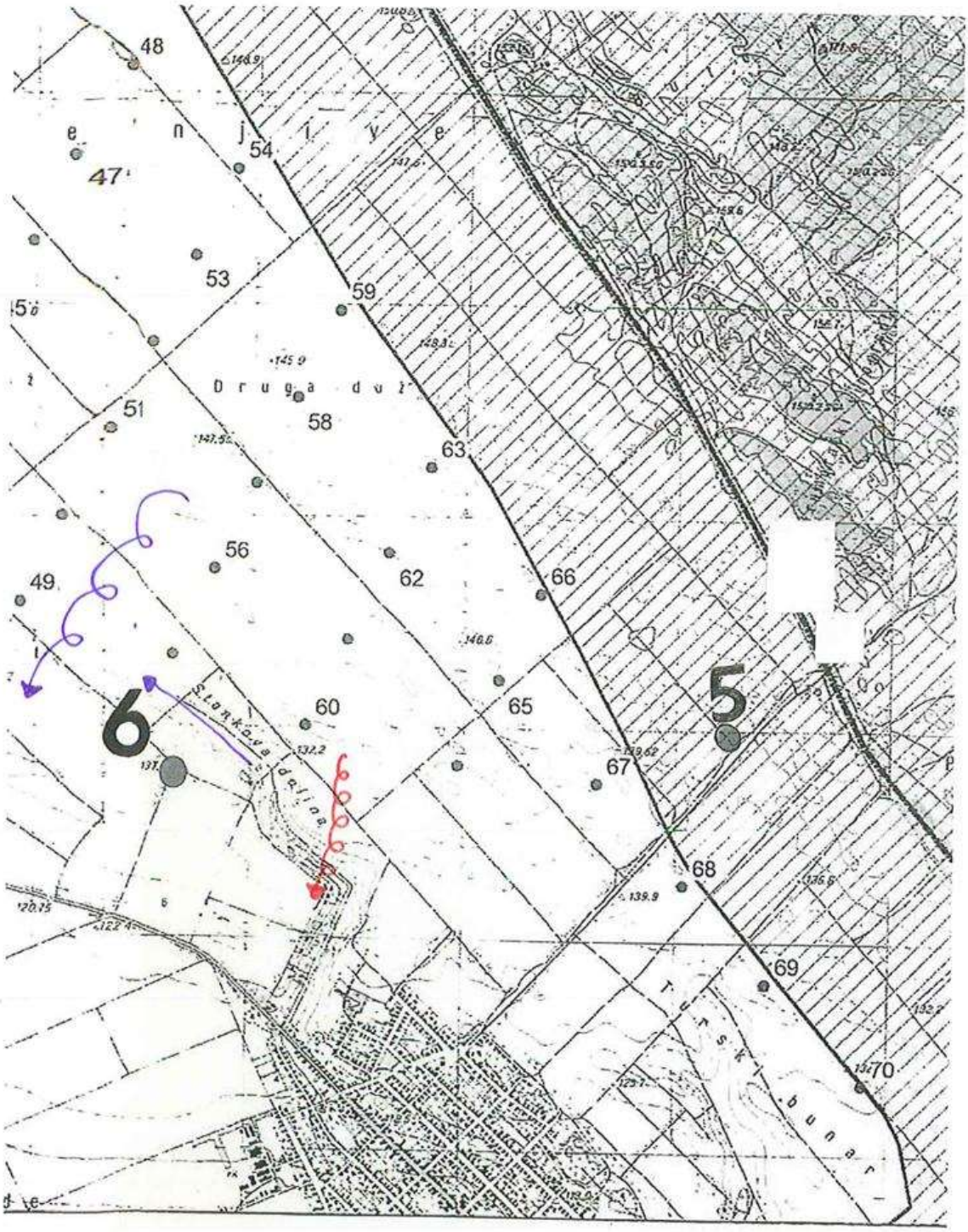
VP6: Falco Tinnunculus (Eurasian Kestrel)



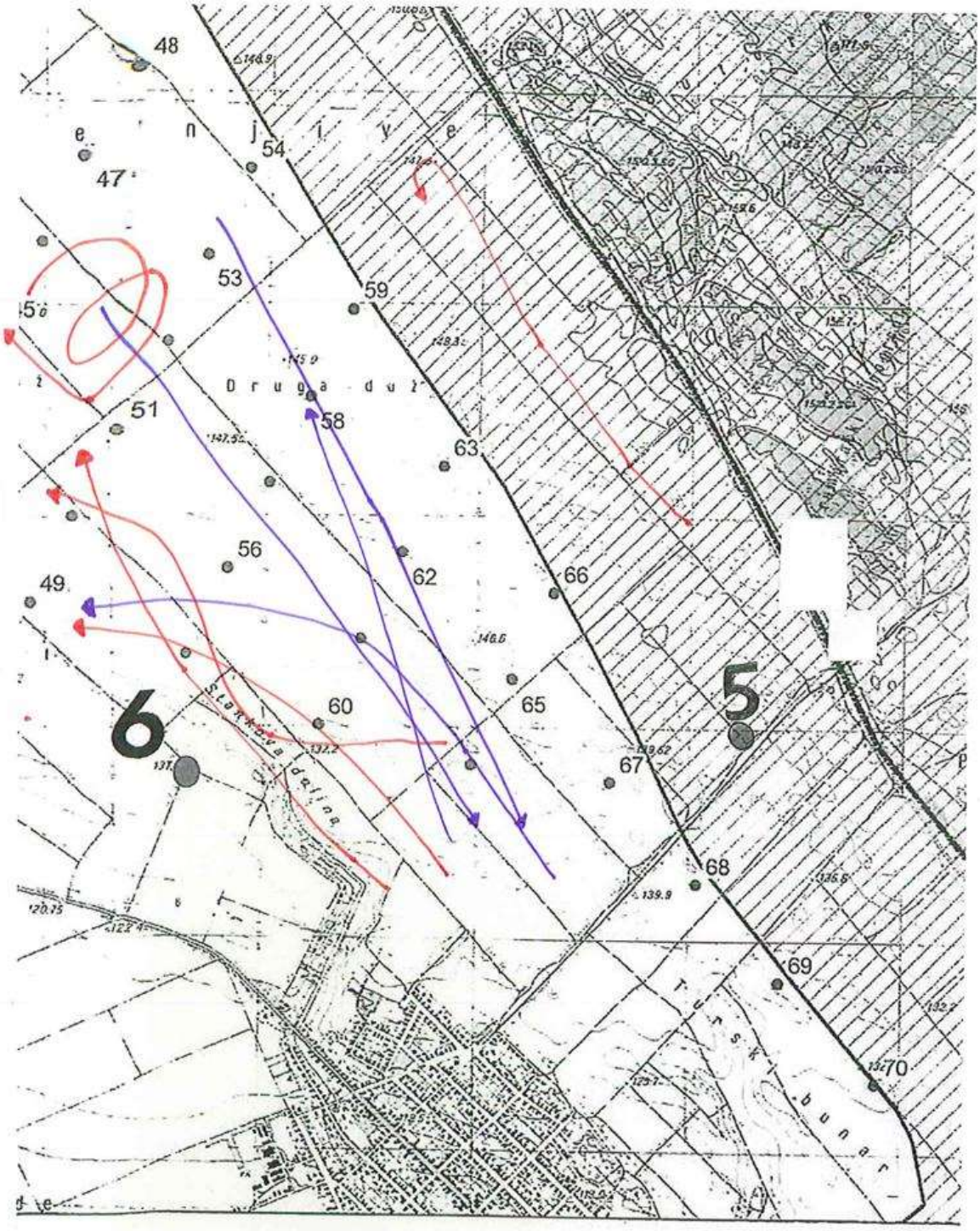
VP6: Accipiter Nisus (Eurasian Sparrowhawk)



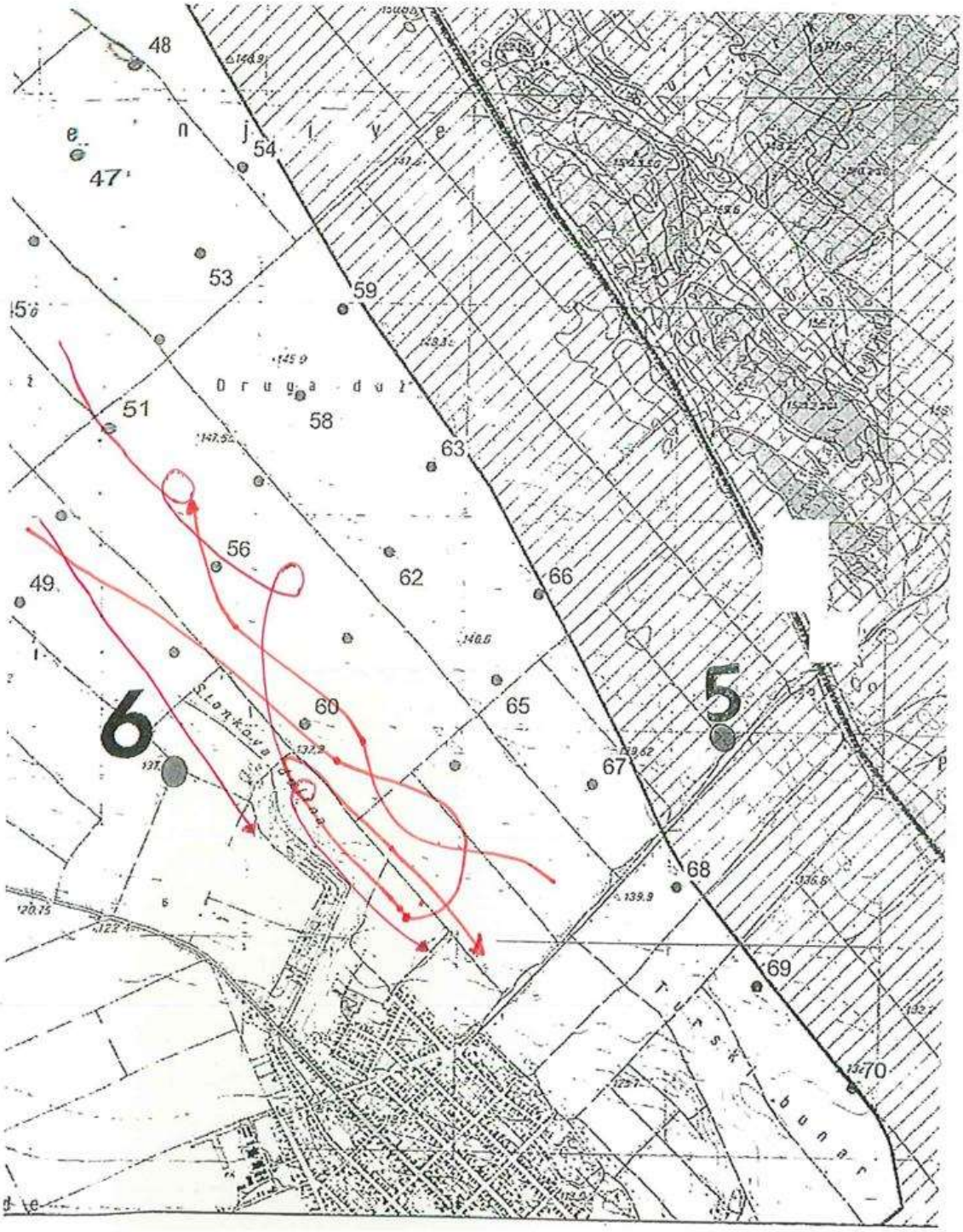
VP6: Merops Apiaster (European Bee-eater)



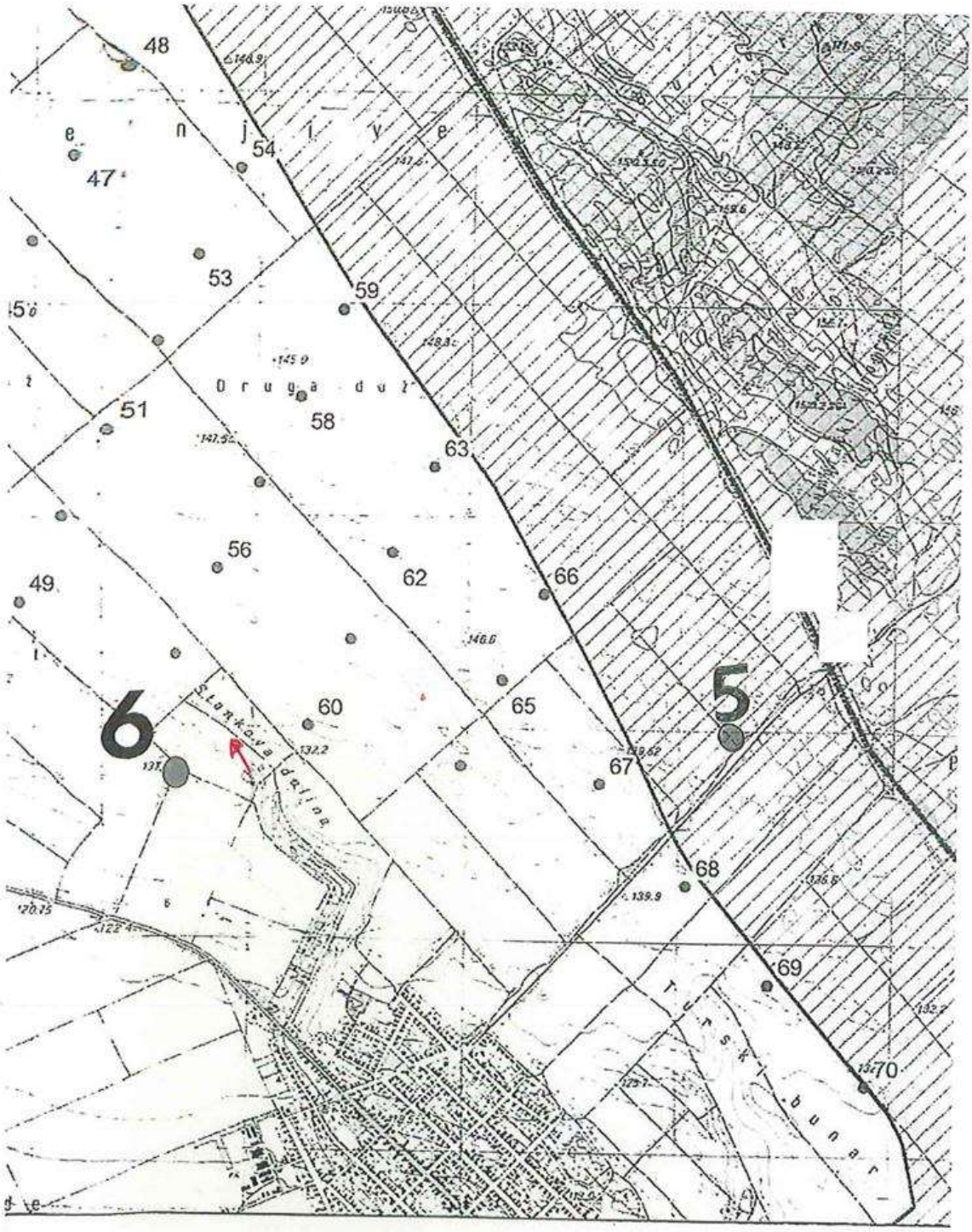
VP6: Anser Anser & Anser Albifrons (Grey Geese (greylag goose and greater white-fronted goose))



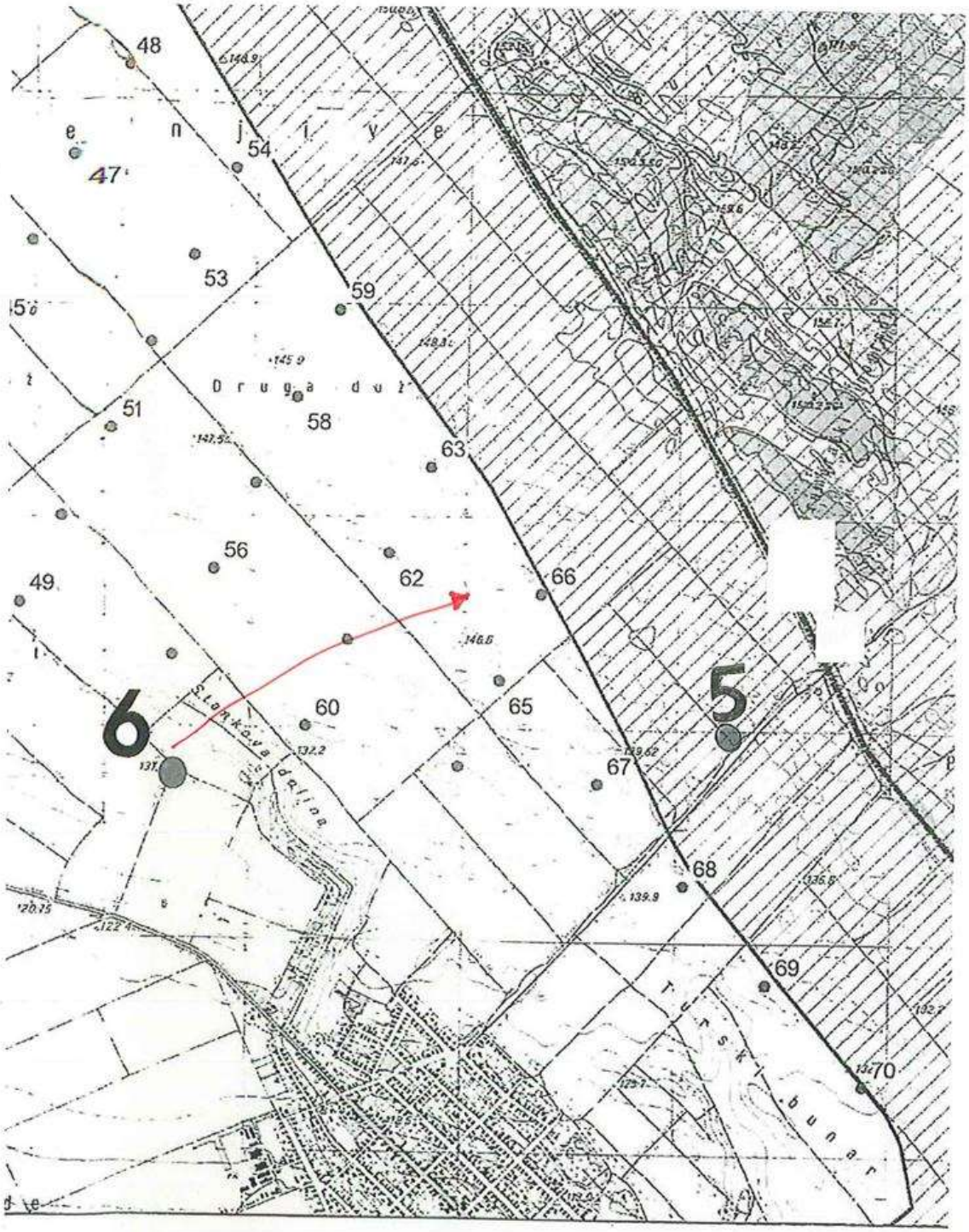
CP6: Circus Cyaneus (Hen Harrier)



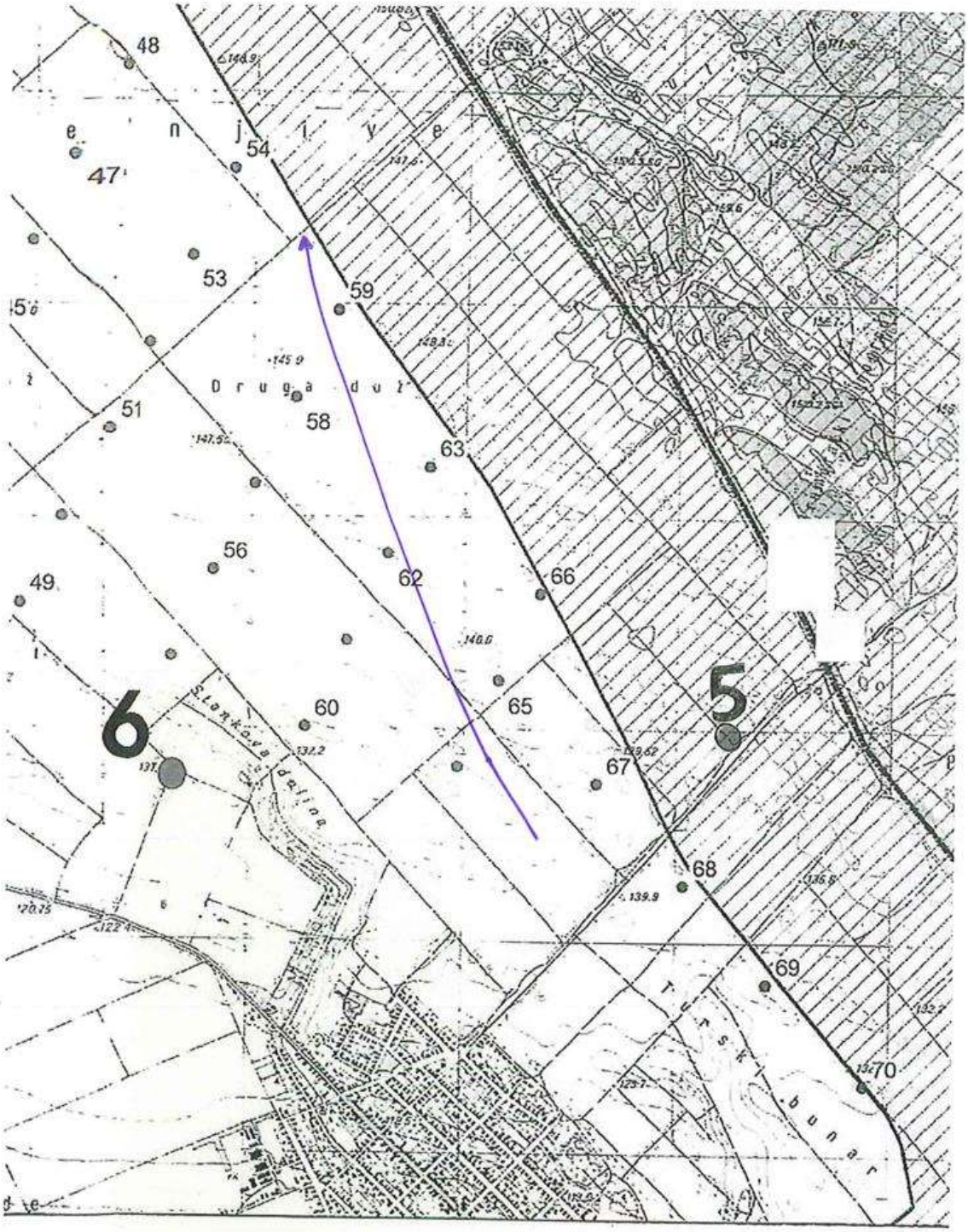
VP6: Falco Columbarius (Merlin)



VP6: Circus Aeruginosus (Western Marsh Harrier)



VP6: Ciconia Ciconia (White Stork)



Full list of species recorded during additional surveys (November 2011 – July 2012)

Species	Scientific name	Breeding status	Record survey type
Barn swallow	*Hirundo rustica*	Probably breeding near wind farm site	Vantage point survey and breeding bird survey
Barred warbler	*Sylvia nisoria*	Passage only	Vantage point survey
Black stork	*Ciconia nigris*	Passage only	Vantage point survey and breeding bird survey
Blackbird	*Turdus merula*	Breeding within or just outside wind farm site	Vantage point survey and breeding bird survey
Blackcap	*Sylvia atricapilla*	Breeding within wind farm site	Vantage point survey
Black-headed bunting	*Emberiza melanocephala*	Breeding within or just outside wind farm site	Vantage point survey
Blue tit	*Parus caeruleus*	Breeding within or just outside wind farm site	Vantage point survey
Brambling	*Fringila montifringila*	Wintering/passage only	Vantage point survey
Caspian gull	*Larus cachinnans*	Wintering/passage only	Vantage point survey
Chiffchaff	*Phyloscopus collybita*	Breeding within or just outside wind farm site	Vantage point survey and breeding bird survey
Common buzzard	*Buteo*	Breeding near wind farm site	Vantage point survey and breeding bird survey
Common chaffinch	*Fringilla coelebs*	Breeding within or just outside wind farm site	Vantage point survey and breeding bird survey
Common crane	*Grus*	Wintering/passage only	Vantage point survey
Common crossbill	*Loxia curvirostra*	Passage only	Vantage point survey
Common cuckoo	*Cuculus canorus*	Breeding within wind farm site	Vantage point survey
Common house martin	*Delichon urbicum*	Probably breeding near wind farm site	Vantage point survey
Common nightingale	*Luscinia megarhynchos*	Breeding within wind farm site	Vantage point survey
Common pheasant	*Phasianus colchicus*	Breeding within or just outside wind farm site	Vantage point survey and breeding bird survey
Common quail	*Coturnix*	Breeding within wind farm site	Vantage point survey and breeding bird survey
Common raven	*Corvus corax*	Breeding within or just outside wind farm site	Vantage point survey and breeding bird survey
Common starling	*Sturnus vulgaris*	Breeding within or just outside wind farm site	Vantage point survey and breeding bird survey
Common swift	*Apus*	Passage only	Vantage point survey
Common whitethroat	*Sylvia communis*	Breeding within wind farm site	Vantage point survey and breeding bird survey
Corn bunting	*Emberiza calandra*	Breeding within wind farm site	Vantage point survey and breeding bird survey
Crested lark	*Galerida cristata*	Breeding within wind farm site	Vantage point survey and breeding bird survey
Eurasian collared dove	*Streptopelia decaocto*	Breeding within or just outside wind farm site	Vantage point survey and breeding bird survey
Eurasian golden oriole	*Oriolus*	Breeding within or just outside wind farm site	Vantage point survey and breeding bird survey
Eurasian hobby	*Falco subbeteo*	Breeding near wind farm site	Vantage point survey and breeding bird survey
Eurasian hoopoe	*Upupa epops*	Breeding within or just outside wind farm site	Vantage point survey and breeding bird survey
Eurasian jay	*Garrulus glandarius*	Breeding within or just outside wind farm site	Vantage point survey

Eurasian kestrel	*Falco tinninculus*	Breeding within wind farm site	Vantage point survey and breeding bird survey
Eurasian linnet	*Carduelis cannabina*	Breeding within wind farm site	Vantage point survey
Eurasian magpie	*Pica*	Breeding within wind farm site	Vantage point survey and breeding bird survey
Eurasian siskin	*Carduelis spinus*	Wintering/passage only	Vantage point survey
Eurasian skylark	*Alauda arvensis*	Breeding within wind farm site	Vantage point survey and breeding bird survey
Eurasian sparrowhawk	*Accipiter nisus*	Breeding near wind farm site	Vantage point survey and breeding bird survey
Eurasian tree sparrow	*Passer montanus*	Breeding within wind farm site	Vantage point survey and breeding bird survey
European bee-eater	*Merops apiaster*	Breeding within wind farm site	Vantage point survey and breeding bird survey
European golden plover	*Pluvialis apricaria*	Passage only	Vantage point survey
European goldfinch	*Carduelis*	Breeding within or just outside wind farm site	Vantage point survey and breeding bird survey
European greenfinch	*Carduelis chloris*	Breeding within or just outside wind farm site	Vantage point survey and breeding bird survey
European sand martin	*Riparia*	Breeding within or just outside wind farm site	Vantage point survey and breeding bird survey
European serin	*Serinus*	Wintering/passage only	Vantage point survey and breeding bird survey
European stonechat	*Saxicola torquata*	Breeding within wind farm site	Vantage point survey and breeding bird survey
European turtle dove	*Streptopelia turtur*	Breeding within wind farm site	Vantage point survey and breeding bird survey
Feral pigeon	*Columba livia (domesticated)*	Breeding within wind farm site	Vantage point survey
Fieldfare	*Turdus pilaris*	Wintering/passage only	Vantage point survey
Great cormorant	*Phalacrocorax carbo*	Passage only	Vantage point survey and breeding bird survey
Great grey shrike	*Lanius excubitor*	Wintering/passage only	Vantage point survey
Great reed warbler	*Acrocephalus arundinaceus*	Passage only	Vantage point survey
Great spotted woodpecker	*Dendrocops major*	Breeding within or just outside wind farm site	Vantage point survey
Great tit	*Parus major*	Breeding within or just outside wind farm site	Vantage point survey
Great white egret	*Egreta alba*	Passage only	Vantage point survey
Greater white-fronted goose	*Anser albifrons*	Wintering/passage only	Vantage point survey
Grey heron	*Ardea cineria*	Passage only	Vantage point survey and breeding bird survey
Grey partridge	*Perdix*	Breeding within or just outside wind farm site	Vantage point survey
Greylag goose	*Anser*	Wintering/passage only	Vantage point survey
Hawfinch	*Coccothraustes*	Wintering/passage only	Vantage point survey
Hen harrier	*Circus cyaneus*	Wintering/passage only	Vantage point survey
Hooded crow	*Corvus cornix*	Breeding within or just outside wind farm site	Vantage point survey and breeding bird survey
House sparrow	*Passer domesticus*	Breeding within wind farm site	Vantage point survey and breeding bird survey
Lesser grey shrike	*Lanius minor*	Passage only	Vantage point survey and breeding bird survey

Lesser whitethroat	*Sylvia curruca*	Passage only	Vantage point survey
Long-tailed tit	*Aegithalos caudatus*	Breeding within or just outside wind farm site	Vantage point survey
Mallard	*Anas platyrhynchos*	Passage only	Vantage point survey
Marsh warbler	*Acrocephalus palustris*	Passage only	Breeding bird survey
Meadow pipit	*Anthus pratensis*	Wintering/passage only	Vantage point survey and breeding bird survey
Merlin	*Falco columbarius*	Wintering/passage only	Vantage point survey
Mistle thrush	*Turdus viscivorus*	Wintering/passage only	Vantage point survey
Montagu's harrier	*Circus pygargus*	Passage only	Breeding bird survey
Northern goshawk	*Accipiter gentilus*	Breeding near wind farm site	Vantage point survey and breeding bird survey
Northern lapwing	*Vanellus*	Passage only	Vantage point survey and breeding bird survey
Northern pintail	*Anas acuta*	Passage only	Vantage point survey
Northern wheatear	*Oenanthe*	Passage/probably breeding near wind farm site	Vantage point survey and breeding bird survey
Pallid harrier	*Circus macrourus*	Wintering/passage only	Vantage point survey
Red-backed shrike	*Lanius collurio*	Breeding within wind farm site	Vantage point survey and breeding bird survey
Redwing	*Turdus iliacus*	Wintering/passage only	Vantage point survey
Reed bunting	*Emberiza schoeniclus*	Breeding within or just outside wind farm site	Vantage point survey
Rook	*Corvus frugilegus*	Probably breeding near wind farm site	Vantage point survey and breeding bird survey
Ruff	*Philomachus pugnax*	Passage only	Vantage point survey
Saker falcon	*Falco cherrug*	Breeding near wind farm site	Vantage point survey
Spotted flycatcher	*Muscicapa striata*	Passage/probably breeding near wind farm site	Vantage point survey and breeding bird survey
Tawny pipit	*Anthus campestris*	Breeding within wind farm site	Vantage point survey and breeding bird survey
Western jackdaw	*Corvus monedula*	Breeding within or just outside wind farm site	Vantage point survey
Western marsh harrier	*Circus aeruginosus*	Wintering/passage only	Vantage point survey and breeding bird survey
Whinchat	*Saxicola rubetra*	Possibly breeding within wind farm site	Vantage point survey and breeding bird survey
White stork	*Ciconia*	Passage only	Vantage point survey
White wagtail	*Motacilla alba*	Breeding within wind farm site	Vantage point survey
White-tailed eagle	*Haliaeetus alba*	Wintering/passage only	Vantage point survey
Woodlark	*Lullula arborea*	Passage only	Vantage point survey
Woodpigeon	*Columba palumbus*	Breeding within wind farm site	Vantage point survey
Yellow wagtail	*Motacilla flava*	Breeding within wind farm site	Vantage point survey and breeding bird survey
Yellowhammer	*Emberiza citrinella*	Breeding within or just outside wind farm site	Vantage point survey and breeding bird survey

Breeding bird square territory maps

Key

BC =Blackcap

CB = Corn bunting

CH = Common chaffinch

CL = Crested lark

ED = Red-backed shrike

HS = House sparrow

K. = Eurasian kestrel

MZ = European bee-eater

Q. = Common quail

S. = Eurasian skylark

SC = European stonechat

TP = Tawny pipit

TS = Eurasian tree sparrow

YW = Yellow wagtail

WH = Common whitethroat

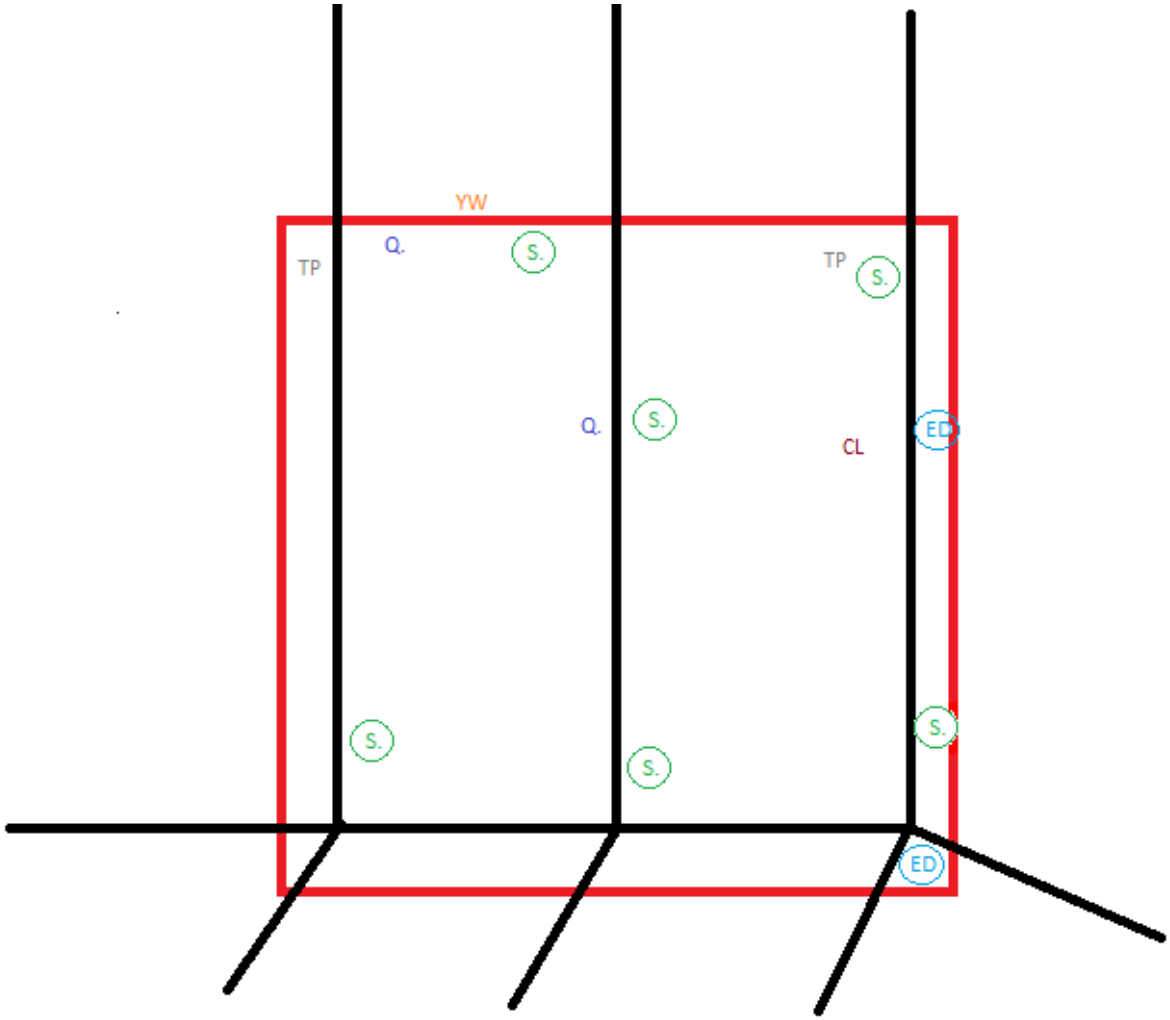
BC = possible territory

BC = confirmed territory

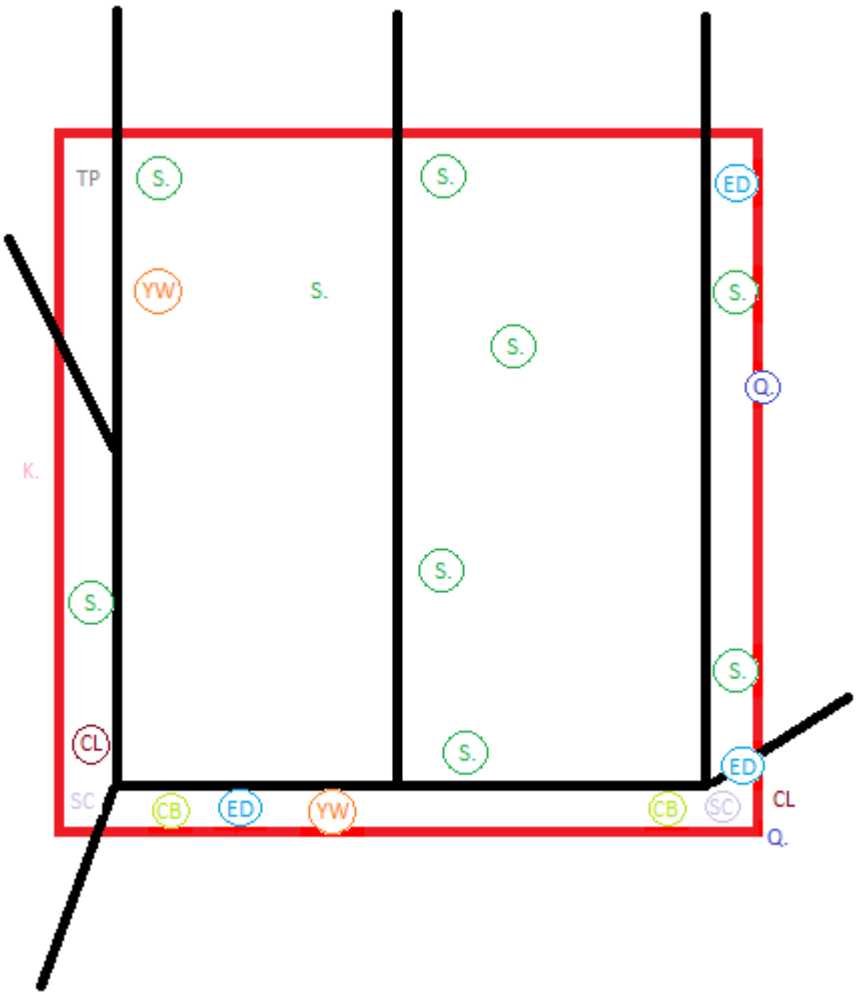
= Survey square boundary

= Access track (survey route)

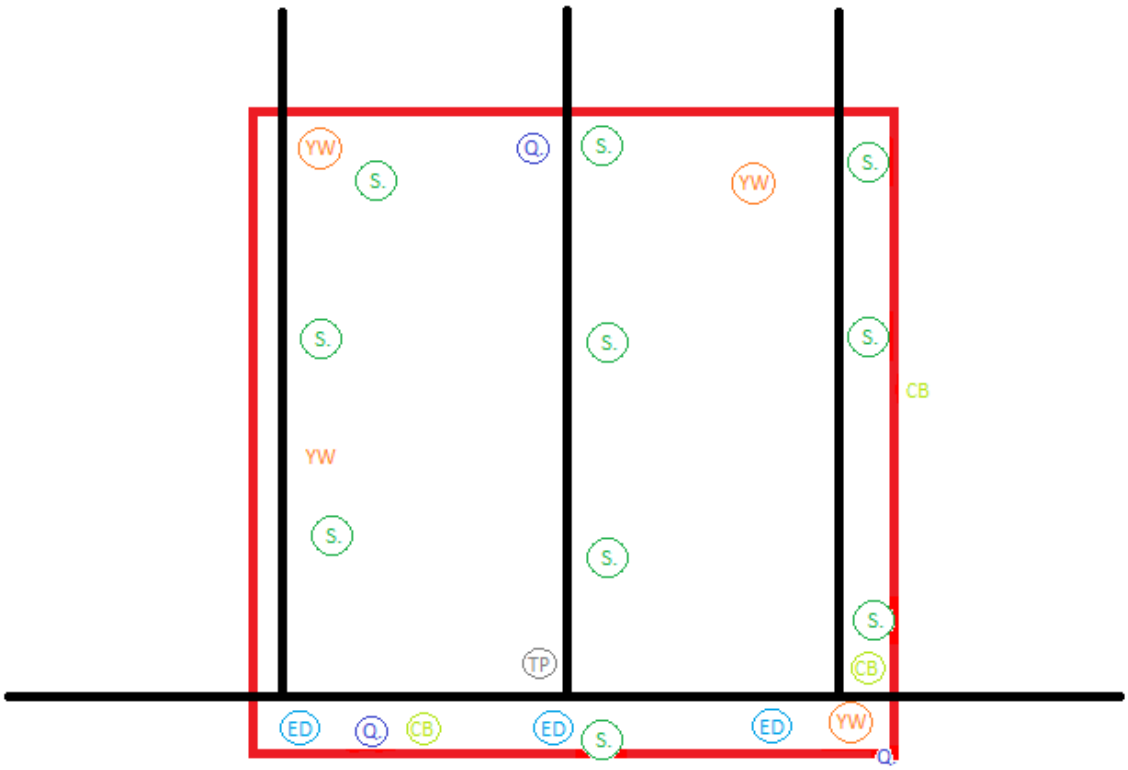
Breeding square 1



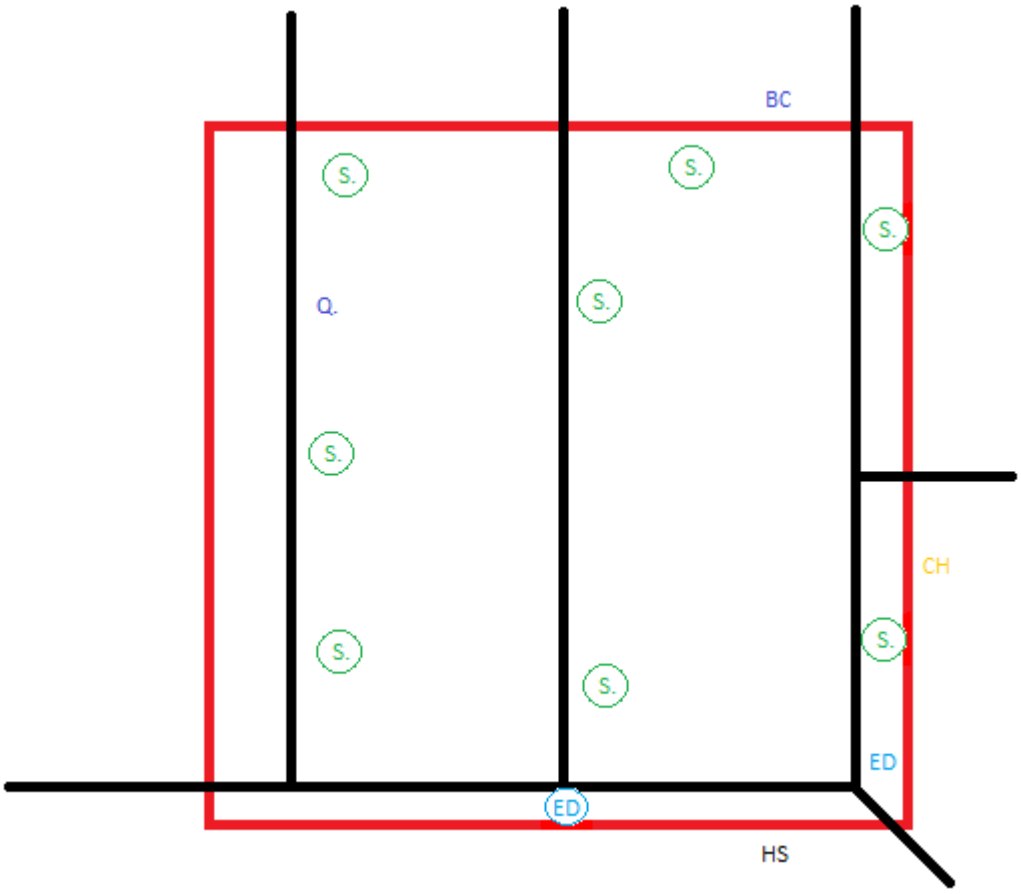
Breeding Square 2



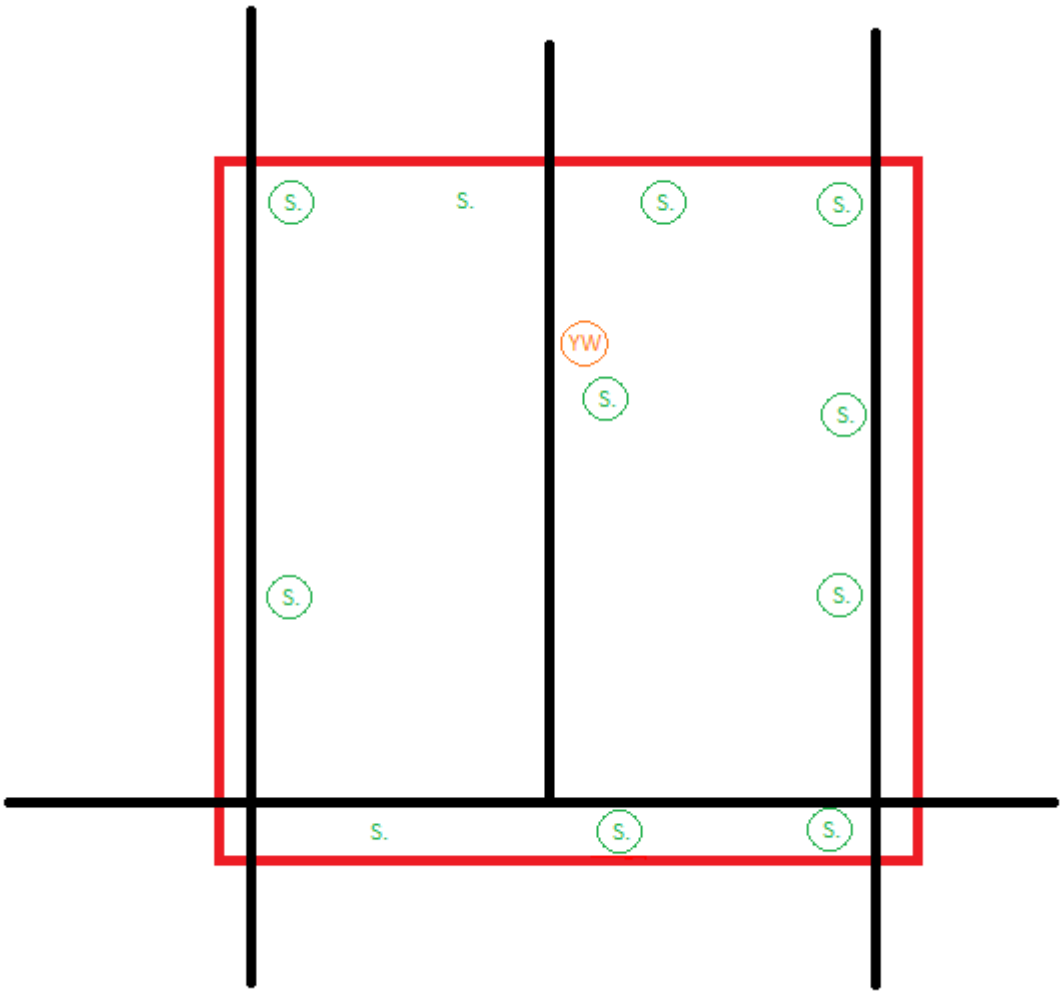
Breeding square 3



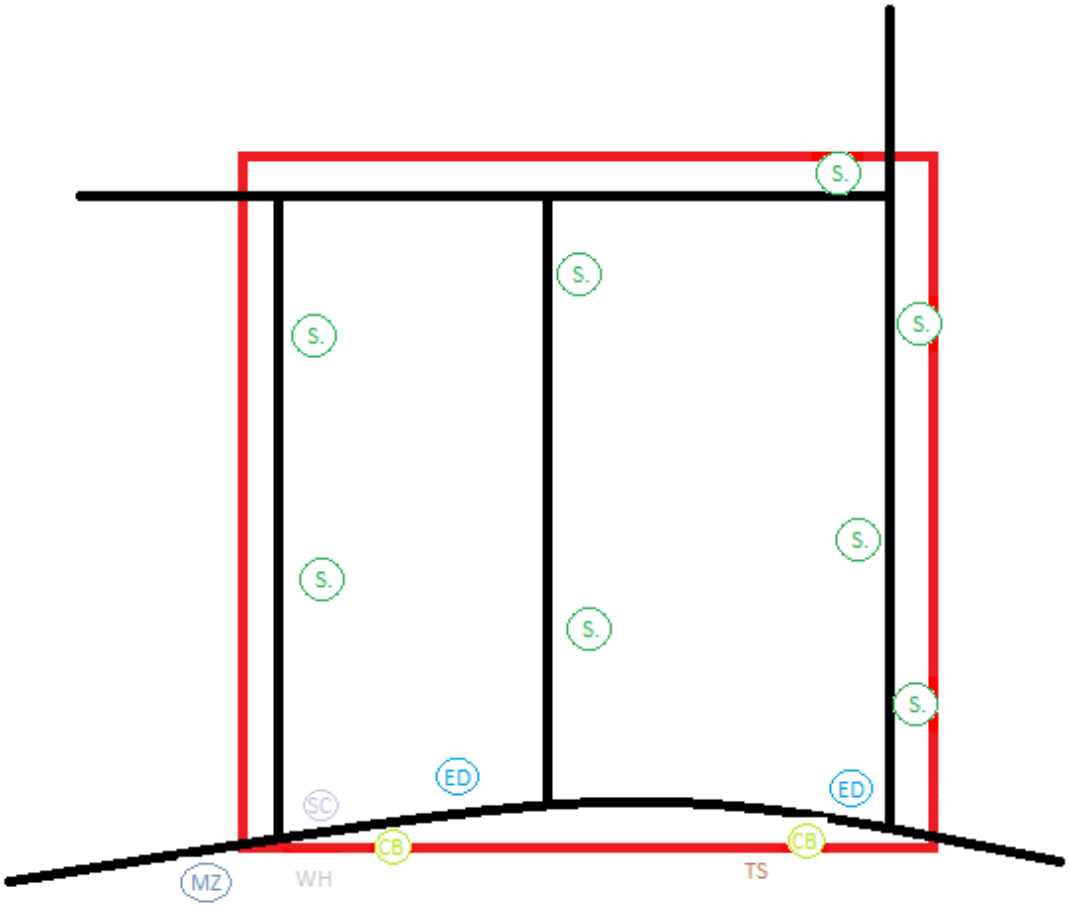
Breeding square 4



Breeding square 5



Breeding square 6



E Management and Mitigation

E1 Introduction

The following sections outline the management and mitigation requirements associated the potential and actual impacts identified throughout the project phases. Section F summarises the management and mitigation measures described below. The nature of the impact once management and mitigation measures are implemented is described in Section F. The impact once management and mitigation measures are applied is termed the 'residual impact'.

The management and mitigation measures identified should be detailed in appropriate plans, applicable to the phase of the project. This is standard practice for all major projects. For example, in terms of 'environment' the appropriate plans would be as follows:

- Construction – Construction Environmental Management Plan (CEMP)
- Operations – Operational Environmental Management Plan (OEMP)
- Closure and Decommissioning – Decommissioning Environmental Management Plan (DEMP)

The plans should remain up to date and accurate based on the activities to be undertaken at the project site. The plans should encompass all of the issues described in the following sections, as well as any other requirements required by the local regulatory authorities. The plans should include detail of how management and mitigation shall be undertaken for each issue and should be approved by the appropriate regulatory parties and any other pertinent stakeholders, such as investment banks.

The implementation of the plans should be through a robust Integrated Management System (IMS), incorporating the requirements of environmental, health and safety, as well as any other requirements of the business and its stakeholders, including issues associated with members of the public. In terms of the requirements detailed in this Statement as well as other requirements delineated by the Investment Bank(s), the management system can be called an 'Environmental and Social Management System (ESMS)'.

E2 Management and Mitigation during Construction

E2.1 Introduction

The following sections provide a brief overview of the management and mitigation measures required during construction, based on the findings of the impact assessment. The impacts associated with the construction of the project are generally the most wide spread and severe of the whole of the project lifecycle.

E2.2 Ecology and Nature Conservation

E2.2.1 Habitat Management and Mitigation

All turbines are offset from the Deliblato Sands SNR a minimum of 1 km. This is 400 m further than the standard regulatory offset required by Serbian law of 600 m. The impact assessment in section D above has been undertaken without taking into account the prescribed mitigation measures.

A Construction Environmental Management Plan (CEMP) will be prepared and will include a precautionary method of working (PMW) in relation to birds, bats, mammals and reptile species. The PMW would include the staged clearance of vegetation from the works footprint. This would take place for all locations where suitable reptile habitat (such as steppic grassland and scrub) would be lost plus a buffer zone of 10 m around the works footprint to minimise the risk of amphibians and reptiles straying into the construction area. This method of working, and the presence of people and machinery, is likely to encourage mammals and reptiles to move away from the working area.

The invasive plant species common ragweed (*Ambrosia artemisifolia*) was present within field margins across much of the site. Non-native invasive species such as this can be responsible for

the loss of native flora and fauna. Where possible during the construction phase, common ragweed within construction areas will be controlled by cutting/ploughing, or by herbicide application. More details in relation to control of this species can be found via the following web link - http://xwww.agrsci.dk/ambrosia/outputs/ambrosia_eng.pdf.

Although desk based assessment of the overhead power line route indicates that habitats present are intensive agricultural farmland of low ecological value, it is recommended that working areas are subject to an ecological survey by a local specialist prior to construction to check for the presence of legally protected species.

E2.2.2 Bats

To minimise effects from construction, work between dusk and dawn should be minimised during the key bat active season (April to October, inclusive). Artificial lighting, where required, will be restricted to the site compound and areas of current construction work. Lighting should be directed towards compound/works areas, with hoods fitted to lights to prevent light spill outside this area. Temporary lighting will not be installed along access roads through the site.

Due to the size of the wind farm, it was not thought practical to discourage bats from passing through the site, especially as flyways linking known roost areas to the Deliblato Sands SNR have been identified. Therefore it is recommended that enhancing known flyways for bats by planting additional woodland and scrub along the roads which pass through the site will be of benefit for some species of bats. In particular between the villages of Dolovo and Mramorak, and foraging areas in Deliblato Sands. These roads have been identified as being of importance for bats in the area (Karapandža and Paunovic, 2011). High flying species such as common noctules may be less likely to use enhanced linear features such as these. Although these roads pass through the wind farm, enhancing the value of the roads to the bats will encourage bats travelling through the site to use them as corridors, rather than pass through the wind farm on a broad front. In, particular this will be of value to Khul's pipstrelle and Nathusius's pipistrelle which are known to use the features as commuting routes.

Collision risk to bats using enhanced liner features such as this will be reduced through shutdown of turbines during the bat active season as detailed below.

Any planting will take place on farmland habitat. No additional planting should be undertaken within areas of grassland identified as being of municipal ecological importance.

Details of habitat enhancement and ongoing habitat management will be detailed in the Construction Environmental Management Plan.

E2.2.3 Birds

Potential Impact

The only predicted significant impact is the loss of breeding habitat for common quails which is considered to be of low significance during construction and moderate significance during operation.

The exact number of common quail territories within the survey area has not been established, but Ecoda (Ecoda Consulting, 2011b) estimate the number of territories within the actual wind farm site to be about 30.

The wind farm site consists predominantly of open agriculture land which in general offers suitable habitats for breeding Quail. Thus it is assumed that the above mentioned 30 territories are distributed equally within the area of the proposed wind farm. As approximately 20% of the area of wind farm will be affected, 20% of the territories (which equates to 6 territories) are predicted to be disturbed by the operation of the wind turbines.

The loss of 6 territories will have an impact of moderate significance on the common quail population within the wind farm site. There are estimated to be 3000-5000 individual common quails in the wider Vojvodina region (Ecoda Consulting, 2011b p72) and the negative impact will only be significant at a local level, rather than at a regional or national level.

Improved areas of habitat for breeding quails will be created to compensate for the disturbance and the resulting deterioration of breeding and foraging habitats. This will include large fallow strips within arable land, flower-rich field margins (further details can be found in the Ecoda Expert Opinion (Ecoda Consulting 2011b, pp 141-142).

For each lost territory (calculated to be 6 territories), an area of 0.75 hectares of improved habitat will be created at a distance of at least 250 m from any wind turbines. In total compensatory measures are recommended for an area of 4.5 hectares (6 territories x 0.75 ha).

These measures will also act as compensation for the deterioration of habitats in the wind farm area for other breeding species.

The potential for impact associated with construction of the wind turbines is also generally applicable to the construction of the OHL, however it is likely that impact will be lower due to the lower ground based impact associated with power lines during construction. Therefore, no mitigation measures are proposed during the construction process.

Assessment of Residual Effects

Taking into account the provision of enhanced compensatory habitat for breeding common quails, the proposed wind farm is expected to have an adverse impact of negligible significance on all species of special interest during the construction, operational and decommissioning phases, either as a result of habitat loss, disturbance or collision.

Conclusion

Intensive surveys have been carried out to establish the ornithological baseline of the survey area (the wind farm site and a 1.3 km buffer between wind farm site and Deliblato Sands IBA). The design and execution of the surveys was managed by Ecoda Ltd. Ecoda have carried out analysis of the survey data, and, with reference to a wide range of relevant research, have formed an expert opinion on the value of the survey area for birds and the potential impacts of the proposed wind farm on the bird populations it supports.

It is considered that the only species that is expected to be significantly impacted by the proposed wind farm is the common quail, which will lose breeding habitat; an impact of low significance is predicted during construction and an impact of moderate significance is predicted during operation. Approximately 30 pairs are thought to currently breed within the wind farm site, and a displacement from approximately 20% of the habitat is expected to cause a loss of approximately 20% of the breeding common quail population (6 pairs) within the site. Improved areas of habitat for breeding quails will be created to compensate for the disturbance and the resulting deterioration of breeding and foraging habitats. The habitat enhancement should also benefit other breeding species.

Taking into account the provision of enhanced compensatory habitat for breeding common quails, the proposed wind farm is expected to have an adverse impact of negligible significance on all species of special interest during the construction, operational and decommissioning phases, either as a result of habitat loss, disturbance or collision.

The proposed wind farm will not have any adverse impacts on qualifying bird populations of Deliblato sands IBA, Deliblato Sands pSPA or Ladudovo Okno Ramsar site. Please refer to the Habitat Regulation Assessment screening report (WS Atkins International Limited, 2012) for a full assessment of the potential impacts of the proposed wind farm on these qualifying bird populations.

No wind farms currently exist in Serbia, and the surrounding area consists of undeveloped, intensive cultivated land.

Although it is considered that the potential impacts have been accurately assessed, it is noted that (i) the breeding bird territories within the site have been estimated based on expert local knowledge rather than factual survey estimates and (ii) the collision risk for target species has been based on available research not on detailed analysis of the flight data within the wind farm (due to variations in survey effort preventing collision risk analysis). Additional vantage point surveys and breeding bird surveys were carried out between November 2011 and July 2012, to inform a supplementary report to this environmental statement. Details of the methodology of these additional surveys can be found in Appendix CIII.

E2.3 Landscape and Visual

E2.3.1 Overview

Mitigation measures for wind farm developments are relatively limited and those that are appropriate have been included as an integral part of the scheme. It is recognised that there is

limited potential to relocate the infrastructure or screen these large scale structures. Therefore there is no separate assessment of residual effects. However there is potential to include integrated mitigation measures that would protect, and potentially enhance, the landscape features and character and also maximise the screening capability of the landscape, thereby minimising visual impacts.

E2.3.2 Specific measures

In relation to landscape and visual impacts, the broad aims and objectives of mitigation measures for the proposals during construction should include, but are not be limited to:

- Judicious vegetation clearance to ensure only limited vegetation is cleared to facilitate construction access and operations;
- Where construction access is required in the vicinity of existing vegetation, suitable protection to existing tree canopies and root zones should be provided with protective fencing and ground protection surfacing, which should be removed immediately upon completion of construction works;
- Bespoke mitigation planting at strategic sites both within and outside the development area to create thickets of trees and shrub that are in keeping with the landscape character and perform targeted screening of potential visual impacts anticipated to be experienced by the surrounding residences exposed to the development.

E2.4 Traffic and Transport

Transport of construction materials and equipment will involve both public roads and site roads on the wind farm site. In order to optimise and improve traffic safety, a Transport Management Plan will be developed and implemented to include two separate sections: one section on public road traffic, and one for on-site traffic. Although WEBG do not have responsibility for transport before the handover point, they should assume responsibility for the effective management of transport at all stages of the project. Therefore, the Transport Management Plan should be owned by WEBG. The plan may be a sub-section of the project Environmental Plan, or may be standalone. The Transport Management Plan will establish:

- for traffic on public roads: methods to reduce the number of trips, suitable routes to follow to/from the project area agreed with the local governments of the localities crossed by transport routes, agreements with the local governments regarding transport delivery, transport scheduling, public warning;
- for site traffic: the traffic routes between the work fronts and the site logistics facilities/ supply areas, travel speed limits, necessary practices in avoiding excessive dust emissions and the fouling of public roads.

In order to minimise traffic and transport impacts, the following mitigation measures should be considered:

- Restricting delivery hours to reduce noise nuisance and congestion;
- Heavy construction traffic will be subject to the traffic management plan.

Management and mitigation measures should also be incorporated in to the Environmental Management Plan once transport requirements and suitable options have been established.

E2.5 Noise

Overall, noise from construction activities would be managed to minimise the impacts on the noise sensitive receptors. Noise control measures would include:

- The use of Best Practicable Means during construction works,
- Ensuring that all staff and operatives are briefed on the requirement to minimise nuisance from site activities,
- Establishment of agreed site working hours for “normal” construction activities,
- Programming works such that the requirement for working outside of normal working hours is minimised,
- Use of attenuation measures such as silencers/enclosures where appropriate,
- Plant and machinery will be well maintained,

- Plant and machinery will be tuned off when not in use,
- Establishment of agreed criteria whilst undertaking significantly noisy or vibration-causing operations near to sensitive locations.

Construction traffic will follow pre-determined routes to access the site to minimise impacts, and where possible, routes will be selected to avoid areas of habitation.

E2.6 Socio-Economic

E2.6.1 Impacts to Land Use

During construction the project will cause a temporary reduction in land available for agriculture. Whilst the actual impact will only be short term, there are certain measures which will be implemented to mitigate it, as well as prevent any impacts to livelihoods. These measures include:

- Minimise the amount of land occupied during construction;
- Position WTGs near edges of land plots to optimize land use;
- Upon the completion of construction activities, fully reinstate the land not permanently occupied;
- Compensation for privately owned land already executed.

Difficulties in accessing land as a result of increased traffic and access track upgrades will be managed by the implementation of following measures:

- Develop and implement a traffic management plan;
- Provide timely information to users of land of when access to their land might be more difficult (e.g. scheduled access track upgrades);
- Establish and implement a community grievance mechanism.

Even if these measures are fully implemented, it is possible that individuals will still occasionally experience difficulties in accessing land, however this is not expected to have a further impact on livelihoods.

E2.6.2 Employment and Procurement Opportunities

The project will create some direct employment opportunities, however a significant proportion of the opportunities will be for semi-skilled and skilled labour, which are expected to be largely national and international staff and thus this impact may not be significant for local communities. In any case, the engagement of all non-employee workers will follow international best practice, with the main measures comprising the following:

- Put in place transparent and fair recruitment procedures
- Ensure that all non-employee workers are engaged in line with both national legislation and applicable international (ILO) standards and recommendations
- Provide a grievance mechanism for workers
- Implement a training programme for the local workforce to enable them to take advantage of the opportunity

To foster the creation of indirect employment opportunities, the Project will procure goods and services locally whenever possible.

Anticipated construction activities may create employment related expectations among the local population, which are unrealistic. If this is not managed appropriately, it could lead to worsened relationships between the Project and the local population, once these expectations do not materialise. The following measure will be implemented to manage the impact:

- Continue to provide timely and transparent information regarding employment opportunities related to the Project.

E2.6.3 Impacts on Livelihoods

Economic displacement of persons whose crops may be affected by construction and generally any loss of livelihoods as a result of loss of land available for agriculture will be mitigated by undertaking the following measures:

- Minimise the amount of land occupied / disrupted during construction
- Provide timely information to users of land of when construction is planned to begin and how lost crops and damages will be compensated
- Compensate all users of land for lost crops and any other damages at full replacement value, in accordance with the Serbian Law on Planning and Construction and IFI policies
- Fully reinstate the land after disruption
- Establish and implement a grievance mechanism.

These measures will ensure that land loss is minimised, however, approx. 30 ha of land will continue to be unavailable for agriculture even after construction.

To prevent any livelihood losses as a result of transport and increased traffic, the following measures will be implemented:

- Provide timely information to people/households located along selected transport route that there will be increased transport activity in their area and the possible impacts as well as foreseen mitigation measures.
- Compensate any business losses full replacement value, in accordance with the Serbian legislation and IFI policies35
- If compensation alone is not sufficient to restore livelihoods, implement livelihood restoration measures in accordance with IFI policies
- Establish and implement a grievance mechanism

E2.6.4 Community Health, Safety and Security

The influx of workers into the Project area causing disturbances for the local population, will be minimised by the implementation of the following measures:

- Encourage contractors to hire local workforce, i.e. give preference to suitably qualified and experienced applicants from the local communities.
- Enforce workers code of conduct
- Cooperate and coordinate with local health and safety facilities

The possibility of occasional incidents still exists. Such incidents could lead to tensions between the community and WEBG and therefore will be prevented to the greatest extent possible.

Increase in traffic (bringing equipment and materials to the site and employee travel) could lead to more accidents in the local communities and reduced quality of life. These impacts will be managed with the implementation of the following measures:

- Provide timely information to people/households located along selected transport route and consult on mitigation measures
- Develop and implement a traffic management plan
- Workers code of conduct (guidance on safe driving)
- Cooperate and coordinate with local health and safety – security facilities

Any accidents involving local community members will have serious effects on the individual or his/her household and could lead to tensions between the community and WEBG, which is why they will be prevented to the greatest extent possible.

E2.6.5 Impacts on Infrastructure

Transport of heavy machinery could lead to damages of road surfaces, further causing accidents, vehicle damages, etc. The following measures will be undertaken to mitigate these impacts:

- Preparation of roads for heavy transport before construction

[35] Full replacement cost is defined in accordance with PR 5 of the EBRD Environmental and Social Policy, as the market value of the assets plus the transaction costs associated with restoring the assets.

- Restoration of roads to at least pre-construction level

If roads used during construction are not fully restored, this could lead to tensions between WEBG and the local communities and therefore this impact will be prevented to the greatest extent possible.

E2.7 Health, Safety and Public Nuisance

In general, construction will be organised in consultation with the local community to ensure that community health and safety risks are minimised. Key issues for consideration will be:

- Routing of traffic to avoid settlements where possible (see Transport Assessment Section D2.3);
- Prevention of nuisance from noise and vibration by timing of certain activities;
- Security and prevention of unauthorised access, particularly during tower erection and blade lifting operations.

Operational health and safety is covered in Serbia by the Law on Occupational Safety and Health (Off. Journal of RS, No. 101/2005). This incorporates the requirements of Directive 89/391/EEC on Workplace Health and Safety. The law provides a framework for management of health and safety risks, in the following hierarchy:

1. Avoid the risk.
2. Evaluate the risk.
3. Combat the risk at source.
4. Adapt the work.
5. Replace the activity with one of lower danger category.
6. Prioritising collective measures over individual measures.
7. Giving appropriate instructions to workers.

A major construction project of this nature would normally have a construction phase safety, health and environmental (SHE) plan, with a designated site manager or H&S officer to maintain, monitor and implement the plan. This would typically give a description of the project, key project dates, description of communication arrangements between the operator and contractors and other parties, and include, but not be limited to, the following specific issues:

- Control of access;
- Induction;
- Site hazard plan;
- Emergency plan;
- Accidents, incidents and near misses recording and reporting, and an elevation system;
- Co-ordinate contractor activities;
- Establish and maintain a register of risk assessments and method statements, and ensure compliance;
- Receive, review and record reports and inspections of lifting equipment and accessories, plant and equipment, scaffolding, excavation and contractors' training qualifications and competency details;
- Containment of substances hazardous to the environment or human health (e.g. spill kits. drip trays, integral bunded fuel storage facilities etc.);
- Traffic management plan.
- Health and safety documentation; and
- Site supervision.

There will be a set of general site rules that must be followed by all construction workers. Examples of these are below:

- Individuals must register upon arrival and sign out when departing from site;
- Individuals must be site inducted before commencing work;

- Alcoholic beverages and prohibited drugs are strictly forbidden. Operatives taking prescribed drugs are required to notify the site manager / H&S officer;
- The wearing of safety helmets, safety glasses, gloves, high visibility coats / vests and safety boots which provide ankle support will be mandatory while on site. Ear defenders must be carried at all times. Additional PPE shall be worn as deemed appropriate by risk assessment. Suitable work wear must be worn at all times;
- All accidents, incidents, injuries and near misses must be reported to the HSE officer. All injuries (however small) must receive medical treatment from a qualified first aider;
- The instruction or command depicted on safety signs must be complied with at all times;
- Individuals may only carry out tasks for which they are competent and authorised to do. Individuals may only operate and use plant or equipment for which they are trained and authorised. Copies of all operators certificates will be retained;
- Smoking will only be allowed in the designated smoking areas. Smoking inside the site establishment cabins will be strictly forbidden;
- Weapons and explosives will be strictly forbidden;
- Fighting, gambling, horseplay, and practical jokes will be strictly forbidden;
- Any query from the general public must be politely referred to the site manager / HSE officer.
- No food is to be consumed at the work area. Welfare facilities are to be provided on site for the consumption of food and for personal hygiene. These will be kept clean and hygienic;
- No person under the age of 18 years will be engaged for work activities on site without the prior approval of the site manager;
- Defective or suspect plant will be tagged and withdrawn from use and not used until repaired or replaced; and
- Waste and debris will be cleared up as work progresses.

Contractors will ensure compliance with all relevant health, safety and environmental legislation. Verbal warnings will be issued to individuals for minor non-compliance with health and safety issues. If an individual endangers themselves or others by their actions or omissions they may be instructed by the site manager to leave site.

Some typical risks associated with the construction of a wind farm, and their management and mitigation techniques, are presented below. Measures to prevent or manage the risks are also discussed, having regard to the IFC General Environment, Health and Safety Guideline, Section 4 on Construction and Decommissioning (IFC, 2007a).

In order to deliver the requirements described above and in the following sections, it is expected that the developer and/or lead contractor will develop a management system to the requirements of the international health and safety management system standard OHSAS18001. The same principles of management should also be adopted for environment through the implementation of a management system to the international environmental standard ISO14001.

At present, WEBG does not have such systems in place but they are in the process of being developed. Therefore, we expect their development as early as possible. Not only should the appropriate management systems be in place before the construction works are started, but the processes of developing contractor method statements and services procurement should be undertaken under the control of a dedicated environmental, health and safety management system, adopting international standards as well as local regulatory requirements.

E2.7.1 Working at Height and Fall Prevention

Work at height may be performed during the erection of towers and fitting of blades. This will be subject to specific health and safety risk assessments by the contractors responsible for these operations. Particular regard will be had for, but not be limited to, the following (as set out in the IFC guidelines):

- Prior to undertaking work, test structure for integrity;
- Implementation of a fall protection program that includes training in climbing techniques and use of fall protection measures; inspection, maintenance, and replacement of fall protection equipment; and rescue of fall-arrested workers;
- Establishment of criteria for use of 100 percent fall protection (typically when working over 2 m above the working surface but sometimes extended to 7 m, depending on the activity). The

fall-protection system should be appropriate for the tower structure and movements to be undertaken including ascent, descent, and moving from point to point;

- Install fixtures on tower components to facilitate the use of fall protection systems;
- Provide workers with an adequate work-positioning device system. Connectors on positioning systems must be compatible with the tower components to which they are attached;
- Ensure that hoisting equipment is properly rated and maintained and that hoist operators are properly trained;
- Safety belts should be of not less than 15.8 mm (5/8 inch) two in one nylon or material of equivalent strength. Rope safety belts should be replaced before signs of aging or fraying of fibres become evident;
- When operating power tools at height, workers should use a second (backup) safety strap;
- Signs and other obstructions should be removed from poles or structures prior to undertaking work;
- An approved tool bag should be used for raising or lowering tools or materials to workers on elevated structures; and
- Avoid conducting tower installation or maintenance work during poor weather conditions and especially where there is a risk of lightning strikes.

Trenches and drainage chambers may be in place on site. Drainage chambers (e.g. manholes and catch pits) will require visual inspection from ground level. Pits or chambers will not be left exposed overnight. Any trenches that have to be left open overnight will have a suitable barrier placed around them to prevent access and/or falls from height. All site operatives and site visitors will be briefed about such hazards during the induction. Suitable means will be taken to prevent the risk of trench wall collapse (e.g. battering back or appropriate trench support systems).

E2.7.2 Delivery and Removal of Materials

Deliveries and collections should be planned and that adequate storage areas for material and equipment are allocated. Waste removal, e.g. excavated soil, should be planned and sufficient temporary storage provided.

E2.7.3 Lifting Operations

Lifting the tower into place, and fitting the blades and nacelle, are specialist operations that will be subject to specific health and safety risk assessments by the contractors responsible for these operations. Particular regard will be had for, but not be limited to, the following:

- Access of lifting equipment to site;
- Fencing off a security area;
- Control of access to operational areas;
- Wind speed and direction;
- Weather conditions and risk of severe weather.

E2.7.4 Use and Maintenance of Plant and Equipment

Construction plant and equipment used on the project will be inspected by the contractor for condition and suitability and be subject to verification of maintenance certificates or records, statutory or otherwise, prior to being put to use. All equipment will carry a suitable and valid examination certificate. Operations using heavy plant and equipment will be undertaken and supervised by a suitably competent person, identified in the site SHE plan.

E2.7.5 Ground Excavation

Normal good practice for preventing or minimising risk from ground excavations will be followed, including but not limited to:

- All operatives should wear appropriate PPE;
- Suitable welfare facilities are to be provided;
- Staff should adopt good hygiene, no eating and smoking on site;
- Contractors should consider providing antiseptic wipes etc.;
- Contractors should adopt a suitable emergency action plan in the event of site accident; and

- Suitable first aid arrangements should be provided.

It is not currently thought that the ground at the project site is likely to be contaminated, but in the event that unusual ground conditions, odours or other signs of contamination are observed, a further risk assessment will be carried out to ensure that the risk to human health and the environment from such contamination is minimised.

Measures will also be taken to minimise the risk from working in confined spaces, such as trenches and pits, such as:

- Slope dewatering;
- Side wall support;
- Gradient adjustments;
- Providing safe means of access and egress;
- Avoiding prolonged use of combustion equipment and ensuring proper ventilation.

E2.7.6 Traffic Management

A traffic management system will be set up, to ensure separation of construction workers from traffic related risks, including moving machinery. Heavy plant and vehicles will be provided with audible and visible reversing alarms. All vehicle movements must follow the designated routes and be accompanied by a banksman. An appropriate site speed limit will be enforced. Private vehicles will park in a designated area. Delivery and collection vehicles will follow the set route. All such vehicles will sign in and out of site. Individuals will wear high visibility clothing and must comply with the site traffic management system and use segregated walkways.

E2.7.7 Storage of Plant and Materials

Plant and equipment will be stored in designated areas when not in use. Appropriate security will be provided.

E2.7.8 Working near Live Electrical Equipment

Specific safety rules will be set up to be followed when working near live electrical equipment. A specific permit to work system will be in place for such work.

E2.7.9 Slips, Trips and Falls

These will be avoided where possible through good housekeeping, spill prevention and clean-up, avoiding uncontrolled use of ropes and cords, proper storage of construction materials and the use of slip resistant footwear.

E2.7.10 Manual Handling and Over Exertion

Manual handling risks will be identified through the risk assessment process undertaken at site. Suitable control measures shall be identified and detailed within contractor risk assessments and method statements to reduce the risk to individuals, including:

- Training personnel to recognise weight limits and use of two person lifts or mechanical assists;
- Planning of work layout to avoid manual lifting of heavy loads;
- Posture improvement; and
- Taking regular breaks and rotate heavy lifting jobs.

E2.7.11 Use of Hazardous Substances

The use of hazardous substances will be in compliance with various EU Directives, including 80/1107/EEC on protection or workers from the risks related to exposure to chemical, physical and biological agents at work, and Directive 1907/2006 on the registration, evaluation, authorisation and restriction of chemicals (REACH). Appropriate health and safety assessments will be undertaken, including handling, storage, transfer and use. A register and site inventory of hazardous materials will be kept.

E2.7.12 Nuisance from Noise and Vibration and Dust

Noise and vibration may be caused by the operation of pile drivers, earth moving and excavation equipment, concrete mixers, cranes and the transportation of equipment, materials and people. Closest human receptors are some 1km distant, and the nearest village of Dolovo is some 2km distant, so impact form noise and vibration is not anticipated to be significant. However, to minimise potential impact as far as possible, the following measures will be taken:

- Construction activities will be planned in consultation with the local communities, so that the noisiest activities are planned during the day;
- Noise barriers and source attenuation measures such as silencers will be used where appropriate;
- Heavy plant will be routed to the construction site avoiding areas of habitation where possible;
- All plant and machinery will be tuned off when not in use;
- Where noise exposure is anticipated, hearing protection equipment will be provided and worn by all personnel.

Airborne dust can be generated by the operation of heavy plant and machinery, excavation and the exposure of bare soil to wind. This can cause a risk to construction workers and the local community, although the distance to the nearest community receptors makes this unlikely. The following control measures are typical of construction activities:

- Minimising dust form material storage and transfer using dust suppression, enclosures and covers;
- Spraying roadways to minimise vehicle generated dust;
- Managing emissions form mobile sources by ensuring vehicles comply with national emissions standards;
- Avoiding open waste burning.

E2.7.13 Being Struck by Objects

Measures will be in place to prevent workers being struck by objects or particles ejected from the use of machine tools. These will include:

- Designated waste drop zones and/or a waste chute;
- Using machine guards;
- Keeping traffic ways clear to avoid machining over obstacles;
- Use of temporary fall protection;
- Use of appropriate PPE including eye protection, face shields and hard hats.

E2.7.14 Fire

Emergency contact numbers will be made available in the site plan. This will include the fire and rescue service and the environmental regulator. A 24 hour spill response contract will also be in place.

E2.7.15 Unauthorised Public Access and Vandalism

Appropriate site security will be provided, including but not limited to:

- Fencing of the construction area, with gates and warning signs on access roads;
- Control of access roads to the turbines and associated equipment;
- Fencing off maintenance and equipment storage areas;
- 24 hour security personnel with CCTV to prevent unauthorised entry to the site;
- Display of contact details for emergency response services and police in the security station, for use in the event of unauthorised entry.

E2.8 Management and Mitigation of Other Construction Impacts

E2.8.1 Ground and Water

The site is relatively level and therefore the potential for water flowing across the site to cause significant soil erosion is low. To prevent impacts from runoff during land preparation and construction the following measures are foreseen: (a) excavations' face will be kept minimal to avoid the exposure of exposed surfaces to natural conditions, (b) surface runoff collection will be implemented through temporary drainage grooves and sedimentation ponds to avoid their direct discharge to the natural receptor, this is particularly important during wet seasons.

The largest user or water will be the concrete batch plant. The water supply from Dolovo is considered to be adequate and the consumption by the batch pant will not affect the towns supply. Appropriate measures will be employed at the construction site to reduce the risk of potentially polluting materials leakage. In particular, polluting materials such as oils, fuels and chemicals will be stored in dedicated storage areas, complete with spillage protection and working procedures, which ensure that these materials are handled correctly.

Domestic type wastewater will be collected at site and will be removed from site for treatment at an appropriate treatment facility. The site will not be connected to the local waste water collection system nor to any surface water and there will be no waste water treatment on site.

E2.8.2 Archaeology and Cultural Heritage

Management and mitigation to preserve archaeology and cultural heritage is particularly important during the construction phase of the project. As outlined in Section D2.8.2, the Institute for Protection of Cultural Monuments from Pančevo as part of the Detailed Regulation Plan, have outlined conditions for the protection of archaeology and cultural heritage associated with this specific project. Briefly the conditions require notification of proposed works to the Institute, appropriate prospecting and supervision of construction activities and informing the institute and stopping works if there are chance finds. Further, as well as agreeing with the conditions set out by the Institute, the developer should ensure that appropriate management systems and training is in place to implement the conditions.

E2.8.3 Air Emissions

In general the key requirements are:

- Minimisation of dust arising at the site through preventing exposure and drying out of soil where ever possible.
- Minimise emissions from generators and vehicles engines through appropriate maintenance, suitable levels of operation in accordance with national requirements and prevention of black smoke emissions.
- Point source emissions from the concrete batch plant will be expected to comply with EU standards.

E3 Management and Mitigation during Operations

E3.1 Introduction

The following sections provide a brief overview of the management and mitigation measures required during the operational phase of the project, based on the findings of the impact assessment. The impacts associated with the operational phase of the project are generally not as widespread as during construction, but are where the impacts associated with specific receptors identified in the impact assessment may be most severe if appropriate management and mitigation measures are not implemented, particularly during the earlier stages of the project, during design and construction.

E3.2 Ecology and Nature Conservation

E3.2.1 Habitat Management and Mitigation

Biodiversity enhancements will be made by converting areas of arable farmland to more diverse semi-natural habitats such as grassland, scrub or woodland. This will be achieved where small parcels of farmland may be annexed by new tracks or infrastructure and rendered insufficiently small for farming. These will be facilitated by collecting and sowing seed from diverse steppic grassland. This will then be left to further, natural colonisation; scrub, and ultimately woodland, being the habitats likely to develop; they will be managed through cutting or grazing to produce a mixed grassland/scrub/woodland habitat. It is not considered that habitat creation such as this would significantly attract bird or bat species at risk of collision with turbines.

The construction of power lines is not expected to have a significant impact on birds passing through the site, therefore we conclude that mitigation is unlikely to be necessary and a suitable approach would be to undertake post construction monitoring. However, the local regulatory authorities have decided to adopt a precautionary approach and have required that, if needed, the power lines are sufficiently marked during the construction phase. It is yet to be defined whether, what kind of, markings are needed, but the developer has stated that they will comply with this requirement.

E3.2.2 Bats

To reduce collision/barotrauma risk to an acceptable level at WPP 16 and WPP 59 for Kuhl's and Nathusius' Pipistrelle (and in doing so for other bats too), both turbines will be shut down from May to September during nights having all the following conditions:

1. Wind speed lower than 6 m/s. This wind speed has been chosen following on a comprehensive study undertaken by (Brinkmann, 2011) (A new method to determine bird and bat fatality at wind energy turbines from carcass searches);
2. Temperature higher than 10°C;
3. No rainfall.

These operating parameters will be in effect an hour before sunset until an hour after sunrise.

Recent investigations show that collision risk of common noctule is mainly restricted to juveniles in the period from mid-July to mid-September (see Section 3.2.1, (Ecoda Consulting, 2011a)). To reduce the collision risk for common noctules at WPPs 37, 38, 39, 44 and 64 to an acceptable level, turbines will be shut down from June to September when weather conditions are as mentioned above. These operating parameters will be in effect an hour before sunset and end an hour after sunrise. The size of the area of importance for noctules in this location meant that relocating the turbines was not feasible, and altering the operating parameters within the bat active season was a more appropriate option.

E3.3 Landscape and Visual

In relation to landscape and visual impacts, the broad aims and objectives of mitigation measures for the proposals during operation phase should include, but are not be limited to:

- To offset significant adverse impacts associated with views from sensitive areas such as the village settlements within the surrounding area (i.e. Dolovo, Bavaniste and Vladimirovac).

The application of a programme of advanced mitigation planting as well should be provided. Proposed replacement planting to replace areas removed during construction and decommissioning phases to facilitate machine access should also be included, all planting should comprise native plant species to reflect the local landscape character.

- All mitigation and replacement planting should be suitably protected, maintained and monitored during medium term establishment for a minimum of 5 years upon completion of the proposed development.

The proposed turbines should be a colour which is unobtrusive in the landscape. Therefore the masts should be finished using a neutral matt colour such as a pale grey to blend with the muted colours of the surrounding landscape and predominant sky colours. The turbine colour should be approved by the overseeing development authority. Unfinished exposed materials (metals particularly) should be avoided due to the potential glare that these will cause to the observer. Corporate logos, lettering and motifs should also be avoided in order to minimise visual impact.

There is one occupied house on the northern edge of Mramorak village that may be susceptible to shadow flicker impacts for a few hours a days for a few days per year. This impact is rated as *Negligible*. However, the situation will be monitored and should WEGB be notified of a problem then the turbine will be stopped during these hours.

E3.4 Noise Impact

The predicted noise levels are below the permitted values, and no particular noise mitigation measures are required other than those which are inherent in the design. It is expected that an appropriate maintenance programme will be implemented to ensure correct functioning of the wind turbines and associated structures, in line with manufacturers' requirements, in order to ensure smooth running and minimisation of noise.

E3.5 Socio-Economic Impacts

E3.5.1 Impacts to Land Use

Approximately 30 ha of land will continue to be occupied after construction. All measures previously listed for the construction phase will be implemented to minimise land occupation to the greatest possible extent.

Minor use restrictions will be applied on agricultural land in the vicinity of WTGs. The imposition of use restrictions is not expected to have a significant impact on users of affected land. However, to reduce the chances of any further impacts on livelihoods, these use restrictions will be confined only to areas needed for the safe operation of wind farms and easy access for repairs and maintenance.

E3.5.2 Employment and Procurement Opportunities

As for construction related employment, the contracting of any individuals for the operation of the wind farm will follow principles of international best practice. To foster the creation of indirect employment opportunities, the Project will continue to procure goods and services locally whenever possible.

E3.5.3 Impacts on Livelihoods

Economic displacement of persons whose crops may be affected by repairs and generally any loss of livelihoods as a result of loss of land available for agriculture will be mitigated by undertaking the following measures:

- Minimise the amount of land occupied / disrupted during repairs
- Compensate all users of land for lost crops and any other damages at full replacement value, in accordance with the Serbian Law on Planning and Construction and IFI policies
- Fully reinstate the land after disruption
- Implement a grievance mechanism

These measures will ensure that land loss is minimised, however, approx. 18 ha of land will be permanently lost to agriculture.

E3.5.4 Revenue Generation for the Local Government / Community

A signed profit sharing agreement between WEBG and Kovin Municipality, as well as registration of the company on its territory and paying VAT, will result in increased revenue for the municipality and local community Mramorak. WEBG will ensure that all payments are made in a timely and transparent manner.

The above positive impact could however lead to tensions between the Project and other local communities not benefiting directly from taxes and profit sharing agreements. This impact is mitigated through provision of support to local communities through the WEBG Social Investment Programme described in Appendix EI.I.

A possible impact of the Project includes enhanced tourism opportunities for local communities. If such opportunities do present themselves, in agreements with the local communities, WEBG will support tourism related initiatives through the WEBG Social Investment Programme

WEBGs presence in the Municipality Kovin is attracting foreign and domestic investments in the municipality and the wider area. Support and lobbying for investments in the project area will continue.

E3.5.5 Impacts on Infrastructure

The operation of the wind farm is expected to contribute to the improved access to agricultural plots and for that to happen, regular maintenance of access tracks will be carried out.

E3.6 Health, Safety and Public Nuisance

Operational health and safety is covered in Serbia by the Law on Occupational Safety and Health (Off. Journal of RS, No. 101/2005). This incorporates the requirements of Directive 89/391/EEC on Workplace Health and Safety. The law provides a framework for management of health and safety risks, in the following hierarchy:

1. Avoid the risk.
2. Evaluate the risk.
3. Combat the risk at source.
4. Adapt the work.
5. Replace the activity with one of lower danger category.
6. Prioritising collective measures over individual measures.
7. Giving appropriate instructions to workers.

In addition, the IFC have published a set of EHS Guidelines on typical industrial risks, as well as a specific guideline on health and safety risks associated with wind farms (IFC, 2007b). These are discussed further below.

E3.6.1 Worker Health and Safety

Specific risks associated with workers at wind farms, as outlined in the IFC guideline, include working at height. This is relevant during construction and maintenance activities. Risk prevention measures included in the guideline are listed below and will be followed for onsite personnel wherever appropriate:

- Prior to undertaking work, test structure for integrity;
- Implementation of a fall protection program that includes training in climbing techniques and use of fall protection measures; inspection, maintenance, and replacement of fall protection equipment; and rescue of fall-arrested workers;
- Establishment of criteria for use of 100 percent fall protection (typically when working over 2 m above the working surface but sometimes extended to 7 m, depending on the activity). The fall-protection system should be appropriate for the tower structure and movements to be undertaken including ascent, descent, and moving from point to point;
- Install fixtures on tower components to facilitate the use of fall protection systems;
- Provide workers with an adequate work-positioning device system. Connectors on positioning systems must be compatible with the tower components to which they are attached;

- Ensure that hoisting equipment is properly rated and maintained and that hoist operators are properly trained;
- Safety belts should be of not less than 15.8 mm (5/8 inch) two in one nylon or material of equivalent strength. Rope safety belts should be replaced before signs of aging or fraying of fibres become evident;
- When operating power tools at height, workers should use a second (backup) safety strap;
- Signs and other obstructions should be removed from poles or structures prior to undertaking work;
- An approved tool bag should be used for raising or lowering tools or materials to workers on elevated structures; and
- Avoid conducting tower installation or maintenance work during poor weather conditions and especially where there is a risk of lightning strikes.

In addition to these general occupational health and safety issues and risk prevention techniques, there are specific issues associated with wind farms, than can have an impact on occupational and public safety. The key issues are discussed in the following sections.

E3.6.2 Blade Shear or Breakage

Wind turbines can suffer from wind shear, i.e. different wind speeds at the bottom and top of the blades. This can lead to bend of the shaft, and it is more likely to arise in onshore installations than offshore due to the larger potential wind gradient. The design of the blades has been selected to be suitable for the prevailing climate and wind speed at Čibuk 1.

Blade breakage can potentially be caused by poor maintenance, or by very unusual wind conditions, e.g. hurricanes, tornadoes, or by lightning strike. This can lead to blades hitting the tower and being scattered. There will be a robust and comprehensive preventative maintenance programme to ensure that collapse does not occur through wear of critical parts such as gearboxes.

In the event of breakage, the blades could potentially be scattered some distance (up to 500m in some cases). The surrounding land use is arable, with very little human occupancy. The nearest residential property is over 1km to the north east, and the nearest settlement, Dolovo village, is just under 2km to the south west of the project boundary. The risk to human safety from blade scattering after breakage is therefore deemed to be very low, due to its very unlikely occurrence, and the absence of receptors.

In the very unlikely event that breakage occurs, the operator will ensure that debris is thoroughly removed and disposed of, proper replacement or removal and restoration is undertaken, with the appropriate level of compensation to any land or livestock owner adversely affected.

There is a very slight residual risk of injury to any employees on site at the time of collapse. Training will be provided to enable the indicators of wind shear or potential breakage, such as unusual noises from the tower, nacelle or blades, and evacuation would proceed immediately in these circumstances.

E3.6.3 Turbine Collapse

Turbine collapse can happen in exceptional circumstances, due to brake failure, caused by extreme wind conditions or malfunctions of key controlling systems such as the gearbox, leading to uncontrolled blade rotation and the removal of the air brakes on the blade tips. Collapse can be prevented through proper design and maintenance. The design selected is suitable for the prevailing climate, wind speed and terrain at Čibuk 1. In addition, there will be a robust and comprehensive preventative maintenance programme to ensure that collapse does not occur through wear of critical parts such as gearboxes.

In the event of collapse, it is expected from previous incidents that the majority of the tower and associated structures will fall in the area immediately adjacent to the turbine. The blades could potentially be scattered further. The surrounding land use is arable, with very little human occupancy. The nearest residential property is over 1km to the north east, and the nearest settlement, Dolovo village, is just under 2km to the south west of the project boundary. The risk to human safety from collapse is therefore deemed to be very low.

In the very unlikely event that collapse occurs, the operator will ensure that debris is thoroughly removed and disposed of, proper replacement or removal and restoration is undertaken, with the appropriate level of compensation to any land or livestock owner adversely affected.

There is a very slight residual risk of injury to any employees on site at the time of collapse. Training will be provided to enable the indicators of potential collapse, such as unusual noises from the tower, nacelle or blades, and evacuation would proceed immediately in these circumstances.

E3.6.4 Lightning Strike and Fire

There is a risk of damage to blades and electrical equipment by lightning strikes, which can also lead to setting fire to the hydraulic oil, the switchgear and transformer present in the nacelle. Fires caused in this way can be hard to detect, as there is no long term human occupancy at the turbine, and they are very hard to fight due to the height of the nacelle above the ground.

The use of fire resistant components in construction, where possible, and preventative maintenance to ensure the robust connection of the lighting protection (earthing) system, electrical systems and the correct operation of rotating parts in the nacelle that can cause temperature increases or sparks if poorly maintained, will help to prevent nacelle fires.

The provision of automatic fire detection systems linked to automatic shutdown systems will allow them to be dealt with in the shortest possible time by disconnection from the power supply systems. If this does not prevent the fire, automatic fire fighting is also provided.

Training of staff undertaking preventative maintenance using items such as welding equipment, will be robust to ensure that this type of introduced hazard does not lead to outbreaks of fires. The area surrounding the turbines will be designated as “no smoking” and signage provided accordingly.

An emergency plan will also be maintained and updated to inform training of personnel. It will include a fire prevention plan, incorporating (but not limited to)

- Staff training;
- Inspection and maintenance (particularly of oil condition in the transformers in the turbine and substation);
- Testing and maintenance of fire control systems; and
- Communication and co-operation with fire services.

In the unlikely event of a nacelle fire, best practice is usually to allow burnout, and for firefighting services to establish a safety zone to ensure secondary fires in the area surrounding the turbine is prevented.[36] The surrounding land use is arable, with no human occupancy within 1km. The risk to human safety from fire is therefore deemed to be very low.

E3.6.5 Unauthorised Public Access and Vandalism

Security will be provided to the site at various levels, as recommended by the IFC (IFC, 2007a), including (but not limited to):

- Locking of each individual turbine tower access door;
- Operating a permit to work system to prevent unauthorised access;
- Gates and warning signs on access roads;
- Control of access roads to the turbines and associated equipment;
- Fencing off maintenance and equipment storage areas; and
- Dissemination of information on safety zones and the hazards posed by the turbines in the local community.

E3.6.6 Aviation

There is a general risk to aviation from the wing turbines, due to their height. Whilst the nearest airport appears to be located at Belgrade, some 30 km to the south west of the project site, nevertheless, the operator will undertake to install suitable anti-collision lighting systems on the towers, in consultation with the air regulatory traffic authorities before installation, in accordance with air traffic safety regulations. At the time of writing the decision of the authorities is that 23

(out of 57) turbines need to be marked with lights, only on the nacelle. In order to ensure that the lighting is working correctly during operation, the owner/operator will develop and implement an appropriate maintenance programme.

E3.6.7 Electromagnetic Interference

Electromagnetic interference can potentially be caused by wind turbines, through near-field effects, diffraction and scattering. These can impact on aviation radar systems and telecommunication systems.

The site is some 30km from Belgrade airport, so it is not expected that there will be any significant impact on their radar system. However, the project will be developed in consultation with the aviation authorities, and any suitable and appropriate measures will be incorporated.

There are a number of potential remedies should there be interference to telecommunication systems. These may include (GL Wind, 2008):

Modifying placement of wind turbines to avoid direct physical interference of point-to-point communication systems;

- Installing a directional antenna;
- Modifying the existing aerial; and
- Installing an amplifier to boost the signal.

Remedies in the event of television interference can include:

- Site the turbine away from the line-of-sight of the broadcaster transmitter;
- Use non-metallic turbine blades;
- If interference is detected during operation:
    - Install higher quality or directional antenna;
    - Direct the antenna toward an alternative broadcast transmitter;
    - Install an amplifier;
    - Relocate the antenna;
    - If a wide area is affected, consider the construction of a new repeater station.

These will be considered should the operator receive complaints about interference.

E3.7 Management and Mitigation of Other Operational Impacts

E3.7.1 Traffic and Transport

The Transport Management Plan should include management of the operation phase. Access routes to the site could be relaxed for the Operational Phase, small vehicles could access the site from the east without any disruption as long as they are in relatively low numbers. During the operational phase it is expect that there will be no disruption of access to the agricultural plots or any compaction of ground caused by vehicles. Heavy vehicles should only access the via dedicated heavy transport route, most likely the route established from the west of the site during the construction phase.

E3.7.2 Materials and Plant Management

The management and mitigation requirements for preventing and/or minimising releases to the environment during operations are generally the same as for construction. During operations is it necessary to ensure the following:

- Correct storage and handling of hazardous materials and prevention from release to ground/groundwater, surface water and sewage networks;
- Ensure the implementation of an appropriate maintenance regime to minimise emissions to the environment both direct (e.g. maintenance of hazardous materials containment) and indirect (e.g. maintenance to maximise resource efficiency).

E4 Management and Mitigation during Closure and Decommissioning

E4.1 Introduction

In general management and mitigation during closure and decommissioning will follow the same requirements as during construction. Since closure and decommissioning will take place in excess of 25 years' time, it is not possible at present to identify with accuracy all closure and decommissioning requirements. Therefore, before any closure and decommissioning activities are undertaken, a formal assessment of the requirements should be undertaken, based on the design at the point of closure and decommissioning and potential issues which may arise at that time and will require management and mitigations. The potential issues and associated management and mitigation measures should be encompassed in a Closure and Decommissioning Plan, approved by the appropriate regulatory parties and any other pertinent stakeholders, such as investment banks.

The following sections provide a brief overview of the management and mitigation measures required during closure and decommissioning.

E4.2 Noise

Overall, noise from decommissioning activities would be managed to minimise the impacts on the noise sensitive receptors. Noise control measures would include:

- The use of Best Practicable Means during decommissioning works,
- Ensuring that all staff and operatives are briefed on the requirement to minimise nuisance from site activities,
- Establishment of agreed site working hours for "normal" decommissioning activities,
- Programming works such that the requirement for working outside of normal working hours is minimised,
- Use of attenuation measures such as silencers/enclosures where appropriate;
- Plant and machinery will be well maintained
- Plant and machinery will be tuned off when not in use
- Establishment of agreed criteria whilst undertaking significantly noisy or vibration-causing operations near to sensitive locations;

Decommissioning traffic will follow pre-determined routes to access the site to minimise impacts, and where possible, routes will be selected to avoid areas of habitation.

E4.3 Traffic and Transport

Management of traffic and transport during decommissioning involves essentially the same requirements as during the construction phase. Transport of equipment to and from site and decommissioned materials from the site will involve both public roads and roads on the wind farm site. In order to minimise disruption and optimise traffic safety, a Transport Management Plan will be developed and implemented to include two separate sections: one section on public road traffic, and one for on-site traffic. WEBG should assume responsibility for the effective management of transport at all stages of the project. Therefore, the Transport Management Plan should be owned by WEBG. The Transport Management Plan will establish:

for traffic on public roads: methods to reduce the number of trips, suitable routes to follow to/from the power plant premises agreed with the local governments of the localities crossed by transport routes, agreements with the local governments regarding delivery of heavy plant, transport scheduling, public warning;

for site traffic: the traffic routes between the work fronts and the site logistics facilities/ supply areas, travel speed limits, necessary practices in avoiding excessive dust emissions and the fouling of public roads.

In order to minimise traffic and transport impacts, the following mitigation measures should be considered:

- Restricting traffic movements to reduce noise nuisance and congestion;
- Heavy plant traffic will be subject to the traffic management plan.

E4.4 Habitats and Species

Prior to decommissioning of the site, the site will need to be re-surveyed to establish ecological baseline and determine whether specific methods of working are required with relation to habitats and species.

With careful programming and precautionary working practices, decommissioning should be possible with no significant effects on habitats or protected species. Any specific mitigation measures would be determined according to site conditions at the time, and would be designed to minimise the effects on receptors.

E4.5 Socio-Economic Impacts

The mitigation measures which will be implemented during decommissioning largely correspond with those undertaken during construction.

With regards to impacts to land use, it will be important to clear all materials and equipment upon dismantling of WTGs and fully reinstate the land for agricultural use.

Decommissioning will result in restoration of private ownership over land on which WTGs were constructed. This provision is already included in the lease contracts signed between WEBG and the owners and registered with the courts, therefore no further mitigation is needed.

E4.6 Health and Safety

Health and Safety management and mitigation during decommissioning is essentially identical to that of construction. Refer to Section E2.7 for the construction based requirements which are also relevant to closure and decommissioning.

E4.7 Management and Mitigation of Other Decommissioning Impacts

E4.7.1 Landscape and Visual Impact

In relation to the maintenance and mitigation of landscape and visual impacts during closure and decommissioning it is anticipated that the processes will be similar to those undertaken during construction therefore the broad aims and objectives of mitigation measures should include:

- Judicious vegetation clearance to ensure only limited vegetation is cleared to facilitate construction access and operations during decommissioning;
- Where machinery access is required in the vicinity of existing vegetation, suitable protection to existing tree canopies and root zones should be provided with protective fencing and ground protection surfacing, which should be removed immediately upon completion of works; and
- Land cover particularly topsoil areas should be stripped and stored during the decommissioning operations and subsequently reinstated (cultivated and graded) and returned to a condition suitable for agricultural use upon completion.

E5 Monitoring Programme

E5.1 Ecology and Nature Conservation

Permanent Monitoring

Local regulatory requirements (Official Gazette of RS, No. 72/2010) state that all wind farms over 50 MW are equipped with continuous monitoring equipment for monitoring bird and bat movements through and around the wind farm site. At the time of writing, it remains to be confirmed with the Institute for Environmental Protection what is meant under equipment to provide constant monitoring of bird and bat movements through and around the wind farm site (e.g. radars, cameras, etc.). This technology is generally considered as a useful addition rather than a stand-alone post-construction monitoring technique (Natural England, 2010). The guidance note provides some information on the use of radar and its limitations but no detailed methodologies are available concerning its installation, the appropriate numbers of radar equipment, how it is used and how the information it produces is used, in the context of this proposed project. In addition, the evidence indicates that the installation of permanent radar may be of limited use for this project and is not considered to be BAT. The developer is waiting for final confirmation as to whether installation of radar is required. The contents of this impact assessment will advise that process.

Post-Construction Bird Surveys

The latest U.K. guidance (Natural England, 2010) on monitoring onshore wind farms both pre- and post-construction, recommends the survey methodology used for the additional bird surveys (detailed in Appendix III). It is recommended that post-construction monitoring will follow this methodology to allow direct comparisons of bird abundance and flight activity within the survey area, pre- and post-construction. This will involve 36 hours of vantage point surveys at each of the 6 vantage points during both the breeding and winter seasons, plus 9 breeding bird surveys between late March and July. In line with U.K. guidance, this monitoring is proposed for years 1, 2, 3, 5, 10 and 15.

It is proposed that post-construction monitoring should also include corpse searches for the first three years after construction. These corpse searches allow the actual bird mortalities for the wind farm to be established, allowing the operator to put in place further mitigating measures in the unlikely event that the wind farm is shown to have a significant mortality impact on any species of concern.

The proposed methodology will be agreed with the local planning authority prior to construction.

Post-Construction Bat Surveys

A post-construction monitoring programme will be implemented for a period of at least two years after construction of the wind farm (recording bat activity automatically by appropriate devices, e.g. batbox or Anabat).

Searches for possible collision casualties will also be undertaken in line with methodologies given in Brinkmann et al. 2011. A search will be made for fatalities within 50m of each WPP. Transects will be walked through the area around each WPP once or twice a week during the bat active season.

The purpose of this monitoring is to

- verify the assumptions made within the impact assessment and to determine significant deviations from predicted impacts;
- test the effectiveness of mitigation measures (e.g. alternation of the operational parameters to reduce bat fatalities); and,
- identify possible critical wind turbines and, if necessary, define further operational parameters to reduce bat fatalities.

The following aspects should particularly be considered during post-construction monitoring:

- collision risk for Serotine Bat at WPP 1 and WPP 2, both located near a flight path, and WPP 48 where bat-box recordings indicate high levels of activity during single nights;
- identifying the annual period of activity of bats in the rotor swept area of that wind turbines where a shut-down program is recommended (WPPs 16, 37, 38, 39, 44, 59 and 64) and probably adjusting the shut-down program due to new findings;

- collision risk for Common Noctule at WPP 48 where bat-boxes also indicated high activity in single nights.

Thus the following post-construction monitoring will be undertaken:

A batbox will be installed in each nacelle of the following wind turbines from mid of March to mid-November for at least two years post-construction: WPP 1, WPP 2, WPP 38, WPP 48, WPP 59 and WPP 64. This selection of turbines provides a representative picture of bat activity across the site. Survey information from these locations will be applicable for nearby turbines also located in areas of value to bats.

Batboxes will be installed in the nacelle and will record permanently during the whole study period. Electricity is provided by the WPP as so they can operate continuously. Details of each survey night are sent via text message which also supplies details of the status of the recorders.

The batbox will be installed from mid-March to mid-November, providing information about bat activity at hub-height during every night of the surveyed period. Weather conditions are collected by the turbines, providing a detailed overview of bat activity in relation to whether conditions.

Periods of high bat activity can be identified during the monitoring (e.g. depending on time of the year, time of the night and wind conditions) and periods of high risk of collisions can be predicted. This information can be used to inform the turbine operating parameters to reduce bat fatalities mentioned in Section D3.2 above, and adjustments made to the operating programme if required. If the results of the two year monitoring show no clear result, the monitoring will be extended for another year or until clear results have been established.

The results from the monitoring studies will be analysed by a bat specialist. If results from post-construction monitoring identify previously unknown areas of high value to bats, and/or areas where bat fatalities have been recorded, this will be fed into the operating restrictions of turbines (Section E3.2 above).

Impacts to arable habitats from the development have been assessed as not significant, and no monitoring of this habitat has been proposed.

Post-construction Bird Surveys

Post-construction monitoring will be carried out to assess the operational impacts of the proposed wind farm.

Local regulatory requirements (Official Gazette of RS, No. 72/2010) state that all wind farms over 50 MW are equipped with continuous monitoring equipment for monitoring bird and bat movements through and around the wind farm site. At the time of writing, it remains to be confirmed with the Institute for Environmental Protection what is meant under equipment to provide constant monitoring of bird and bat movements through and around the wind farm site (e.g. radars, cameras, etc.). This technology is generally considered as a useful addition rather than a stand-alone post-construction monitoring technique (Natural England, 2010). The evidence indicates that the installation of permanent radar may be of limited use for this project and is not considered to be BAT. The developer is waiting for final confirmation as to whether installation of radar is required.

The latest U.K. guidance (Natural England, 2010) on monitoring onshore wind farms both pre- and post-construction, recommends the survey methodology used for the additional bird surveys (detailed in Appendix CIII). It is recommended that post-construction monitoring will follow this methodology to allow direct comparisons of bird abundance and flight activity within the survey area, pre- and post-construction. This will involve 36 hours of vantage point surveys at each of the 6 vantage points during both the breeding and winter seasons, plus 9 breeding bird surveys between late March and July. In line with U.K. guidance, this monitoring is proposed for years 1, 2, 3, 5, 10 and 15.

It is proposed that post-construction monitoring should also include corpse searches for the first three years after construction. These corpse searches allow the actual bird mortalities for the wind farm to be established, allowing the operator to put in place further mitigating measures in the unlikely event that the wind farm is shown to have a significant mortality impact on any species of concern.

The proposed methodology will be agreed with the local planning authority prior to construction.

E5.2 Noise

We are not proposing monitoring to be undertaken during the construction phase of the project nor are we proposing any post construction (i.e. operational phase) monitoring. Evidence

indicates that the noise levels will fall well within the prescribed limits during operations and appropriate controls will be in place during construction. In the event that noise appears to be causing a nuisance during operation, amendments to the construction management programme will be implemented. In the event that, during operation, the wind farm appears to be causing nuisance, a post construction monitoring programme will be devised and agreed with the appropriate regulatory authorities.

E5.3 Traffic and Transport

It is not deemed to be necessary to undertake any specific monitoring associated with the traffic and transport. However, we expect that the transport management procedures will include an audit process to ensure that the construction traffic is adopting the appropriate transport routes.

E5.4 Socio-Economic

Complaints and grievances submitted through the Project grievance mechanism should be regularly monitored. Feedback received from various Project stakeholders will alert WEBG of any problems or issues that need to be dealt with, whether on an individual or community level. For example, frequent grievances regarding levels of traffic related noise at certain times of day or reoccurring difficulties in accessing land with agricultural machines and equipment may indicate that the Transport / Traffic Management Plan needs to be re-adjusted.

Grievance management itself needs to be monitored to ensure that all received complaints are addressed as described in the Project SEP. All of this also pertains to workers' grievances.

Another key activity that requires monitoring is the reinstatement of land upon completion of construction activities, and later after decommissioning. Proper reinstatement is key to ensuring that people can continue to farm their land and expect the same quality of crops, so that their livelihoods do not suffer. The same applies to restoration of roads. This needs to be monitored at the end of constriction, to ensure that all roads have been reinstated to at least pre construction level. The same applies during operations, concerning road repairs and maintenance.

Similarly, the execution of compensation payments for lost crops and damages must be monitored to ensure that it is being paid in a timely manner, so as to prevent any loss of livelihoods. If businesses are affected by increased traffic, their losses must be compensated and this too must be monitored to ensure livelihoods are improved or at least restored to the previous level.

Finally, the implementation of the Social Investment Programme should be regularly monitored to ensure that it is achieving its goals and if there is a need to update possible areas of support, revise the application procedure, include more people in the decision making process, etc.

E5.5 Landscape and Visual Impact

Further to a programme of advanced mitigation and enhancement, (including replacement tree and shrub vegetation) all areas should be suitably protected, maintained in line with good horticultural practice and monitored for a minimum of 5 years upon completion of the proposed development.

The following aspects should be considered during post-construction monitoring:

- The monitoring of the planting areas will ensure that the planting is suitably maintained ensuring it achieves the performance and function as intended such as the screening of views from sensitive areas and replacing lost vegetation through preconstruction site clearance activities.
- Monitoring should be undertaken at least annually for the duration of the 5 year period upon completion of the planting operations. The monitoring visit should be undertaken by a landscape architect or a suitably qualified horticulturalist.
- During monitoring, plant stock should be inspected to assess the plant establishment and identify rates of plant losses. Plant failures should be recorded and species replaced within the first available planting season, generally between November and February.

E5.6 Health, Safety and Public Nuisance

We are not proposing any specific monitoring associated with Health, Safety and Public Nuisance. However, we expect that the management systems implemented for construction and operation will incorporate the following:

- Appropriate communications processes to receive communications from internal and external stakeholders
- Implementation of a non-conformance and corrective action process to record issues reported by internal and external stakeholders
- Audits to review the Health and Safety Performance during all phases of the project and encompassing work undertaken by all workers associated with the project, particularly those that are involved with site work.
- Transport management procedures will include an audit process to ensure that the construction traffic is adopting the appropriate transport routes and that health, safety and public nuisance issues are not being caused.
- Senior management review of the health and safety performance and improvements where necessary to ensure international level best practice.

Implementation of the management arrangements will be a requirement of any IFI and will be part of the Environmental and Social Action Plan (ESAP).

E5.7 Surface Water, Effluent and Land and Ground Quality

We are not proposing any specific monitoring associated with surface water, effluent and land and ground quality. However, we expect that the management systems implemented for construction and operation will incorporate the following:

- Appropriate training for all personnel involved in the handling of hazardous materials.
- Appropriate communications processes to receive communications from internal and external stakeholders, including that associated with reporting releases of hazardous materials to the environment.
- Implementation of a non-conformance and corrective action process to record issues reported by internal and external stakeholders.
- Audits to review the environmental performance during all phases of the project and encompassing storage, containment and use of all hazardous substances so as to prevent emissions to the environment.
- Senior management review of the environmental performance and improvements where necessary to ensure international level best practice.
- An accidental spillage procedure will be drafted and put in place prior to construction beginning.

Implementation of the management arrangements will be a requirement of any IFI and will be part of the Environmental and Social Action Plan (ESAP).

EI Appendices

EI.I Social Investment Programme

The cornerstone of the WEBG's Social Investment Programme is the cooperation with Local Communities (LC) to enhance local economic and cultural development, and promote EU spirit, principles and values of EU integration with special focus on harmonization with EU legislation, enhancement of transparency, sustainable development, Aarhus principles, cultural diversity, human rights, civil liberties and non-discrimination on any grounds in private or professional life.

The LC Offices exist in Serbia within local governments, are defined by the Law on Local Self Government, and represent one or more communities (villages). In rural areas of Serbia, such as the Project area, they are the most direct and effective proponents for citizens' interests. LC representatives are elected by direct vote by all citizens of a local community and have a four-year term.

Since Local Community Offices are directly elected by and responsible to the citizens and are essentially local community's voice in its purest form, WEBG has from the very beginning of its activities in Serbia, channelled its corporate-social responsibility activities through LCs. WEBG has to date supported a number of local level initiatives, festivals, sports events, competitions, etc. In addition, WEBG has invested considerable resources to support national level initiatives which promote the rule of law and transparency as the cornerstone of Serbia's sustainable development in economic, political and social aspect.

As of 2013, WEBG will introduce a system for financing social investment activities in three local communities surrounding the Project area – Mramorak, Dolovo and Vladimirovac, through their respective LC Offices. An annual social investment budget will be established and divided into three parts proportionate to the expected level of Project impacts on each community in the forthcoming year. WEBG will allocate funds each year in such a way to ensure that it reflects the changes anticipated during different Project phases and to take into account other relevant factors.

Upon announcing the available annual budget, LC Offices will be asked to publish an invitation to citizens, associations, and organizations to submit their proposals to both local LC Offices and WEBG which address the following issues:

- Small infrastructure improvements
- Education and sports
- Support for vulnerable people (e.g. elderly, disabled, youth or children)
- Environmental protection
- Local customs and traditions
- Promotion of European values, rule of law, transparency and non-discrimination.

Submitted proposals should include the following sections:

- Name of the local community submitting the proposal and contact details of the responsible person
- Description of the proposed activity
- Duration of the activity and implementation period
- Budget breakdown
- Explanation of how the action is expected to contribute to local development and / or further socially desirable goals
- Other relevant information.

The LC Offices will be requested to organize public discussions inviting all local residents, associations and organizations to discuss and vote on the proposals. Upon public discussions and collection of all comments and opinions, WEBG and the LC Councils will consider proposals which address the stated objectives.

WEBG will decide which proposals will be funded, in accordance with the above principles, in the forthcoming year. WEBG may fund more than one proposal from a particular community if they fit within the allocated budget. In choosing the applications for funding, WEBG will take into account the minutes from public discussions and meetings with the LC Council, the feasibility of the

proposed activity, the sustainability of the action, the number of beneficiaries, and compliance with WEBG's social investment programme and its goals.

A list of successful proposals will be published on WEBG's website, relevant LC Offices, along with a brief pertinent description, including the name of the action, location, anticipated implementation period, and budget.

Local Communities will be requested to follow-up and collect brief reports on to date activities from the successful applicants as well as any local media coverage, and local community response, in order for WEBG to assess the short-term, medium-term, and long-term impacts on the community. These will be consolidated by WEBG into a single social investment annual report describing all funded activities and achieved results, also published on the company website.

The system of support to local communities will be continually improved and revised to suit local needs and respond to feedback received from the communities.

F Summary of Impacts and Control Measures

F1 Introduction

The following Sections provide a summary of the impact assessment detailed in Section D, the Management and Mitigation measures described in Section E and the 'Residual Impact' once the Management and Mitigation Measures have been applied.

The residual impact is summarised as a simple graduate scale from positive benefits down to negative impacts as follows:

- Substantial Beneficial
- Moderate Beneficial
- Minor Beneficial
- Negligible Beneficial

Benefit

- No Change

- Negligible Adverse
- Minor Adverse
- Moderate Adverse
- Significant Adverse

Disbenefit

Where the summary of the impact is variable, such as where the impact is variable over a number of individual receptors, this can be expressed as a band of potential impacts. For example, a visual impact may be dependent on the position/location of individual receptors. In such a case, the impact may include:

- No change
- Negligible Adverse
- Minor Adverse
- Moderate Adverse

Rather than list each of the potential impact levels, the residual impact will be expressed as '*No Change – Moderate Adverse'*, where the impacts include those presented in the text (in this case '*No Change – Moderate Adverse)* and those in between on the impact scale (in this case *'Negligible Adverse and Minor Adverse'*)

The following summaries are divided in to the three phases of the project; Construction; Operations; and, Closure and Decommissioning. Within each section the impacts, associated management and mitigation measures and residual impacts are presented in the same order as the impacts are presented in Section D. That is, with the key potential impacts associate with each phase of the project, followed by less significant issues.

F2 Summary of Construction Phase Impacts and Control Measures

F2.1 Ecology and Nature Conservation

ECOLOGY & NATURE CONSERVATION: HABITATS			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Loss of arable farmland habitat and marginal habitats such as grassland and scrub	Habitat management and enhancement (see section E3.2.1)	Loss of farmland habitat	**Minor Adverse**
Disturbance to mammal and reptiles	Clearance of working areas prior to construction	None	**Minor Adverse**
ECOLOGY & NATURE CONSERVATION: BIRDS			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Disturbance to breeding birds during vegetation clearance	Time vegetation clearance to avoid the breeding season	Breeding birds will not be disturbed	**No Impact - Negligible Adverse**
Loss of breeding quail habitat	Create of 4.5Ha of fallow strips and flower-rich field margins located at least 250m from any wind turbines	The fallow strips and flower-rich field margins will provide breeding habitat for the quail territories predicted to be lost as a result of the wind farm	**No Impact - Negligible Adverse**
Loss of breeding bird habitat	Creation of quail habitat will benefit other breeding birds	Some breeding habitat will be lost, however the impacts will be minor due to the abundant surrounding agricultural land and the creation of quail habitat, which will benefit other breeding birds	**Minor Adverse**
ECOLOGY & NATURE CONSERVATION: BATS			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Noise, vibration and light disturbance to roosting, commuting and foraging bats	Minimise construction work between dusk and dawn. Restrict artificial lighting to required areas only.	Some noise, vibration and light disturbance to roosting, commuting and foraging bats is inevitable, but implementation of appropriate measures should have no appreciable effect.	**Minor Adverse**

F2.2 Landscape and Visual Impact

LANDSCAPE AND VISUAL IMPACT			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Impact on land cover to form the new access points and tracks between turbines, electricity pylons, construction compound and material storage facilities.	Judicious vegetation clearance to ensure only limited vegetation is cleared to facilitate construction access and operations; Suitable tree protection to be provided through protective fencing and ground protection surfacing.	No significant impact expected.	**Minor Adverse**
Impact on landscape character due to the increased 'urbanisation' of the landscape associated with construction activities.	Bespoke mitigation planting at strategic sites both within and outside the development area to create thickets of vegetation in keeping with the landscape character.	The turbines and electricity pylons would progressively introduce modern dominant elements which would contrast with the character of the rural landscape and ultimately become the dominant feature and characteristic of the landscape.	**Minor Adverse**
Impact due to change in land use including an increase in movement of construction vehicles, plant and equipment.	Full reinstatement of working areas to agricultural use.	These effects will have a limited degree of exposure on the wider area and as such, the effects on the landscape resources are expected to be minor	**Minor Adverse**
Visual / landscape character impact on adjacent sites (Deliblato Sands)	Bespoke mitigation planting at strategic sites both within and outside the development area to create thickets of vegetation in keeping with the landscape character.	The proposed development will be contained at a distance of a minimum of 1km from the designated area the proposals will not result in direct physical effects on this area.	**Minor Adverse**
Visual Impacts on views from villages and hamlets Properties on the edge of villages will have views of wind turbines in the development area and potential views of the electricity pylons depending on orientation and location of receptor within a given settlement.	Bespoke mitigation planting at strategic sites both within and outside the development area to create thickets of vegetation and perform targeted screening of potential visual impacts.	Residual Impact varies according to receptor location; Most significant visual impact experienced by receptors on edge of village settlements toward development, within the immediate area including receptors within; Dolovo, Mramorak, Vladimirovac.	**Varied Adverse: Negligible Adverse - Significant Adverse** **(dependent on settlement location and orientation)**
Visual Impacts on views from vehicle travellers.	Bespoke mitigation planting at strategic sites both within and outside the development area to create thickets of	Views from main E70 highway would be limited to vehicle travellers travelling north eastwards towards the	**Minor -Moderate Adverse**

LANDSCAPE AND VISUAL IMPACT			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Including numerous locations throughout the study area often associated with locations between villages and settlements from varying hierarchy of roads/ lanes and tracks in the area. Impacts associated with short term activities during construction such as crane and plant machinery movement during wind turbine and electricity pylon installation.	vegetation and perform targeted screening of potential visual impacts.	development. Views would be fleeting due to speed of travel and intervening vegetation alongside the road. Views from village link roads would be restricted to a limited number of road sections and direction of vehicle travellers. Views from small tracks between villages within close proximity of the development would be most severely affected; however these are infrequently used.	
Visual Impact on views from people in work Including receptors at varying distances from the scheme, ranging from immediate to in excess of 15km. Impacts associated with short term construction activities such as turbine and pylon installation processes.	No specific mitigation measures,	Views of the scheme would vary, from direct views of the temporary construction activities and direct views of the assembled turbines. In areas views are disrupted by intervening vegetation and few vantage points are available due to the low lying and level landform.	**Minor - Moderate Adverse**
Visual Impact on views from users of Deliblato Sands Designated Nature Site Impacts associated with construction activity such as crane and plant machinery movement and turbine installation. Potential views of a very limited number of turbines from the Deliblato Sands site, these views would in all likelihood comprise only the upper sections of a limited number of turbines concentrated near western fringes of designated area.	No specific mitigation measures,	Where views are available the wind farm development would form a small proportion of the view and, from these areas, the scale and composition of the view are not likely to be affected due to intervening vegetation and topography. Limited potential for views of the power line and pylons owing to distance and intervening vegetation and built settlements to the west of the Deliblato Sands area.	**No Change - Minor Adverse**

F2.3 Traffic and Transport

TRAFFIC AND TRANSPORT			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Increased heavy vehicles traffic both locally and regionally.	Use of designated managed traffic routes only. Restricting delivery hours to reduce noise nuisance; avoid heavy truck movements in the night hours Considering whether deliveries should be scheduled to avoid peak times to reduce congestion; Heavy construction traffic will be subject to a traffic management plan, as necessary.	The traffic has the potential to contribute to congestion and lead to complaints due to noise/vibration nuisance on a local basis. However, the transport study indicates that there will not be a significant impact.	**Minor Adverse**

F2.4 Noise

NOISE AND VIBRATION			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Noise from construction of wind turbines – No significant impact expected.	Use Best Practicable Means during construction to prevent/manage noise emissions. For example, undertaking piling during day light hours only.	No significant impact expected.	**Negligible Adverse - Minor Adverse**
Noise from construction traffic - Potential for minor adverse noise and vibration impacts.	Define access routes to the site with the smallest number of properties in proximity to it.	There may be noise/vibration increases at residential properties in proximity to the chosen access routes.	**Minor Adverse**

F2.5 Socio-Economic Impacts

IMPACTS TO LAND USE			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Reduction in land available for agriculture The total amount of land which will be occupied during construction is approx. 128 ha. (of which approx. 98 ha will only be temporarily occupied during construction).	Minimise the amount of land occupied during construction Position WTGs near edges of land plots to optimize land use. Upon the completion of construction activities, fully reinstate the land not permanently occupied *Compensation for privately owned land already executed.*	Approx. 30 ha of land will remain unavailable for agriculture after construction. *Possibility of impacts on livelihoods discussed in separate section below.*	**Minor Adverse**
Difficulties in accessing land as a result of increased traffic and access track upgrades	Develop and implement a traffic management plan Provide timely information to users of land of when access to their land might be more difficult (e.g. scheduled access track upgrades) Establish and implement a community grievance mechanism	Individuals may still occasionally experience difficulties in accessing land. *Possibility of impacts on livelihoods discussed in separate section below.*	**No impact - Negligible Adverse**
EMPLOYMENT AND PROCUREMENT OPPORTUNITIES			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Creation of direct employment opportunities Approximately 400 people will be employed during construction, most of which will be either local (approx. 20%) or national staff (approx. 50%).	Put in place transparent and fair recruitment procedures Ensure that all non-employee workers are engaged in line with both national legislation and applicable international (ILO) standards and recommendations Provide a grievance mechanism for workers Implement a training programme for the local workforce to enable them to take advantage of the opportunity	*Possibility of impacts on livelihoods discussed in separate section below.*	**Moderate Beneficial**

Creation of indirect employment opportunities, associated with: • the project's supply chain • spending of project employees in local communities	Procure goods and services locally wherever possible	*Possibility of impacts on livelihoods discussed in separate section below.*	**Minor Beneficial**
Creation of employment related expectations among the local population	Continue to provide timely and transparent information regarding employment opportunities related to the Project	Individuals may still have unrealistic employment expectations from the Project.	**No impact - Negligible Adverse**
IMPACTS ON LIVELIHOODS			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Economic displacement may occur during construction for the following categories of people: • Persons who are using the land plots which have been or will be acquired for the project, but who are not owners of land, and whose crops may be affected by construction. • Persons who are using the land plots which will be crossed during the transport and installation of WTGs in their future locations or other land which may be disrupted during construction, whose crops may be affected.	Minimise the amount of land occupied / disrupted during construction Provide timely information to users of land of when construction is planned to begin and how lost crops and damages will be compensated Compensate all users of land for lost crops and any other damages at full replacement value, in accordance with the Serbian Law on Planning and Construction and IFI policies Fully reinstate the land after disruption Establish and implement a grievance mechanism	Proposed mitigation should be enough to at least restore livelihoods, if not improve them.	**No impact**
Loss of livelihoods as a result of loss of land available for agriculture	Minimise the amount of land occupied during construction Upon the completion of construction activities, fully reinstate the land not permanently occupied *Compensation for privately owned land already executed.*	Proposed mitigation should be enough to at least restore livelihoods, if not improve them.	**No impact**
Increased incomes for farmers who sold their land to	No mitigation needed.	*Possibility of further impacts on livelihoods discussed below.*	**Minor Beneficial**

WEBG (during 201037) and received compensation with which they bought replacement land.			
Improvements for local economies as a result of employment and increased incomes for farmers.	No mitigation needed.	None.	**Minor Beneficial**
Loss of livelihoods as a result of transport and increased traffic Negligible with potential to rise to low adverse if any businesses along transport routes are identified.	Provide timely information to people/households located along selected transport route about the transport plan and possible impacts as well as foreseen mitigation measures. Compensate any business losses full replacement value, in accordance with the Serbian legislation and IFI policies[38] If compensation alone is not sufficient to restore livelihoods, implement livelihood restoration measures in accordance with IFI policies Establish and implement a grievance mechanism	Proposed mitigation should be enough to at least restore livelihoods, if not improve them.	**No impact**
Increased value of land in the Project area. ***Negligible***	No mitigation necessary.		**No impact**
COMMUNITY HEALTH, SAFETY AND SECURITY			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Influx of workers into the Project area, further impacting on community health, safety and security (law and order issues, social pathologies)	Encourage contractors to hire local workforce, i.e. give preference to suitably qualified and experienced applicants from the local communities. Enforce workers code of conduct Cooperate and coordinate with local health and safety facilities	The possibility of occasional incidents still exists. Such incidents could lead to tensions between the community and WEBG. However, the CWP/WEBG has regional and international experiences in solving these issues.	**Minor Adverse - Moderate Adverse**

[37] Only one family sold their land in January 2011.
[38] Full replacement cost is defined in accordance with PR 5 of the EBRD Environmental and Social Policy, as the market value of the assets plus the transaction costs associated with restoring the assets.

Increase in traffic (bringing equipment and materials to the site and employee travel) could lead to more accidents in the local communities and reduced quality of life.	Provide timely information to people/households located along selected transport route and consult on mitigation measures Develop and implement a traffic management plan Workers code of conduct (guidance on safe driving) Cooperate and coordinate with local health and safety – security facilities	Accidents involving local community members will have serious effects on the individual or his/her household and could lead to tensions between the community and WEBG	**Minor Adverse - Moderate Adverse**
IMPACTS ON INFRASTRUCTURE			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Improved access to agricultural plots as a result of upgrading and widening of access tracks prior to construction	No mitigation needed.	None.	**Minor Beneficial**
Damages to road surfaces during transport of heavy machinery	Preparation of roads for heavy transport before construction Restoration of roads to at least pre-construction level	If roads used during construction are not restored, this could lead to tensions between WEBG and the local communities.	**Minor Adverse - Moderate Adverse**

F2.6 Health, Safety and Public Nuisance

HEALTH, SAFETY AND PUBLIC NUISANCE			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Industrial accidents associated with the construction of the wind farm. Potential for serious injury or death, particularly associated with falls from height and electrocution.	Implementation of an appropriate health and safety management system for all personnel on site.	Small scale accidents and slight injuries are inevitable on a large construction site. However, implementation of appropriate management systems should ensure that the risk of serious accident is very small.	**No Change - Minor Adverse**
Accidents associated with construction traffic, both on and off site associated with both workers and members of the public.	Accidents associated with construction traffic are not acceptable and all efforts should be made to prevent them. This will include implementation of traffic management plan. This includes	The traffic management measures should be robust enough to prevent accident.	**No Change**

HEALTH, SAFETY AND PUBLIC NUISANCE			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
	ensuring vehicles are driven within speed limits and with care on public roads, as well as on site.		
Risks to the public and also workers associated with unauthorised site access. Risk of injury to those entering the site unauthorised and also risks to workers as a result of the unauthorised access.	Implementation of appropriate signage and site security.	Implementation of appropriate management systems will prevent impacts.	**No Change**

F2.7 Emissions to Ground and Water

GROUND AND WATER			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Accidental release of fuels, oils, chemicals, hazardous materials, etc., to the ground, groundwater and/or surface water.	Appropriate procedures and protocols to be established and monitored for materials delivery and handling	Potential for accidental release during delivery of materials to the site will be minimised	**No Change**
Deliberate or accidental discharge of sanitary wastewater to ground, groundwater and/or surface water.	Sanitary waste will not be discharged to the ground deliberately. Measures to be in place to prevent accidental releases including locating waste water management systems away from open water and assurance that appropriate containment both primary and secondary is in place.	None	**No Change**
Discharge of pollutants in water used for plant, equipment and vehicle washing to ground	Washing activities will take place on areas with appropriate containment and procedures and protocols will be established and monitored to ensure that the preventative measures are efficient	Potential for accidental release of pollutants to the ground during washing activities will be minimised	**No Change**
Increase of sediment load in natural aquatic receptors resulted from direct runoff disposal	Minimisation of excavations face during construction Temporary drainage grooves and sedimentation ponds for surface runoff collection	None	**No Change**

F2.8 Archaeology and Cultural Heritage

CULTURAL HERITAGE			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Possible chance finds There are no registered archaeological or cultural heritage sites within the project area, however the archaeological features in the area have not been investigated fully and chance finds during construction are possible. The Institute for Protection of Cultural Monuments has identified there is a potential for archaeological or cultural finds within the project area. Findings will increase knowledge of cultural heritage but unnecessary damage will be a negative impact.	In case of chance finds, all works will be immediately halted and the Institute for Cultural Heritage from Pančevo will be notified to issue necessary measures, in accordance with the Serbian Law on Cultural Heritage.	If chance finds are encountered - potential for slowing down construction or changes in the project footprint. Any findings will increase knowledge of archaeological and cultural heritage.	**Minor Beneficial - No Change**

F2.9 Air Emissions

AIR			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Dust emissions during construction and ground works	Development of procedures for : • water spraying roads and dusty materials stockpiles • sheeting vehicles carrying dusty materials on leaving the site to prevent materials being blown from the vehicles • speed limits on unmade surfaces on site to limit dust	Dust propagation will be limited to construction area and will not influence local community. However workers should be supplied with dust masks especially in dry days.	**Minor Adverse**
Emissions from generators and vehicles	Assurance that all engines operate to national standards and are fully maintained, particularly to prevent the release of black smoke.	Minor emissions from engines.	**Minor Adverse**

F3 Summary of Operational Phase Impacts and Mitigation Measures

F3.1 Ecology and Nature Conservation

ECOLOGY: HABITATS			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
There will be no further impacts on the habitats once the wind farm has been constructed.	N/A	N/A	**No Change**
ECOLOGY: BIRDS			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Collision risk of birds with wind turbines	No mitigation is proposed	The baseline data and associated research has concluded that the proposed turbines are not expected to have a significant collision impact on bird populations	**Minor Adverse**
Disturbance/displacement/barrier effect of birds from wind farm	No mitigation is proposed	It is considered that some species, such as geese, are likely to be displaced from the wind farm. However, there is plentiful alternative agricultural land in the surrounding area and therefore this displacement is not expected to have a significant impact. No clear flight lines were recorded through the wind farm. Therefore, the proposed wind farm is not thought to present a barrier area for birds.	**Negligible Adverse - Minor Adverse**
Collision risk with OHLs	Possible installation of visual aides to mark OHL if needed.	Collision risk was considered to not be significant even without mitigation.	**No Change - Negligible Adverse**
ECOLOGY: BATS			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Collision risk with turbine blades	• Post Construction monitoring	Reduced collision risk	**Negligible Adverse**

ECOLOGY: HABITATS			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
	• Targeted turbine shutdown during certain weather conditions (see section E3.2.2)		

F3.2 Landscape and Visual Impact

LANDSCAPE AND VISUAL IMPACT			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Effects on Vegetation and Land Cover The site comprises large agricultural fields with open, undefined boundaries and therefore the proposals will not result in the loss of any significant landscape features or vegetation of particular value for its contribution to the wider landscape.	The application of a programme of advanced mitigation planting. All planting should comprise native plant species to reflect the local landscape character. Turbines should be a colour which is unobtrusive, such as a neutral matt colour (pale grey) to blend with the muted colours of the surrounding landscape and predominant sky colours. Corporate logos, lettering and motifs should be avoided.	During operation phases, access tracks, the footprint of the turbines and electricity pylons will occupy a limited area of the overall site extents, this combined with the restoration of construction areas will in the main return the site to its current land cover condition.	**No Change**
Effects on Landscape Character The operation of the wind farm would result in a negative change to the landscape character of the site and its immediate surroundings due to the introduction of the tall industrial structures in the rural and predominantly low lying, open landscape.	The application of a programme of advanced mitigation planting. All planting should comprise native plant species to reflect the local landscape character. The proposed turbines should be a colour which is unobtrusive in the landscape, using a neutral matt colour. Corporate logos, lettering and motifs should be avoided.	The turbines and electricity pylons would introduce modern dominant elements which would contrast with the character of the rural landscape and become the dominant feature and characteristic of the landscape.	**Minor Adverse – Moderate Adverse**
Effects on Land Use The scheme would introduce new tall vertical, manmade elements and associated infrastructure into	Areas affected by construction activities to be fully reinstated and reverted back to agricultural land use.	It is anticipated that there will be continuation of agricultural land use over the rest of the site during operation and	**No Change - Minor Adverse**

LANDSCAPE AND VISUAL IMPACT			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
an existing rural landscape resulting in alteration to the current agricultural land use.		thus no detrimental change to the land use of the site.	
Visual Impacts on views from villages and hamlets; Operational phase would see the introduction of large scale features that, from certain locations, would occupy a large proportion of the view from residential properties. Properties on the edge of villages will have views of wind turbines in the development area and potential views of the electricity pylons depending on orientation and location of receptor within a given settlement.	Bespoke mitigation planting at strategic sites both within and outside the development area to create thickets of vegetation and perform targeted screening of potential visual impacts. Turbines should be a colour which is unobtrusive, such as a neutral matt colour (pale grey) to blend with the muted colours of the surrounding landscape and predominant sky colours. Corporate logos, lettering and motifs should be avoided.	Residual Impact varies according to receptor location and perception; Most significant visual impact experienced by receptors on edge of village settlements toward development, within the immediate area including receptors within; Dolovo, Mramorak, Vladimirovac.	**Minor Adverse – Moderate Adverse** **(dependent on settlement location, orientation and perception)**
Visual Impacts on views from vehicle travellers Including numerous locations throughout the study area often associated with locations between villages and settlements from varying hierarchy of roads/ lanes and tracks in the area.	Bespoke mitigation planting at strategic sites both within and outside the development area to create thickets of vegetation and perform targeted screening of potential visual impacts. Turbines should be a colour which is unobtrusive, such as a neutral matt pale grey to blend with the muted colours of the surrounding landscape. Corporate logos, lettering and motifs should be avoided.	Views from main E70 highway would be limited to vehicle travellers travelling north eastwards towards the development. Views would be fleeting due to speed of travel and intervening vegetation alongside the road and within the intermediate landscape. Views from village link roads would be restricted to a limited number of road sections and direction of vehicle travellers. Views from tracks between villages and farmland within close proximity of the development would be most severely affected; however these are infrequently used.	**Minor Adverse - Moderate Adverse**
Visual Impact on views associated with people who are working	The proposed turbines should be a colour which is unobtrusive in the landscape. Masts should be finished using a neutral matt colour such as a pale grey to blend with the muted colours of the surrounding landscape and predominant sky colours.	Impact on views would vary according to distance of the worker from site and their work activity.	**Minor Adverse - Moderate Adverse**

LANDSCAPE AND VISUAL IMPACT			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
	Corporate logos, lettering and motifs should be avoided.		
Visual Impact on views from users of Deliblato Sands Designated Nature Site Potential views of turbines from the Deliblato Sands site would in all likelihood comprise only the upper sections of a limited number of turbines dependent on viewer's position within the area. Limited potential for views of the power line and pylons owing to distance, intervening vegetation and built settlements to the west of the Deliblato Sands area.	The proposed turbines should be a colour which is unobtrusive in the landscape. Masts should be finished using a neutral matt colour such as a pale grey to blend with the muted colours of the surrounding landscape and predominant sky colours. Corporate logos, lettering and motifs should be avoided.	Where views are available the wind farm development would form a small proportion of the view and, from these areas, the scale and composition of the view are not likely to be affected due to intervening vegetation and topography.	**No Change - Negligible Adverse**

F3.3 Traffic and Transport

TRAFFIC AND TRANSPORT			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Increased heavy vehicles traffic both locally and regionally.	Use of designated managed traffic routes only. Heavy construction traffic will be subject to a traffic management plan, as necessary.	There should be no appreciable residual impact	**Negligible Adverse**

F3.4 Noise Impact

NOISE AND VIBRATION			
Environmental Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Noise from wind farm operation – Levels below permitted values, but increases in noise expected – minor adverse.	None required as below permitted levels.	Wind farm will contribute to noise levels, but should not be significant	**Negligible Adverse**

F3.5 Socio-Economic Impacts

IMPACTS TO LAND USE			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Reduction in land available for agriculture The total amount of land which will continue to be occupied after construction and during operations is approx. 30 ha. (of which approx.11.8 ha only until decommissioning).	*Compensation for privately owned land already executed*	Approx. 18 ha of land will remain permanently unavailable for agriculture.	**Negligible Adverse**
Imposition of minor use restrictions on land available for agriculture	Confine use restrictions only to areas needed for the safe operation of wind farms and easy access for repairs and maintenance.	None.	**No impact - Negligible Adverse**
EMPLOYMENT AND PROCUREMENT OPPORTUNITIES			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Creation of direct employment opportunities Approximately 20 individuals (a few local and international, but mostly national) will be contracted by WEBG during the operational phase of the project.	Put in place transparent and fair recruitment procedures	None.	**Negligible Beneficial**
Creation of indirect employment opportunities, associated with: • the project's supply chain • spending of project employees in local communities	Procure goods and services locally wherever possible	None.	**Negligible Beneficial**

IMPACTS ON LIVELIHOODS			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Economic displacement Persons who are using the land plots which will be crossed during repairs of WTGs may be economically displaced if their crops are affected.	Minimise the amount of land occupied / disrupted during repairs Compensate all users of land for lost crops and any other damages at full replacement value, in accordance with the Serbian Law on Planning and Construction and IFI policies Fully reinstate the land after disruption Implement a grievance mechanism	Proposed mitigation should be enough to at least restore livelihoods, if not improve them.	**No impact**
Increased incomes for farmers who regained full access to land (under lease from WEBG), previously occupied for construction.	No mitigation needed.	None.	**Minor Beneficial**
REVENUE GENERATION FOR THE LOCAL GOVERNMENT / COMMUNITY			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Increased revenue for Kovin Municipality and local community Mramorak	Ensure all payments are made in a timely and transparent manner	Tensions between the Project and other local communities not benefiting directly from taxes and profit sharing agreement Mitigation: Implementation of the WEBG Social Investment Programme	**Minor Adverse - Moderate Adverse**
Enhanced tourism opportunities for local communities	Support tourism related initiatives from local communities through the WEBG Social Investment Programme	Local economic development	**Moderate Beneficial - Minor Beneficial**
WEBGs presence in the Municipality Kovin is attracting foreign and domestic investments in the municipality and the wider area	Continued support and lobbying for investments in the project area	Local economic development	**Moderate Beneficial - Minor Beneficial**
IMPACTS ON INFRASTRUCTURE			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Improved access to agricultural plots as a result of regular maintenance of access tracks needed to access WTGs for repairs and maintenance	Regular maintenance of access tracks	None.	**Minor Beneficial**

F3.6 Health, Safety and Public Nuisance

HEALTH, SAFETY AND PUBLIC NUISANCE			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Industrial accidents associated with the operation of the wind farm. Potential for serious injury or death, particularly associated with falls from height and electrocution.	Implementation of an appropriate health and safety management system for all personnel on site.	Implementation of appropriate management systems should ensure that the risk of serious accident is very small.	**No Change - Minor Adverse**
Accidents associated with traffic, both on and off site associated with both workers and members of the public.	Accidents associated with traffic are not acceptable and all efforts should be made to prevent them. This will include implementation of traffic management plan. This includes ensuring vehicles are driven within speed limits and with care on public roads, as well as on site.	The traffic management measures should be robust enough to prevent accident.	**No Change**
Risks to the public and also workers associated with unauthorised site access. Risk of injury to those entering the site unauthorised and also risks to workers as a result of the unauthorised access.	Implementation of appropriate signage and site security.	Implementation of appropriate management systems will prevent impacts.	**No Change**

F3.7 Electric and Magnetic Fields

ELECTRIC AND MAGNETIC FIELDS			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Perception that electric and magnetic fields could cause health impacts. Evidence suggests that this is only possible with very high exposure levels.	Location of the electric and magnetic sources are not situated adjacent to public residences.	No residual impact	**No Change**

F3.8 Electromagnetic Interference

ELECTROMAGENTIC INTERFERENCE			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Potential for disruption of aviation radar and radio systems	Wind farm situated away from main airport and flight paths	None.	**No Change**
Potential for disruption of public telecommunications	Situation and design (including materials design) to minimise disruption. Relevant authorities stated that no disruptions are expected.	In the conditions received from telecommunication operators, it is clearly stated that no disruptions are expected and that they approve the construction of the wind farm.	**No Change**

F3.9 Traffic and Transport

TRAFFIC AND TRANSPORT			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Increased heavy vehicles traffic both locally and nationally, leading to congestion, damage to roadways	Restricting delivery hours to reduce noise nuisance; avoid heavy truck movements in the night hours Considering whether deliveries should be scheduled to avoid peak times to reduce congestion; Heavy construction traffic will be subject to a traffic management plan, as necessary.	The traffic has the potential to contribute to congestion and lead to complaints due to noise/vibration nuisance on a local basis. However, the transport study indicates that there will not be a significant impact.	**Negligible Adverse**

F3.10 Ground and Water

GROUND AND WATER			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Accidental release of fuels, oils, chemicals, hazardous materials, etc., to the ground, groundwater and/or surface water.	Appropriate procedures and protocols to be established and monitored for materials delivery and handling	Potential for accidental release during delivery of materials to the site will be minimised	**No Change**

GROUND AND WATER			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Deliberate or accidental discharge of sanitary wastewater to ground, groundwater and/or surface water.	Sanitary waste will not be discharged to the ground deliberately. Measures to be in place to prevent accidental releases including locating waste water management systems away from open water and assurance that appropriate containment both primary and secondary is in place.	None	**No Change**
Groundwater depletion if borehole sunk to provide water for operations.	Minimisation of water use or elimination of the need for a borehole through transport of water to site by tanker.	Existing groundwater reserves exploitation rate for water supply exceeds by far water requirements. Alternatively, on site water tanks will be installed.	**No Change**

F4 Summary of Decommissioning Phase Impacts and Control Measures

F4.1 Noise

NOISE AND VIBRATION			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Noise from decommissioning of wind turbines – Potential adverse impact from removing turbine foundations.	Use Best Practicable Means.	No change.	**Negligible Adverse - Minor Adverse**
Noise from decommissioning traffic - Potential for minor adverse noise and vibration impacts.	Define access routes to the site with the smallest number of properties in proximity to it.	There may be noise/vibration increases at residential properties in proximity to the chosen access routes.	**Minor Adverse**

F4.2 Traffic and Transport

TRAFFIC & TRANSPORT			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Increased heavy vehicles traffic both locally and nationally	Traffic management and site access to avoid built up areas or areas where traffic may cause nuisance or disruption. Restricting delivery hours to reduce noise nuisance; avoid heavy truck movements in the night hours Considering whether deliveries should be scheduled to avoid peak times to reduce congestion; Heavy construction traffic will be subject to a traffic management plan, as necessary.	The traffic has the potential to contribute to congestion and lead to complaints due to noise/vibration nuisance on a local basis. However, the transport study indicates that there will not be a significant impact.	**Minor Adverse**

F4.3 Socio-Economic Impacts

LAND USE AND LAND ACQUISITION			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Reduction in land available for agriculture The total amount of land which will be permanently lost to agriculture is approx. 18 ha.	Clearance of all materials and equipment Upon the completion of decommissioning, fully reinstate the land	None	**Negligible Adverse**
Increase in land available for agricultural use and no more use restrictions on land. Upon dismantling of WTGs, another 11.8 ha (out of 30 ha) will become available for agricultural use. At the same time, use restrictions which existed on 67 ha of land will cease to exist.	Same as above	None	**Minor Beneficial**
EMPLOYMENT AND PROCUREMENT OPPORTUNITIES			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
The dismantling of WTGs, disposal of materials and reinstatement of land will generate some direct and indirect employment opportunities. A part of those opportunities will be available for local people.	Same as for construction impacts	None.	**Minor Beneficial**
IMPACTS ON LIVELIHOODS			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Economic displacement Persons who are using the land plots which may be crossed during dismantling and transport of WTGs and site clearance, may be economically displaced if their crops are affected.	Same as for construction impacts	Proposed mitigation should be enough to at least restore livelihoods, if not improve them.	**No change**

Restoration of private ownership over land on which WTGs were constructed Owners of land and/or their descendants will have the possibility to regain full ownership of land after decommissioning of WTGs for a fee of 1 EUR (approximately 62 ha)	This provision is already included in the lease contracts signed between WEBG and the owners and registered with the courts.	None	**Minor Beneficial**

F4.4 Health, Safety and Public Nuisance

HEALTH, SAFETY AND PUBLIC NUISANCE			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Industrial accidents associated with the decommissioning of the wind farm. Potential for serious injury or death, particularly associated with falls from height and electrocution.	Implementation of an appropriate health and safety management system for all personnel on site.	Small scale accidents and slight injuries are inevitable on a large decommissioning site. However, implementation of appropriate management systems should ensure that the risk of serious accident is very small.	**No Change - Minor Adverse**
Accidents associated with decommissioning traffic, both on and off site associated with both workers and members of the public.	Accidents associated with decommissioning traffic are not acceptable and all efforts should be made to prevent them. This will include implementation of traffic management plan. This includes ensuring vehicles are driven within speed limits and with care on public roads, as well as on site.	The traffic management measures should be robust enough to prevent accident.	**No Change**
Risks to the public and also workers associated with unauthorised site access. Risk of injury to those entering the site unauthorised and also risks to workers as a result of the unauthorised access.	Implementation of appropriate signage and site security.	Implementation of appropriate management systems will prevent impacts.	**No Change**

F4.5 Ecology and Nature Conservation

ECOLOGY: HABITATS			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Habitat loss	Resurvey of site		**Negligible Adverse**

ECOLOGY: HABITATS			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Disturbance to wildlife	Resurvey of site		**Negligible Adverse**
ECOLOGY: BIRDS			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Disturbance to breeding birds during deconstruction	Time any vegetation clearance to avoid the breeding season	Breeding birds within the work area will not be disturbed	**No Change - Negligible Adverse**
Displacement of bird during deconstruction	No mitigation proposed	Some birds may be displaced from the wind farm area during deconstruction. However, abundant alternative habitat is available, including the quail habitat created during construction	**Negligible Adverse - Minor Adverse**
ECOLOGY: BATS			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Noise, vibration and light disturbance to roosting, commuting and foraging bats	Minimise construction work between dusk and dawn. Restrict artificial lighting to required areas only. (see section E2.1.2)	Potential to disturb bats	**Negligible Adverse**

F4.6 Landscape and Visual Impact

LANDSCAPE AND VISUAL IMPACT (DECOMMISIONING)			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
Impacts of decommissioning are anticipated to be of a similar magnitude and severity as those experienced during construction. This is also likely to be the same of decommissioning of the associated ancillary infrastructure such as overhead power lines and transformer stations should these elements be decommissioned at a separate timeframe to the turbines.	It is anticipated that the processes will be similar to those undertaken during construction therefore the broad aims and objectives of mitigation measures should include: Judicious vegetation clearance to ensure only limited vegetation is cleared to facilitate access and operations during decommissioning; Where machinery access is required in the vicinity of existing vegetation, suitable	Upon completion of the decommissioning, impacts on the landscape character of the area would be insignificant resulting in **no change *compared with the baseline conditions*** once the site has been fully and successfully restored thus reverting back to its pre-existing baseline condition	**No Change**

LANDSCAPE AND VISUAL IMPACT (DECOMMISIONING)			
Impact	**Proposed Control Measure**	**Residual Impact**	**Residual Impact Rating**
	protection should be provided through protective fencing and ground protection surfacing. Land cover should be stripped and stored during the decommissioning operations and subsequently reinstated (cultivated and graded) and returned to a condition suitable for agricultural use upon completion.		

G Further Information

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G2 Abbreviations

b.g.l	Below Ground Level
BAT	Best Available Techniques
BREF	BAT Reference
CAPEX	Capital Expenditure
CCTV	Closed Circuit Television
CEMP	Construction Environmental Management Plan
CO_2	Carbon Dioxide
CSR	Corporate Social Responsibility
CWP	Continental Wind Partners
dBA	Decibels (Acoustic)
DEMP	Decommissioning Environmental Management Plan
EBRD	European Bank for Reconstruction and Development
EC	European Commission
ECSEE	Energy Community of South East Europe
EEA	European Environment Agency
EEC	European Economic Community
EIA	Environmental Impact Assessment
EIONET	European Environmental Information Observation Network
EIPPB	European Integrated Pollution, Prevention and Control Bureau
ESIS	Environmental and Social Impact Statement
EMF(s)	Electric and Magnetic Field(s)
EMS	Environmental Management System
EMS	Elektromreža Srbije Public Enterprise
EPFIs	Equator Principle Financial Institutions
EPs	Equator Principles
ESAP	Environmental and Social Action Plan
ESIA	Environmental and Social Impact Assessment
ESMS	Environmental and Social Management System
ETC/BD	European Topic Centre on Biological Diversity
EU	European Union
EUNIS	European Nature Information System
EUPHRESCO	European Phytosanitary Research Coordination
EUR	Euro - Currency
EUROBATS	Agreement on the Conservation of Bats in Europe
FRY	Federal Republic of Yugoslavia
GHG	Greenhouse Gas
GIS	Global Information Systems
Ha/ha	Hectare
HSE	Health, Safety and Environment
IBA	Important Bid Area
IED	Industrial Emissions Directive
IEEM	Institute of Ecology and Environmental Management
IFC	International Finance Corporation
IFI	International Finance Institution
ILO	International Labour Organization
IPA	International Plant Area
IPCC	Intergovernmental Panel on Climate Change
IPPC	Integrated Pollution Prevention and Control - a European Directive
ISO	International Organization for Standardization
IUCN	International Union for Conservation of Nature
km	kilometre(s)
$kN//m^2$	kiloNeutons per metre squared
kV	kilovolt
kW	Kilowatt

LC	Local Community
LNG	Liquified Natural Gas
LVIA	Landscape and visual assessment
m	meter(s)
m/s	meters per second
MTS	Main Transformer Station
MVA	Megavolt Amperes
MW	Megawatt
MWe	Megawatt Electricity
NALED	(Serbian) National Alliance for Local Economic Development
NGO	Non-Governmental Organisation
NTS	Non-Technical Summary
OEMP	Operational Environmental Management Plan
OEMP	Operational Environmental Management Plan
Off.	Official
OHL(s)	Overhead Power Line(s)
OPEX	Operating Expenditure
PMW	Precautionary method of working
PR	Performance Requirements - EBRD Environmental and Social Policy Requirement
pSPA	proposed Special Protection Area
Q	Quarter - as in quarter of the year
RR	Radio Resource
RS	Republic of Serbia
SEIA	Strategic Environmental Impact Assessment
SEP	Stakeholder Engagement Plan
SHE	Safety, Health and Environment
SME	Small and Medium Sized Enterprises
SNH	Scottish Natural Heritage
SNR	Special Nature Reserve
SPA	Special Protection Area
SRES	IPCC Special Report on Emission Scenarios
SRFJ	Socijalistička Federativna Republika Jugoslavija / Socialist Federal Republic of Yugoslavia
SRJ	Savezna Republika Jugoslavija / Federal Republic of Yugoslavia
SEWEA	Serbian Wind Energy Association
TN	Target Notes - used to describe habitats, and species associated with these habitats, and highligh features of ecological interest.
TS	Transformer Station
U.K.	United Kingdom
U.S.A	United States of America
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNESCO-MAB	UNESCO Man and the Biosphere
UNMIK	United Nations Interim Administration Mission in Kosovo
USFWS	U.S. Fish and Wildlife Service
VAT	Value Added Tax
VP	Vantage Point
WEBG	Wind Energy Balkan Group / Vetroelektrane Balkana d.o.o
WPP	Wind Turbine/Power Plant
WTG	Wind Turbine Generators
ZTV	Zone of Theoretical Visibility
ΔGHG	Change in greenhouse gas

Notice

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