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FUNDÃO – VILAROUCO AXIS, 400KV

ENVIRONMENTAL IMPACT ASSESSMENT

Heritage Impact Assessment – Alto Douro Wine Region

REN

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1. INTRODUCTION

The current report corresponds to the Heritage Impact Assessment regarding the projeto "Fundão-Vilarouco Axis, at 400kV", and stems from the fringe crossing of the Special Protection Area (SPA) of the Alto Douro Wine Region (ADWR), classified as National Monument as per Notice 15170/2010, 30th July, in the "Evolving, living and cultural Landscape".

It is important to note that the project is located about 4,5 km away from the ADWR itself, only slightly interfering with the SPA in the section where there is the need of connecting to the already existing powerline, and which will allow the connections Armamar – Vilarouco and Vilarouco – Lagoaça, as stated in Figure XX.

As so, the approach towards ADWR in the present report will serve only as a framework of the project within the area, since the project itself won't be the cause of any negative impacts in the ADWR.

Aditionnally, this project falls under the Environmental Impact Assessment legal framework (Decree-Law no 151-B/2013, of 31st October, altered and republished by Decree-Law no 152-B/2017, 11th November and altered by Decree-Law no 11/2023, of 10th February). As such, this Heritage Impact Assessment takes place within the scope of an Environmental Impact Assessment (EIA).

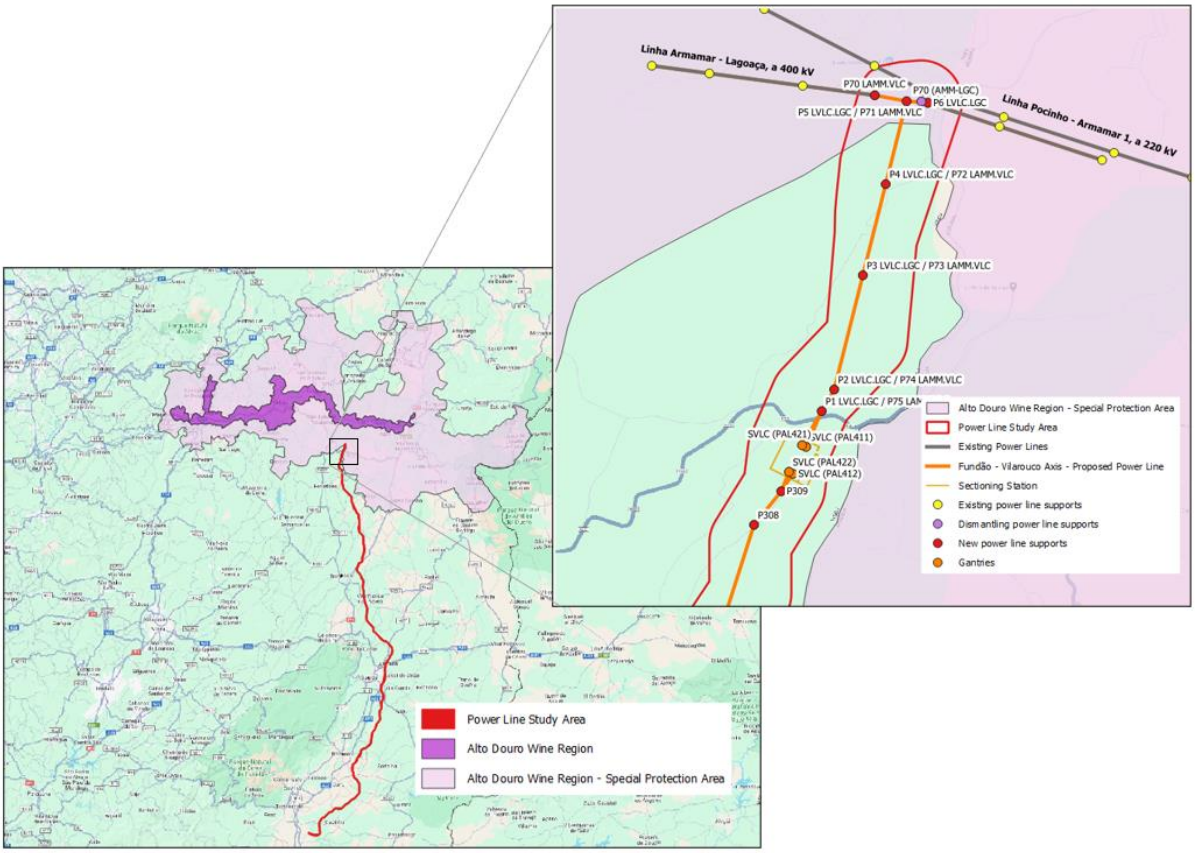


Figure 1-1 - Location of the project within the Alto Douro Wine Region

In the Environmental Impact Study report, the Alto Douro Wine Region (ADWR) was analyzed through different approaches as a Sensitive Area within which the project occurs. ADWR is registered in the World Heritage List since 14th December 2001, as a Cultural Heritage Site, as per the 25th session of the World Heritage Committee, taking place in Helsinki (Decision 25 COM X.A). The present designation (or typology) took place within the scope of the World Cultural and Natural Heritage Protection Convention, adopted by the UNESCO General Convention – United Nations Organization for Education, Science and Culture in 16th November 1972 and open for signature in Paris, in 23rd November 1972. The Convention was approved to be ratified, by Portugal, as per Decree-Law nº49/79, of 6th June.

ADWR, as per numbers 3 and 7 of article 15º in Law nº 107/2011, of 8th September, is part of the list of assets classified as having national interest, being considered a "National Monument" which, through Notice nº1510/2010, 30th July, publicizes the classification of ADWR as a World Heritage site and presents its geographic boundaries, as well as the Special Protection Area (Area), which is almost in its totality

coincidental with Região Demarcada do Douro.

As a reinforcement to those measures, the Council of Ministers' Resolution no. 4/2014, 10th January, bestows the Comission for Coordination of Regional Development of the North (CCRD North), the mission to protect, conserve and value, as well as disclosing and promoting the "Evolving, Living and Cultural Landscape of the Alto Douro Wine Region", being that CCRD North is simultaneously, at present times, part of the Assessment Comission of the Project in question.

This HIA was elaborated according to the methodology disclosed in the document "*Guidance on Heritage Impact Assessements for Cultural World Heritage Properties*", ICOMOS 2011.

Particularly, and as requested by the AC, the aim is to assess the possible physical interference of the project with the cultural and natural attributes that grant ADWR its Outstanding Exceptional Value, but also the visual impacts they might cause to the ADWR/SPA landscape, namely:

- Cultural Attributes – vineyards in terrace cultivation systems; vineyards with other cultivation systems; "mortórios", olive groves; almond groves; orange orchards; farms; Classified Heritage sites or sites undergoing classification processes; villages; places of worship; panoramic roads and viewpoints.
- Natural Attributes – Grasslands and Shrubs; riparian galleries; "geossítios"; Douro river and relevant ridges.

1.1 PROJECT IDENTIFICATION

The project consists in a very high tension double overhead powerline, at 400kV, between the Fundão Substation (SFDA) and the future Vilarouco Sectioning station (PCVLC), with a total length of 120km and a total of 309 power line supports.

The following infrastructure will be implemented within the scope of the project:

- Construction of the Fundão – Vilarouco Powerline (LFDA.VLC) at 400kV, double line to take place between the Fundão and the future Vilarouco Sectioning station (PCVLC), with a total length of 120km and a total of 309 power line supports, which will also imply the following modifications:
- Falagueira -Fundão Powerline (LFR.FDA), at 400kV – detour to a new alignment, more to the south of the section between the Fundão Substation and the current electric pole "APS 261 LFR.FDA". In order to do so, 7 new power line supports will have to be implemented (APS 262 LFR.FDA" to "APS 268 LFR.FDA"), a total length of 2140meters and 1 power line support will have to be dismantled ("APS 262 LFR.FDA").
- Castelo Branco – Ferro 1 and 2 Powerline (LCC.FE 1-2), at 220kV – a power line support

YDR2 will be implemented at the crossover with the future Fundão-Vilarouco powerline, 400kV, corresponding to the gap between power line supports P124 and P125 of LCC.FE 1-2;

- Construction of the Vilarouco Sectioning Station (PCVLC), 400kV;
- Opening of the Armamar-Lagoaça powerline, 400kV (LAMMLGC), to the Vilarouco Sectioning Station, through the construction of a double line section with 2000m over 5 power line supports, plus two simple power line supports, resulting in the Armamar-Vilarouco powerline (LAMM.VLC), 400Kv, and the Vilarouco – Lagoaça powerline (LVLC.LGC), 400kV, which will require the following additional works:
- Dismantling of one existing power line support ("APS 070 LAMM.LGC");
- Renumbering of the power line supports of the Vilarouco-Lagoaça powerline, between P6 and the Lagoaça substation.

This project aims at reinforcing the Nacional Electricity Transport Network (NTN), enabling the flow of the new renewable energy generation, including in the interior region of the country, between Fundão and Vila Nova de Foz Côa. Also, it aims to ensure enough response capacity to the expressions of interest that reached the NTN operator regarding the development of new solar photovoltaic projects, contributing to the renewable energy goals set by the National Energy and Climate Plan 2030 (PNEC 2030).

The Fundão-Vilarouco double powerline, 400kV, the Vilarouco Sectioning station and all the associated project are represented in drawings 001 – Administrative Framework and 002 – Project Implementation.

The construction works are predicted to last 24 months, starting after the acquisition of the establishing license, which is scheduled to the second trimester of 2024.

The tenderer of this project, which is also the responsible for its elaboration is REN – Rede Eléctrica Nacional S.A., headquarted in Avenida dos Estados Unidos da América nº55, 1749 – 061 Lisboa, Portugal.

The licensing organization for this project is Direção-Geral de Energia e Geologia (DGEG), the General Administration of Energy and Geology.

1.2 TEAM

The current HIA is the responsibility of **GIBB Portugal - Consultores de Engenharia, Gestão e Ambiente, S.A.,** having been prepared between November and December of 2023.

The team responsible for the report is as stated in the following table, a multidisciplinary team that gathers all the fields of expertise necessary to the analysis of the several environmental factors.

Quadro 1-1 – Team responsible for the study.

TECHNICIAN	ACADEMIC / PROFISSIONAL TRAINING	FUNCTION
Helena Nascimento	Environmental Engineering Degree (Pre-Bologna)	General Coordination of the Study Land Use Planning and Constraints
Teresa Brissos	Environmental Engineering Master Degree – Environmental Sistems	Coordination support Climate, Air Quality and Climate Change, Socioeconomics and Human Health
Jessica Silva	Environmental Engineering Degree Environmental Engineering Master Degree	Coordination support Land Use Planning and Constraints
André Gandini Candido	Sanitarian Engineering Degree Environmental Engineering Master Degree	Hydric Resources
Tiago Santos	Environmental Engineering Degree	Geology and Soils and Capacity of Use
Bárbara Monteiro	Biology Degree and Ecology, Biodiversity and Ecosystem Management Master Degree	Ecology and Landuse
Catarina Ferreira	Biology Degree	
Vanessa Rodrigues	Biology Degree and Applied Ecology Master Degree	
Luís Sobral	Geographic Information Systems Technician	
Adelaide Pinto	Archeology Degree	Archaeological, Architectural and Cultural Heritage
João Maurício	History Degree – Archeology Speleologist	Heritage fieldwork
Susana Dias Pereira	Landscape Architecture Degree	Landscape
Vítor Rosão	Physics Engineering Degree and PhD in Acoustics	Acoustic Environment
Rui Leonardo	Environmental Engineering Master Degree	
Sofia Pereira	Geography Degree Science and Geographic Information Systems Master Degree	Support Cartography and Geographic Information Systems Land Use Planning and Constraints
Gilberto Nunes	CAD and SIG Technician	Cartography and Geographic Information Systems

GIBB Portugal is in the list of organizations with prior notification to carry out the activities of thematic map production, as stated in Direção Geral do Território's website (DGT).

1.3 GEOGRAPHIC AND ADMINISTRATIVE LOCATION

The Fundão – Vilarouco powerline, 400kV and its associated projects are located in the districts of Viseu, Guarda and Castelo Branco. According to the Nomenclature of Territorial Units for Statistics (NUTS), it's located in the North and Center Regions Portugal (NUTS II), and sub-regions of Douro and Beiras and Serra

da Estrela (NUTS III). The project elements go through 10 municipalities, namely Fundão, Belmonte, Guarda, Sabugal, Trancoso, Mêda, Celorico da Beira, Penedono, São João da Pesqueira and Vila Nova de Foz Côa, as presented in the following figure.

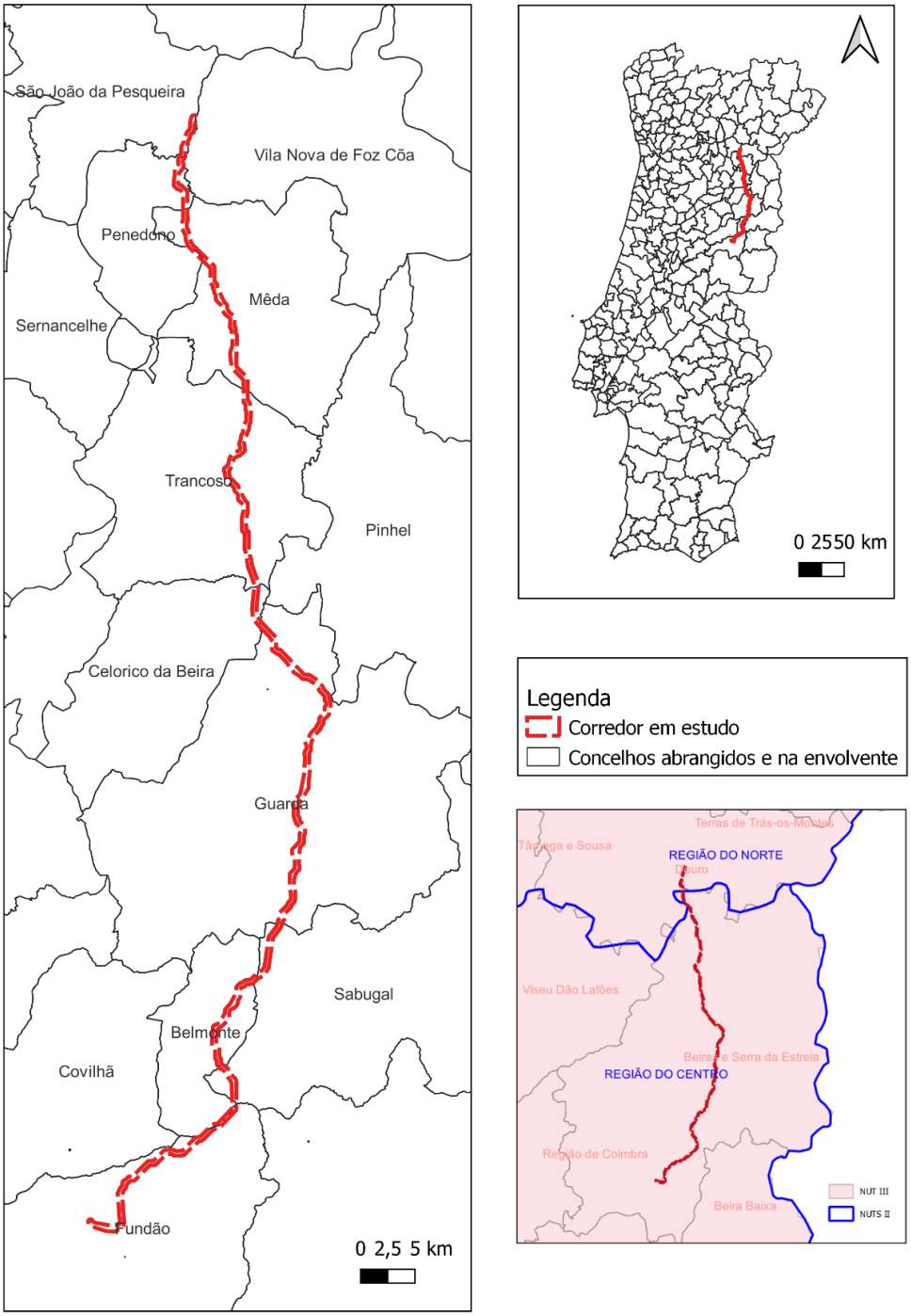


Figure 1-2- Administrative Framework of the project

As civil parishes are concerned, the information is presented in the following table, for each of the municipalities mentioned earlier.

Quadro 1-2 – Administrative Framework of the project

NUTS II	NUTS III	DISTRICT	MUNICIPALITY	CIVIL PARISH
Norte	Douro	Viseu	Penedono	Souto
				U.F. de Antas e Ourozinho
			São João da Pesqueira	U.F. de Vilarouco e Pereiras
		Guarda	Vila Nova de Foz Côa	Cedovim
				Custóias
Centro	Beiras e Serra da Estrela	Guarda	Celorico da Beira	Maçal do Chão
				U.F. de Açores e Velosa
			Guarda	Arrifana
				Benespera
				Casal de Cinza
				Codesseiro
				Guarda
				João Antão
				Panóias de Cima
				Pêra do Moço
				Santana de Azinha
				U.F. de Avelãs de Ambom e Rocamondo
				Vila Franca do Deão
			Mêda	Aveloso
				Prova e Casteição
				Ranhados
				U.F. de Mêda, Outeiro de Gatos e Fonte Longa
				U.F. Vale Flor, Carvalhal e Pai Penela
			Sabugal	Bendada
				Casteleiro
			Trancoso	Cogula
				Tamanhos
				U.F. de Trancoso (S. Pedro e Sta. Maria) e Souto Maior
				U.F. de Vila Franca das Naves e Feital
				U.F. de Vilares e Carnicães
				Valdujo
		Castelo Branco	Belmonte	Caria
				Inguias
				Maçaínhas
				U.F. Belmonte e Colmeal da Torre

NUTS II	NUTS III	DISTRICT	MUNICIPALITY	CIVIL PARISH
			Fundão	Capinha
				Fatela
				Pêro Viseu
				Três Povos
				U.F. de Fundão, Valverde, Donas, Aldeia de Joanes e Aldeia Nova do Cabo

As per subparagraph a) of article 2nd of Decree-Law no 151-B/2013 of 31st October, altered and republished by Decree-Law no 152-B/2017, of 11th December, sensitive areas are defined as follows:

- Protected areas, classified under Decree-Law no 142/2008, of 24th July;
- Sites belonging to Natura 2000 network, special protection and conservation areas classified under the terms of Decree-Law no 140/99 of 24h April, within the scope of Directives no 79/409/CEE, of the Council of 2nd April 1979, regarding the wild bird species conservation, and 92/43/CEE, of the Council of 21st May 1992, regarding the conservation of natural habitats and wild flora and fauna;
- Protection Areas for classified properties or going through classification processes, as per Law no 107/2001, of 8th September.

Regarding the analysis of the assets described under said Decree that has resulted in this report, a world heritage site was identified, namely the Alto Douro Wine Region area (as per Decision 25 COM X.A.) and the corresponding Especial Protection Area (Notice nº 4498/2021, DR 2nd Series, no 49, of 11th March/ Notice no 15170/2010, DR 2nd Series, no 147 of 30th June) as presented in the following figure.

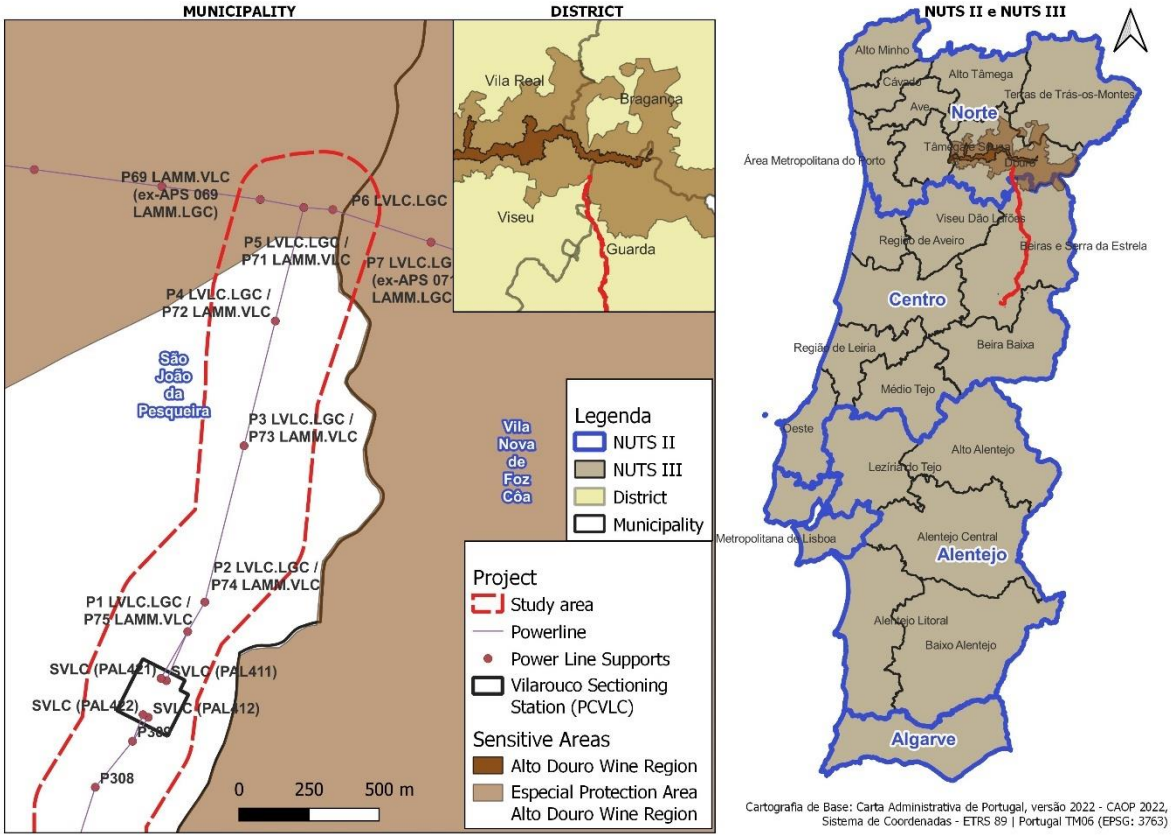


Figure 1-3 – Location of the project within the Special Protection Area of the Alto Douro Wine Region

2. METHODOLOGY

The current Heritage impact assessment is based on the work previously developed in the Environmental Impact Assessment, as well as the guidelines presented in the document "Guidance on Heritage Impact Assessments for Cultural World Heritage Properties", ICOMOS 2011.

The purpose of this study is to study the general environmental implications of the project, specifically the attributes that bestow Outstanding Universal Value (OUV) to the Alto Douro Wine Region, also indicating the minimization actions for the generated impacts that are liable to be implemented, during construction, exploration and deactivation phases (even though the deactivation phase is not expected to occur in a near future), as to allow the implementation of the project, while guaranteeing that all the site attributes are safeguarded.

This analysis is focused on the works in the ADWR area and its SPA, and it encompasses a set of activities,

namely:

- Data and information collection (in situ, through field work, and the systematization of all the information gathered through literature review and from external entities);
- Orthophotos and basemap analysis;
- Identification and analysis of natural and cultural attributes that grant ADWR its Outstanding Universal Value;
- Description and analysis of the project and its interference with ADWR;
- Assessment of the degree of impact project will have in the World Heritage Site.

3. FUNDÃO-VILAROUCO PROJECT CHARACTERIZATION WITHIN THE ADV REGION

As stated before, the current project marginally but inevitably crosses the Special Protection Area of the Alto Douro Wine region, with no predictions of interference with the ADWR itself, which is located about 4,5km away from the intervention area.

The intervention located withing the SPA corresponds to the connection of the project to the already existing powerline, which will allow for the creation of the connection Armamar – Vilarouco and Vilarouco – Lagoaça, as represented in Figure 1-3. The proposed interventions will have low intrusiveness as they stem from the interventions necessary for opening the Armamar – Lagoaça Powerline, 400kV, to the Vilarouco Sectioning Station.

The following interventions are predicted within the SPA of the ADWR:

- Construction of three power line supports (P70 LAMM.VLC, P5 LVLC.LGC/71 LAMM.VLC and P6 LVLC.LGC) and the dismantling of P70 LAMM.LGC)
- A new double power line, corresponding to the Armamar-Vilarouco and Vilarouco-Lagoaça power lines, with 122 m length;
- The alteration of a 262 m section of the existing powerline (Armamar – Lagoaça), of which 158 m correspond to the Armamar-Vilarouco power line and 104m to the Vilarouco-Lagoaça powerline.

Although there is no interference with the Alto Douro Wine Region, and there is only a marginal crossing of the SPA, having into account its classification as a World Heritage Site, a framework characterization

and analysis is required.

3.1 HISTORICAL AND TERRITORIAL FRAMEWORK FOR THE ALTO DOURO WINE REGION

The Alto Douro Wine Region was classified as a World Heritage Site by UNESCO in 2001 (at the 25th Session of the World Heritage Committee – 25COM/2001), in the Cultural, Evolving and Living Landscape category, which lead to its classification as a National Monument and the establishment of its Special Protection Area which, as mentioned before, largely matches the area of the Douro Demarcated Region.

As per Notice no 15171/2010, of 30th June and UNESCO, the wine region of Alto Douro or Alto Douro Wine Region is an area in Portugal's Northeast surrounded by mountains that grant them particular characteristics and that stretches over 24 600 acres, corresponding to a central plot of the Demarcated Region (which, in its entirety, encompasses around 250 000 acres). The ADWR encompasses the municipalities of Mesão Frio, Peso da Régua, Santa Marta de Penaguião, Vila Real, Alijó, Sabrosa, Carrazeda de Ansiães, Torre de Moncorvo, Lamego, Armamar, Tabuaço, São João da Pesqueira e Vila Nova de Foz Côa. These last two municipalities are also part of the studied corridor for the Fundão-Vilarouco Axis.

The classification of the Alto Douro Wine Region was based on three of the ten criteria presented by UNESCO in the Operational Guidelines for the Implementation of the World Heritage Convention based on its allocation of OUV to the Site, which give it authenticity and integrity:

> **(iii) Being a unique or at least an exceptional testimony of a cultural tradition or a living or disappeared civilization.**
>
> The ADWR has been producing wine for about two thousand years and its landscape was shape by human activities (Nomination of Alto Douro Wine Region for the World Heritage List, 2000).
>
> **(iv) Representing an exceptional example of a type of construction or architectural or technological ensemble, or landscape that illustrates one or more significant periods in human history.**
>
> The components of the ADWR landscape are representative of the full range of activities associated with wine production - terraces, estates, agglomerates, chapels and roads and paths (Nomination of Alto Douro Wine Region for the World Heritage List, 2000).
>
> **(v) Being an exceptional example of a traditional human settlement, of the traditional use of the territory or the sea, which is representative of a culture (or cultures), or of human interaction with the environment, especially when the latter has become vulnerable under the impact of irreversible changes**.

Besides the general legal framework and regulations regarding the protection of land use and heritage values, any intervention in the ADWR falls under the following specific regulations:

- Council of Ministers' Resolution no 150/2023: Alto do Douro Vinhateiro Intermunicipal Land Use Plan (Plano Intermunicipal de Ordenamento do Território Alto Douro Vinhateiro, PIOT-ADV), which stems from the pledge undertaken by the Portuguese State of efficiently protecting any classified heritage sites and preserving the characteristics that grant them "exceptional value";

- Joint Decree no 473/2004: defines the public interest requirements for any earth works or plant cover destruction interventions within the ADWR area.

3.2 REGIONAL CHARACTERISTICS OF ALTO DOURO WINE REGION

"Cultural landscapes are cultural assets and represent the "joint work of nature and man" referred to in Article 1 of the Convention. They illustrate the evolution of society and human settlement over time, under the influence of physical limitations and/or opportunities presented by their natural environment and successive social, economic, and cultural forces, both external and internal" (Operational Guidelines for the Implementation of the World Heritage Convention - Annex 3, 2015, p. 71).

The landscape of the Alto Douro Wine Region clearly fits this definition presented by UNESCO. The scenario evident in this demarcation denotes a vast knowledge of the conditions imposed by the territory and their bold use: "The ADWR's cultural landscape is determined by a wise management of the scarcity of soil and water and the high slope of the land" (ISPP-ADWR in Nomination of Alto Douro Wine Region for the World Heritage List, 2000, p. 3).

The impositions of the territory thus determine the configuration of a landscape with very peculiar characteristics. The modelling of this typical landscape was made in a progressive and continuous manner, successively adjusting the applied techniques, and adapting, in an increasingly sustained manner, the culture of the vineyard to the existing adverse situation.

In this way, there are several testimonies found throughout this region that denote different periods and stages of transformation of the vine culture in the Alto Douro Wine Region, patenting its classification as Evolutionary and Living Cultural Landscape: "The landscape is a whole and is evolutionary" (ISPP-ADWR in Nomination of Alto Douro Wine Region for the World Heritage List, 2000, p. 3).

The oldest forms of landscape modelling, corresponding to the traditional ways of ground frame, are evident in the heart of this region and are characterized by the arrangement of one to two rows of very narrow terraced vines - also known as estreitos - supported by walls of shale (wedges) and spaced according to the slope gradient along which they are established, giving them variable geometries, and outlining the sinuosities that follow the contour lines. This type of configuration denotes the prephyloxeric

period, before a major crisis that devastated the Alto Douro Wine Region (ISPP-ADWR in Nomination of Alto Douro Wine Region for the World Heritage List, 2000).

After the mildew affected the vineyards in 1852, with great incidence in the Baixo and Cima Corgo sub-regions, this crop was again affected by a plague in 1863, which in turn became the best known for its devastating effect - the phylloxera. This became a tragic time in the history of the Alto Douro Wine Region, leading countless owners to ruin and with consequences in terms of the landscape, with the abandonment of many cultures and the claim of the old vineyard terraces for spontaneous vegetation (bush) or with its occupation by the olive grove - mortórios (Noé, 2002; Lourenço-Gomes, L. & Rebelo, J., 2012; ISPP-ADWR in Nomination of Alto Douro Wine Region for the World Heritage List, 2000).

Despite the scourge that phylloxera represented for the Alto Douro Wine Region in the mid-19th century, it can be considered, on the other hand, that it had a constructive effect on viticulture. Given the seriousness of the situation, producers were forced to seek new forms and new knowledge regarding this crop, refining their knowledge and leading to new ways of building terraces (ISPPADWR in Nomination of Alto Douro Wine Region for the World Heritage List, 2000).

With the overcoming of the phyloxeric crisis "that for nearly a decade destroyed all the old Douro vineyards, viticulture is reborn, with the introduction of hybrids of American species, whose root system is naturally phylloxera-resistant, since it has always cohabited with it in its origin areas "(ISPP-ADWR in Nomination of Alto Douro Wine Region for the World Heritage List, 2000, p. 43).

In addition to this renewal in terms of the plants themselves, to circumvent the disease outbreak that previously affected the ADWR, the ground frame structure and the vineyard installation were also reformulated. Thus, after the phyloxeric crisis, the increase in labour costs implied a series of changes at the landscape level, given the "systematization of the land to improve the productivity of labour and land" (ISPP-ADWR in Nomination of Alto Douro Wine Region for the World Heritage List, 2000, p. 43).

This is then reflected in a new terracing mode: to increase the area to be occupied by the vineyard, with a greater number of vine rows per geio, the terraces become fewer in number but wider, with higher walls and broken lines that also follow the contour lines. These are now slightly inclined to favour sun exposure and prevent the appearance of new plagues (Lourenço-Gomes, L. & Rebelo, J., 2012; ISPP-ADWR in Nomination of Alto Douro Wine Region for the World Heritage List, 2000).

The configuration of the territory for the vine cultivation again undergoes a restructuring around the 1970's. At this time, given the higher cost of labour due to its relative scarcity, it becomes necessary to

use machinery intended for *surriba* and other actions aimed at land work. In this way, the modelling of the landscape is now based on the circulation of this equipment: the ground frame is then made on wider *patamares* of land embankments, providing a free space between two rows of wired vine to allow the passage and work of the wine tractors (ISPP-ADWR in Nomination of Alto Douro Wine Region for the World Heritage List, 2000).

In the 1980s, the tendency to set the vineyard "at the top" began to emerge, according to the highest slope lines, on inclined platforms with rows of vines following the lines perpendicular to the contour lines, separated by working roads, in addition to the layout of the vineyard without ground frame. These new configurations thus allow "not only a fuller mechanization, but also an almost complete use of the available land" (Noé, 2002; ISPP-ADWR in Nomination of Alto Douro Wine Region for the World Heritage List, 2000, p. 48).

The old and traditional manners and the more modern manners, which seek more efficient solutions for setting up the land and installing the vineyard, evident in the Alto Douro Wine Region landscape, thus denote a landscape in constant change based on an empirical knowledge of the territory and its constraints, translating "into an immense sculpture of armed slopes where the vine cultivation takes preponderance next to the olive and almond trees and a mosaic of plots consisting of Mediterranean bush" (Lourenço-Gomes, L. & Rebelo, J., 2012 ; ISPP-ADWR in Nomination of Alto Douro Wine Region for the World Heritage List, 2000, p. 3).

The landscape of the Alto Douro Wine Region stands out for its mosaic: "The ADWR has an aptitude for the quality production of Mediterranean cultures and is a unit that lives by maintaining a diversified landscape mosaic consisting of a balance between production and conservation areas" (Presidency of the Council of Ministers, Resolution of the Council of Ministers no. 150/2003 - Official Gazette no. 219/2003, Series IB of 2003-09-22, p. 6145).

This landscape, despite being recognized by its imposing terraces, representing the Douro Demarcated Region, shows so many other benefits and expressive marks associated with the life and traditions of this place that contribute to its prominent position and which are listed below.

3.3 ADWR HERITAGE VALUE

According to the Alto Douro Wine Region Inter-Municipal Spatial Planning Plan (ISPP-ADWR) (Volume I - Diagnosis of the Situation) regarding the vernacular heritage built, it states "*Territory and heritage thus form an inseparable binomial, since the heritage condition of each element lies in its relationship with a*

specific territorial and historical context, which makes it unique and significant. But if the territory is a physical support of the heritage, it is also being shaped by cultural practices, whether they are subsistence activities, social representations or symbolic markings".

As previously mentioned, it is the terracing techniques associated with different times of wine production, around which the region has established itself and the way in which the landscape was shaped, which prevails in its characterization. However, this landscape takes on a much deeper dimension, with the interrelation of multiple players that complement and complete each other in a coherent and high-quality whole, in a link between natural and cultural elements.

"*The meaning of a cultural landscape is [thus] directly related to the (tangible and intangible) attributes that contribute to the OUV - each per se and at the level of the interconnections that they establish, with the significant attributes applicable to authenticity, as well as the integrity criteria that make it possible to appreciate the state of the property's physical tissue, the maintenance of relationships and the dynamic functions present*" (Ramos, C. (Coord.), 2013, p. 14)

In this way and based on the proposal of Statement of Outstanding Universal Value, the elements that comprise the Alto Douro Wine Region landscape are presented below and are taken as expressive attributes that reveal its quality character (Ramos, C. (Coord.), 2013).

Natural Attributes

Regarding natural values that grant OUV, the following can be identified in the Alto Douro Wine Region:

- Shrublands and woods;
- Riparian Galleries;
- Geosites;
- Douro River;
- Relevant Ridges.

Regarding the Cultural Attributes present in the ADWR, the following were identified:

- Vineyards (terraced vineyards with ground frame system or other ground frame systems);
- *Mortórios* (Abandoned Vineyards);
- Olive Groves;

- Almond Groves;
- Orange Groves;
- Farms, Properties;
- Classified Heritage sites or going through classification processes;
- Villages;
- Places of Worship;
- Viewpoint;
- Panoramic Roads.

4. PROJECT JUSTIFICATION AND GOALS

The ongoing energetic transition entails an ever-growing contribution of renewable energy for electricity production, alongside a reduction in fossil fuel consumption. To ensure the possibility of this trend, one of the necessary pieces of the puzzle is the adequate connection between the production centers and the transport network, ensuring the necessary conditions for the produced energy to flow.

Decree-Law no 172/2006, of 23rd August, republished by Decree-Law no 76/2019, of 3rd June, regulates amongst other issues the access to the Public Service Electric Network (PSEN) by renewable production centers, anticipating the need for network reinforcements in areas where there is no capacity to receive new energy production. Decree-Law no 15/2022 of 14th January, regulates the access to the Public Service Electric Network (PSEN) by renewable production centers, anticipating the need for network reinforcements in areas where there is no capacity to receive new energy production.

In light of the power already allocated to new photovoltaic energy production centers, with emphasis in the southern region of Portugal but also the interior center, namely between the municipalities of Covilhã and Nisa, the current PSEN can no longer accommodate the surplus of production against the predicted consumption in the region, as to be able to guide that power to the highest consumption values located in northern regions, and where there is a strong component related to hydroelectric pumping (in which the installed power will be briefly reinforced by the start of the reversible hydroelectric power station of Gouvães).

In order to attribute reception capacity to new power production centers in areas where there is no

receiving capacity, point b) of no 2 of article 5th of Decree-Law no 172/2006, in its current writing, contemplates the possibility of establishing deals between the power production centers and the PSEN operator so as to build the necessary grid reinforcements to the reception of the newly produced energy.

Having this into consideration, REN has promoted studies regarding the integration of about 3,5GVA of installed power in the PSEN, from new photovoltaic production, to ensure the connection and distribution of its production. In these studies, a need to reinforce the grid structure of the NTN was identified, through a set of new infrastructure part of the Axis G7 – Fundão – Vila Nova de Foz Côa, that include the following:

- Foz Côa Sectioning Station, 400kV;
- Fundão – Foz Côa powerline, 400kV;
- Opening of the Armamar – Lagoaça powerline, 400kV to the Foz Côa Sectioning Station

The mentioned network reinforcements are part of the new NTN infrastructure as presented in PDIRT 2022-2031 (Investment and Development Plan for the Electricity Transport Network for the 2022-2031 period), and corresponding Environmental Report which stemmed from its Strategic Environmental Assessment.

Bearing this context in mind, the present project contributes to the fulfillment of the renewable energy goals set by the National Energy and Climate Plan (NECP 2023), allowing the flow of the predicted renewable energy production, which includes the aforementioned region between Fundão and Vila Nova de Foz Côa, and ensuring enough response capacity to the expressions of interest that reached the NTN operator regarding the development of new solar photovoltaic projects.

5. GENERAL PROJECT CHARACTERISTICS

As mentioned before, this project refers to the Fundão Vilarouco Axis, at 400kV, a double line that will make the aerial connection between the existing Fundão substation and the future Vilarouco sectioning station (yet to be built), and which is in its project execution phase. This line has a total extension of 120 030 m, and a total of 309 power line supports.

The construction of this line encompasses the following changes:

- Falagueira -Fundão Powerline (LFR.FDA), at 400kV – detour to a new alignment, more to the south of the section between the Fundão Substation and the current electric pole “APS 261 LFR.FDA”, to allow the establishment of the new Fundão Vilarouco power line, at

400kV, in the current alignment of the Falagueira – Fundão powerline, at 400kV, without any line crossing. In order to do so, 7 new power line supports will have to be implemented (APS 262 LFR.FDA" to "APS 268 LFR.FDA"), a total length of 2140meters and 1 power line support will have to be dismantled ("APS 262 LFR.FDA").

- Castelo Branco – Ferro 1 and 2 Powerline (LCC.FE 1-2), at 220kV – a power line support YDR2 will be implemented at the crossover with the future Fundão-Vilarouco powerline, 400kV, corresponding to the gap between power line supports P124 and P125 of LCC.FE 1-2, so as to change the section from a vertical double track line to a horizontal double track line, thus complying with the minimum safety distances between the two lines.

In the axis under study is also included the construction of the Vilarouco Sectioning Station and the opening of the Armamar-Lagoaça power line to said Sectioning station, which includes a new double line section with an extension of 2km throughout 5 power line supports, plus two simple line power line supports to connect to the current line and form the new Armamar-Vilarouco power line, at 400kV to the west, and the Vilarouco Lagoaça, at 400kV, to the east. This opening also involves the dismantling of an already existing power line support ("APS 070 LAMM.LGC").

As previously mentioned, the project in question marginally crosses the SPA of the ADWR, and only in a section of the opening of the Armamar-Tabuaço power line, characterized further in chapter 5.3.

5.1 ELECTRIC POWER LINE

The power line project is composed of the elements presented in the table below. Generally, two conductors per phase are used, with two circuits supported by steel lattice supports of the "DL", "QT" and "EL" families, made up of conventional metal lattice structures, built from L profiles, and the ACSR 595 (Zambezi) cable is used, as it is the one that is suited to the power to be transported for this particular project, and to the expected short-circuit currents.

Quadro 5-1 – Power line characteristics

STRUCTURAL ELEMENTS	CHARACTERISTICS
Support Foundations	Four independent reinforced concrete blocks
Ground circuits	Sized according to the characteristics of the power line support locations
Power line supports	Apoios reticulados em aço das famílias "DL", "QT" e "EL" constituídos por estruturas metálicas treliçadas convencionais, construídas a partir de perfis L de abas iguais ligados entre si diretamente ou através de chapas de ligação e parafusos
Conductor Cables	Two ACSR 595 cables per phase (ZAMBEZE)
Guard Cables	Two ACSR 153 - DORKING and/or OPGW guard cables per phase (ZAMBEZE)
Insulator Chains and Accessories	Suitable for maximum fault current ranges of 50 kA

5.1.1 POWER LINE SUPPORTS

For this power line project, supports from the DL, EL and QA family (in its DLA, DLR, DLT e DLS). Figure 5-1 presents exemples of all the support variations.

These supports are made of conventional trussed metal structures, consisting of S355JO type steel L sections with equal flanges, connected to each other directly or by means of connecting plates and bolts. The screws are class 8.8 metric thread, according to DIN 7990, a standard generally adopted in Europe with the advantage of having a range of spikes of lengths well suited to use in metal structures and in power line supports in particular.

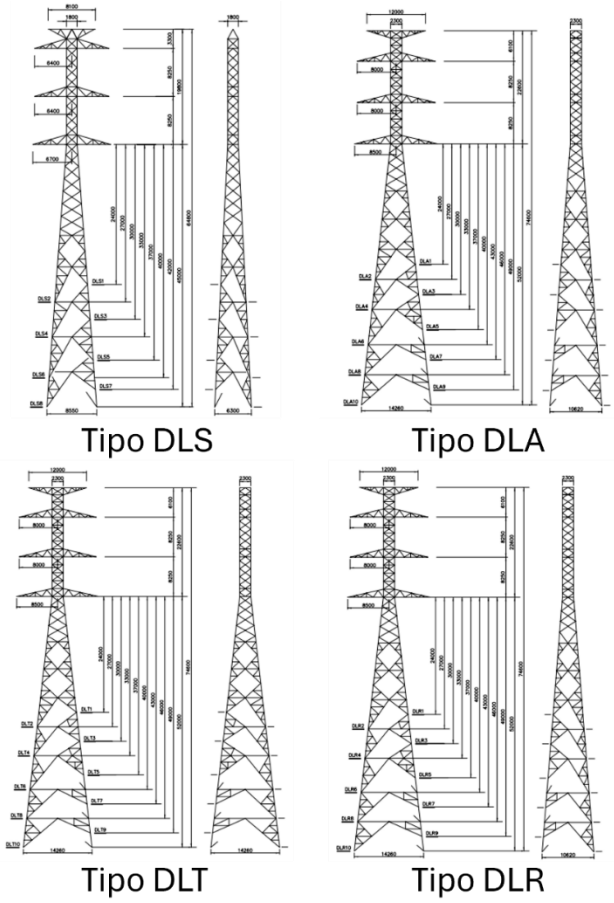


Figure 5-1 – Support Types

Support heights vary between 34 and 74,5m, according to their type. The DL lattice type supports used for the project haven already been licensed as standards for the NTN power lines.

5.1.2 CABLES

For this project is foreseen the use of cables already typically used at this voltage levels, and one of the

cables that will be installed in the guard cable position will be an OPGW (optical ground wire), which contains optical fibre intended for telemetering and telecontrol functions, as well as telecommunications in general.

The conductor cables are aluminium-steel ACSR 595 (ZAMBEZE) cables and ACSR 153 (DORKING) guard cables. These cables were sized according to the expected short-circuit currents for this voltage bracket of the Transmission Network (40 kA).

In the power line configuration (vertical treadmill - DL type supports), the minimum distance between the axes of the conductor bundles corresponding to each phase (0.40m apart) is 8.25 metres. The two guard cables that equip the line are supported by the upper arms of the support structures, arranged in a horizontal track and symmetrically in relation to the line axis, at a level of 3.30 metres (on the suspension supports) and 6.1 metres (on the lashing supports) above the fixing plane of the conductor suspension or lashing equipment; the minimum distance between the two guard cables is 8.10 metres on the suspension supports and 12.00 metres on the lashing supports.

This arrangement provides coverage angles of 19.83 grd and 20.17 grd at the suspension and lashing supports respectively.

However, these coverage angles decrease towards the middle of the span, having into the account that the mounting parameters of the guard cables are higher than the corresponding values for the conductors by around 15 per cent. The protection angles of the conductors by the guard cables are absolutely satisfactory, guaranteeing that there will be no atmospheric discharges directly hitting the conductors.

Furthermore, in the gaps where there are buoyancy spheres, when they are isolated gaps the guard cables will be tied at both ends, whereas in the case of several continuous, suspended, buoyed gaps the first and last ones will be tied at the beginning and end, respectively.

5.1.3 AERIAL BEACONING

According to the guidelines provided in ANAC Aeronautical Information Document CIA No. 10/03 of May 2003:

- the daytime beaconing of the guard cables will be done by alternating international White and Orange/red coloured balls, with a minimum diameter of 600mm spaced 60m apart, and arranged in a zigzag pattern, roughly in line with the horizontal plane. This way, the orthogonal ball projections on the 2 cables, on a vertical plane parallel to the line, will be 30 metres apart;

- The stripes to be painted correspond to modular sections of the structures in order to emphasise their shape and dimensions. The end strips are painted in international red or orange;

- The lines' night beaconing consists of placing LED beacons approved by ANAC or ANA next to the supports of the A23 motorway crossing. These devices permanently emit red light with a minimum intensity of 10 Cd. In each of the two beacons, one on each side of the support, or alternatively two LED devices at the ends of the guard rods, are placed on each of the upper conductors, next to the framing supports of the gaps indicated below, as shown in the following table.

Quadro 5-2 – power line supports in which to install night beaconing.

SUPPORTS TO BE BEACONED	NUMBER OF BEACONS TO INSTALL PER POWER LINE SUPPORT	NUMBER OF LED LIGHTS TO INSTALL PER POWER LINE SUPPORT
P132 – P133	4	2
P140 – P141	4	2
P147 – P148	4	2

5.1.4 MAIN ACTIVITIES FOR EACH PROJECT PHASE

Regarding the activities related to this project type, these can be seen for each project phase in the table below.

Quadro 5-3 – Activities per project phase: construction

PROJECT PHASE	NECESSARY ACTIVITIES
Construction Phase	**Action 1 –** Set up and operation of construction sites, material and equipment parks and other support structures
	Action 2 – Recognition, signposting and path and access opening
	Action 3 – Deforestation, vegetation removal and clearing
	Action 4 - Movement and operation of heavy machinery and equipment
	Action 5 – Safety strip opening
	Action 6 – Topographical survey
	Action 7 – Soil workds
	Action 8 – Construction of foundations, concrete and base assembly
	Action 9 – Power line support assembly and placement
	Action 10 – Cable Placement
	Action 11 - Placement of aerial beaconing devices and bird-saving devices
	Action 12 - Recovery of roads and paths and construction site locations.

Quadro 5-4 - Activities per project phase: operation

PROJECT PHASE	NECESSARY ACTIVITIES
Operation Phase	**Action 13 –** Periodic Inspection of the power line's needs for repair
	Action 14 - Regular inspection of the urban expansion areas and inspection and monitoring of interaction with birdlife
	Action 15 - Implementation of the Safety Strip maintenance plan

PROJECT PHASE	NECESSARY ACTIVITIES
	Action 16 - Presence/General Operation of the line
	Action 17 - Periodic maintenance and repair/replacement of damaged equipment.
	Action 18 – Power line *Upgrade* due to technologic evolution or changes in energy transport needs

Quadro 5-5 - Activities per project phase: decomissioning.

PROJECT PHASE	NECESSARY ACTIVITIES
Decomissioning Phase	Regarding the decommissioning phase, it is considered that the actions arising from it are similar to those of the construction phase.

Regarding this subject and having into consideration the lifespan of this project (50 years), the end of operation of power lines isn't generally associated to the deterioration of its components, but rather with the need/demands of the operation, frequently associated with action 18 of the operation phase.

5.2 SECTIONING STATION

5.2.1 PREDICTED WORKS

The Vilarouco Sectioning Station is a new sectioning station located next to km186 of EN222, in rh municipality of São João da Pesqueira, district of Viseu, next to the limit with district of Guarda, as per

Figure 5-2. It is located between the village of Pereiros, to the west (district of Viseu), and Horta, to the east (district of Guarda).

The aim of the AB.00 works is to build the Vilarouco Sectioning Station, at 400kV with its initial layout, considering the establishment of the platform for the electrical installations and equipment, the access road to EN222 to be built on REN terrain and the installation of three panels: P411 (Lagoaça), P412 (Armamar) e P421 (Fundão 1). The works of AB.02 consist of the installation of one panel, panel P422 (Fundão 2).

Access to the sectioning station is developed from road EN222 and around 300m until the entrance.

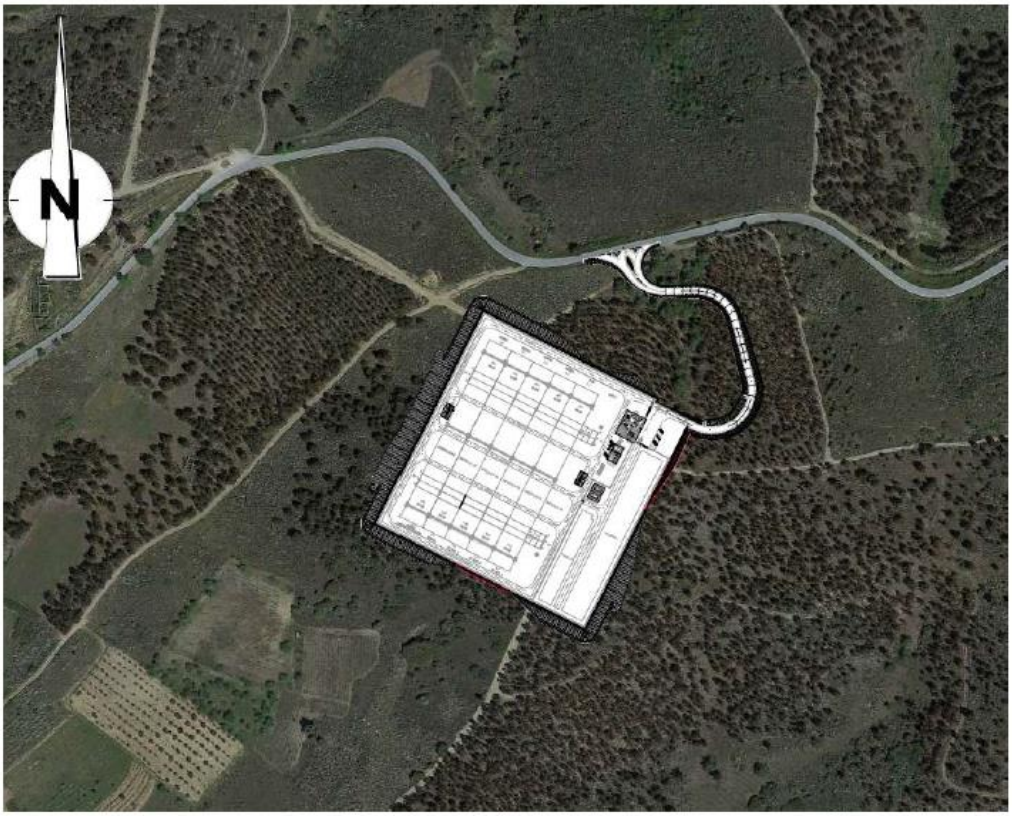


Figure 5-2 – General overview of the sectioning station

In terms of construction works, specifically, the following is predicted:

- Execution of the sectioning platform with the necessary clearing, excavation and embankment;
- Construction of gabion walls to reduce the environmental impact of the platform embankment and contribute to the landscape integration of the intervention;
- Access to the platform from national road EN222, including drainage;
- Execution of the platform drainage system both inside and around the cutting station with the execution of new bodies, routing to the water courses, including manholes;
- Fencing of the sectioning station, access gates and property boundary fencing;
- Implementation of circulation routes within the platform;
- Execution of the lighting, CCTV and SADIR network, in particular massifs and cable crossings;
- Implementation of the external telecommunications network;
- Execution of water supply network and supply reservoir;
- Execution of wastewater drainage networks for technical buildings and septic tanks;
- Construction of technical buildings: ECA-type Command Building, CSA1-type Auxiliary Services House and C41 Panel House and connection of the water supply, rainwater drainage

and wastewater drainage networks to the sectioning station's general network;

- Construction of massifs and gutters for equipment support, cable gutters, cable trenches and associated drainage systems for the initial installation, which includes three panels, P411, P412 and P421.

Works for AB.02 are as follows:

- Construction of massifs and gutters for equipment support, cable gutters, cable trenches and associated drainage systems for the initial installation, which includes a panel, P422.

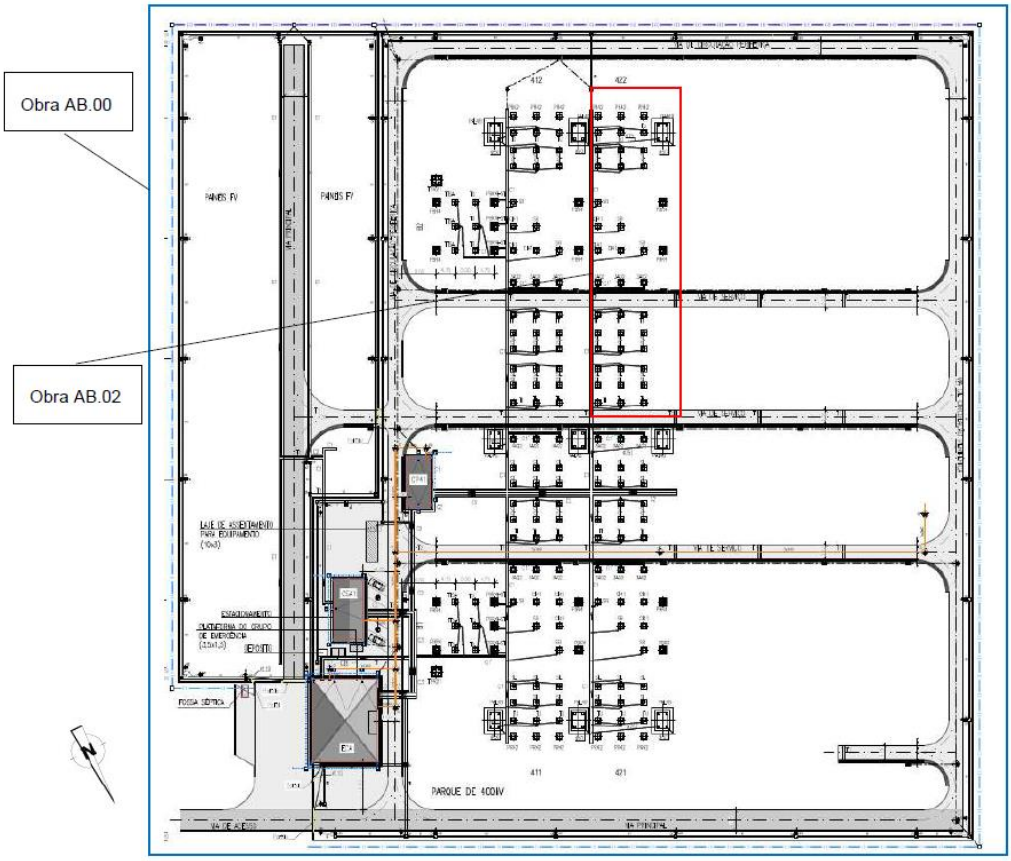


Figura 5-3 – Initial Configuration for the Vilarouco Sectioning Station (obra AB.00 e AB.02)

After the installation, the sectioning station will the subject of intervention to include new panels, equipment and building that will constitute different construction works. This final configuration is shown in the figure below.

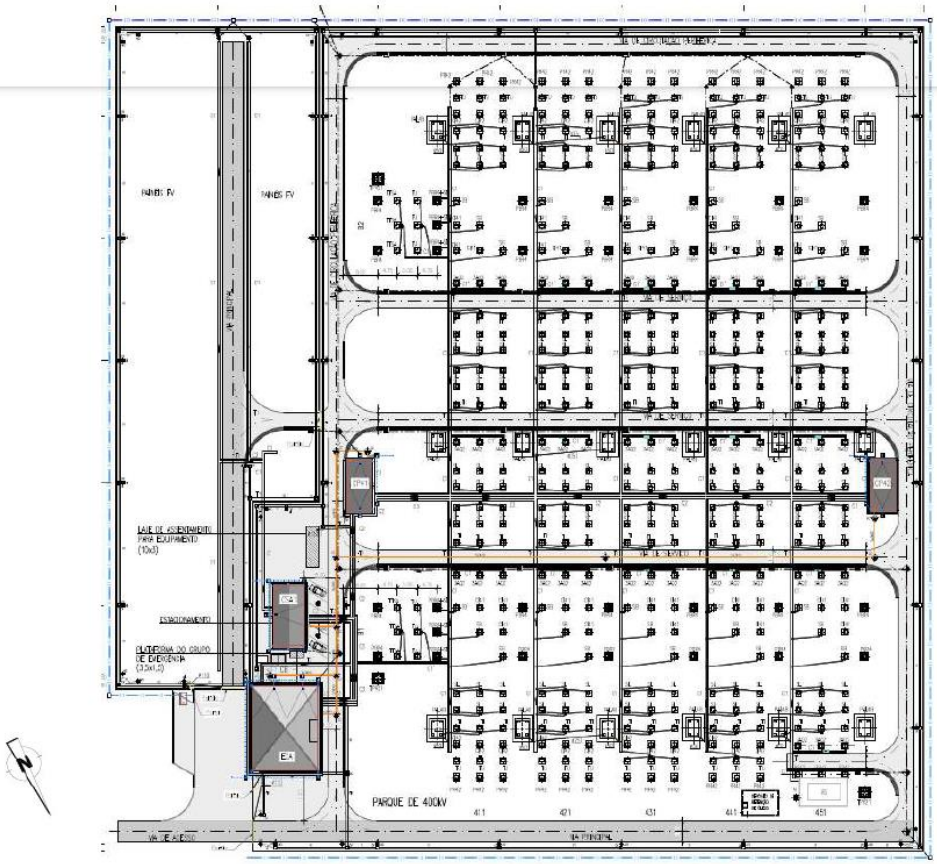


Figura 5-4 - Initial Configuration for the Vilarouco Sectioning Station

5.2.2 RAINWATER DRAINAGE

As presented in the extract of the Portuguese Military Charter (Figure 5-5), the substation platform will be built in a high place. The platform drainage solution is for rainwater to be discharged into the natural watercourses identified in the topography.

Figura 5-5 – Substation location and water courses in the militar charter 1:25 000, Folha 140 - Touça (Vila Nova de Foz Côa), IGeoE, 1994 (2nd Edition).

The collection of rainwater on the platform is done through gutters and drains. Rainwater from the roof of the buildings will be collected in gutters, where pine cone drains will be installed and connected to fall pipes that will connect to a network of boxes and pipework to be installed outside. The cable gutters follow the slope of the platform, collecting any water at the ends, and the crossings have a collection point in the lowest area that connects to the nearest drain or box. An underground network of collectors and manholes is planned to transport the collected rainwater to the discharge points.

There will be a discharge point, which will direct the run-off to the natural water line located to the south-east of the substation. The discharge area will be protected by a manhole.

5.2.3 SOIL WORKS AND FOUNDATIONS

For the platform of the Vilarouco sectioning station, the considered height was 736,60, aligned with the main road, considering a slope of 0.3% on each side of the road up to the boundary with the fence (SW and NE). At this level, the 0.07 m thickness for the covering gravel will be removed.

This platform is developed in a rectangular area of about 199 × 202 m^2, located in a rugged terrain area, with the natural terrain varying between 725,00 e 737,50. In order to establish the aforementioned platform elevation, soilworks consist mainly of excavation works which go up to 11m high in the central platform area. Embankments, that go up to 10m high, are predominantly located in the outer areas of the

study area. Where deemed necessary it was considered a clearing of about 0,20m.

Regarding the geometry of the excavation and embankment slopes, a configuration with a slope of 1V:1H and 1V:2H was assumed, respectively.

Given the earth balance, on the platform alone 133 250 m^3 of surplus material from excavations and 94 250 m^3 of surplus material from embankment are expected, which is around 40%, and thus these materials are to be reused in the construction works.

Any final surplus materials should be sent to a licensed deposit area. The sorting of materials resulting from the excavations will have to be carried out in a temporary deposit located within REN's land, so these areas will need to be determined.

Taking into consideration the elevation of the natural terrain and the foundation height it is noted that excavation works will intersect:

- A layer of topsoil about 0.3 m thick.
- Rock mass in a medium altered to decomposed state (ZGC1) with longitudinal seismic wave velocities, VL, of less than 1000 m/s; occurs up to about 0.5 and 1.0 m deep; prone to excavation with light or medium-powered rotary-type equipment;
- Rock mass in a medium altered to decomposed state to medium altered to little altered state (ZG1B) with longitudinal seismic wave velocities, VL, of between 1000 and 2100 m/s; occurs up to a depth of around 1.5 to 4.5 metres; excavable by heavy equipment with a Caterpillar D9R ripper or equivalent;
- Competent Rock Mass (ZG1A), with longitudinal velocities of seismic waves, VL, greater than 2100 m/s; occurs below ZG1B; excavable with a pneumatic hammer and/or explosives to excavate and/or dismantle it.

Compact embankments are built with rock materials (rock fills) resulting from the dismantling of the rock mass.

5.2.4 ROAD ACCESS

The road access to the future platform to the sectioning station goes from the EN222 for about 300m until the entrance of the sectioning station.

The cross-sectional profile adopted is fundamentally characterised by:

- bi-directional carriageway comprising two traffic lanes, one in each direction, each 2.50 metres wide and with a total width of 5.00 metres;
- 1.00 metre wide verges.

Adjacent to the road, 1.0 metre wide lined triangular platform ditches are proposed to ensure drainage

of both the platform and the excavation slopes.

The pavement of the roadbed will the be 0,15m thick, and made of selected soil. The traffic lane will be made of betuminous paving.

In the case of excavation, slopes with a gradient of 1:1 (V:H) were adopted, with the exception of the slope on the west side from PK 0+200 where a gradient of 1:1.5 (V:H) was adopted, with a small excavation stool 0.60 metres wide and with a 10% gradient. The slope adopted for the embankment slopes was 1:2 (V:H).

Looking at the earth balance in which, around 8 800m^3 of surplus material from the excavations works and just about 162 m^3 from the embankment works, which is about 2%, so it's important to reuse materials from the excavation works.

As such, the sorting of materials resulting from the excavations will have to be carried out in a temporary deposit located within REN's land, so these areas will need to be determined. Any final surplus materials should be sent to a licensed deposit area.

5.2.5 BACKGROUND ON THE STUDY OF ALTERNATIVES FOR THE SECTIONING STATION LOCATION

A Strategic Environmental Assessment (SEA) in the scope of the Investment and Development Plan for the Electricity Transport Network for the 2022-2031 period.

As such, several strategic axis throughout the country were assessed, one of which was Axis G7 – Fundão – Vila Nova de Foz Côa, currently denominate Fundão -Vilarouco Axis, which would imply the construction of a new sectioning station in the Vila Nova de Foz Côa area, and would allow for new connections for renewable energy projects such as solar and wind.

In terms of planning, t is customary to envisage the opening of a line or a new network node in a certain wide area, and its final location is the result of environmental studies and technical design criteria.

The principal conclusion of the assessment of the G7 Axis were as follows:

- Overlaps wolf utilisation areas;
- Covers Alto Douro Wine Region and it's respective "buffer zona" (SPA), in its northern sector.
- This strategic axis also overlaps with the SPA of the Côa Valley Rock Art Archaeological Sites. Thus, from a perspective of sites with high landscape value, this strategic axis is assumed as particularly

tricky, with the biggest concerns focusing on the arrival to Vila Nova de Foz Côa, where ther is the intersection with the SPA of the ADWR.

The planning criteria for the new sectioning station location were as follows:

- Lack of a preferential point for opening the Armamar-Lagoaça line;
- Preferential distance of up to 5 km from the existing line and a maximum of 10 km.

As such, in the Corridor Environmental Risk Analysis (ARAC), while selecting the better alternative the aim was to avoid the restraints previously identified in the SEA by both the infrastructure and the associated power lines.

Areas that complied with the technical criteria of distance to the connection point, outsider the SPA and within the previously defined corridors were sought, resolution in three great alternative for the Sectioning Station, in relatively flat areas and without large environmental constraints. The extension of power lines within the SPA was minimized to the maximum, and therefore it's not possible to further avoid its interference, since the existing power line is located within the SPA itself.

It should be noted that the ZEP follows the eastern boundary of the selected corridor for an extension of around 10 kilometres to the south.

In the Southern alternatives, the sectioning station would have to occupy areas that are more exposed, dominated by permanent cultures (mainly olive groves), chestnut trees and oak trees.

It's also importante to note that besided the slopes and hypsometry, simplified visual basins were made, and are shown in the following figures. It was thus found that the locations to the north would not, from the outset, have visibility from the ZEP since the visual basin for these sites is very localized.

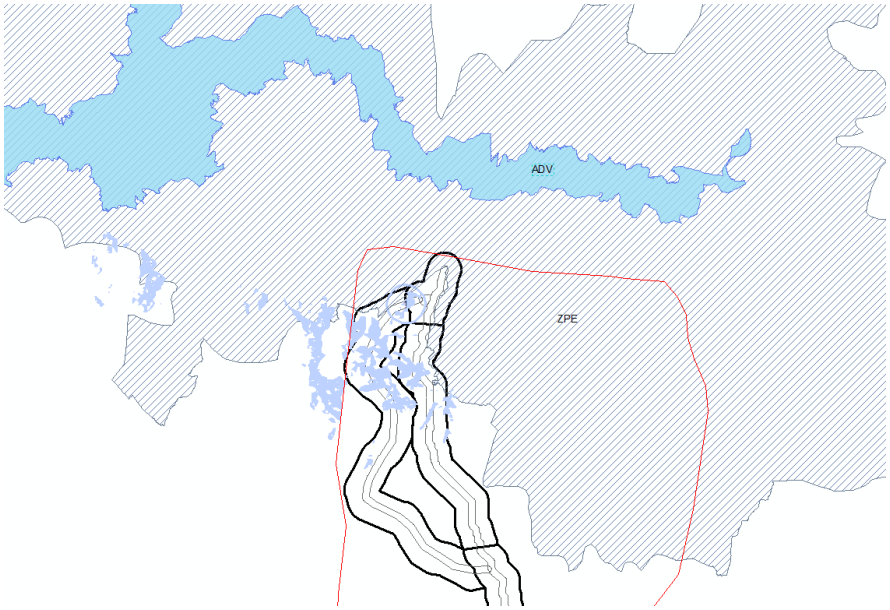


Figure 5-6 – Visual Basin Simulation for Sectioning Station Option 1

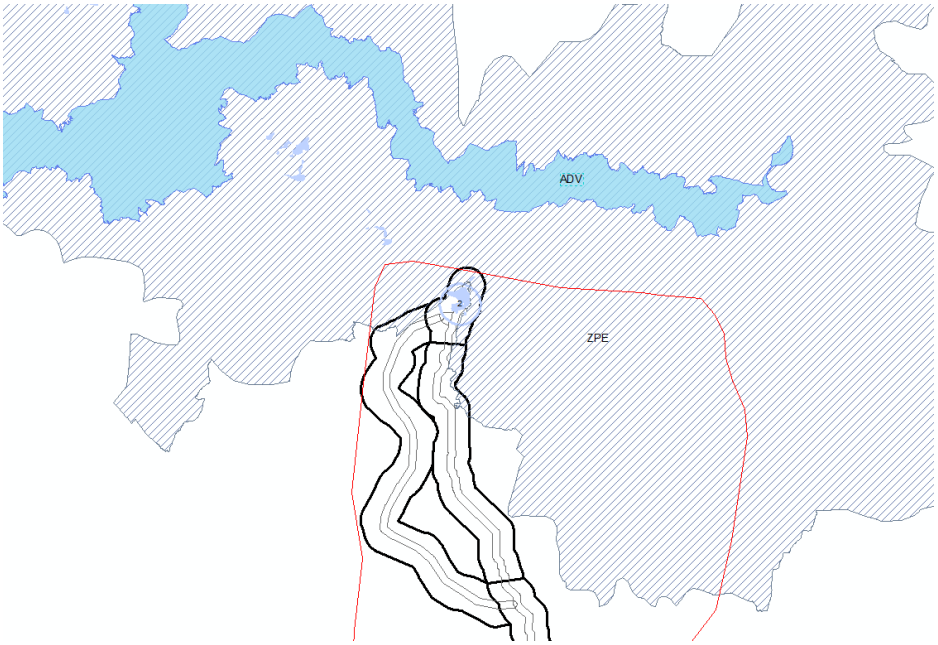


Figure 5-7 - Visual Basin Simulation for Sectioning Station Option 2

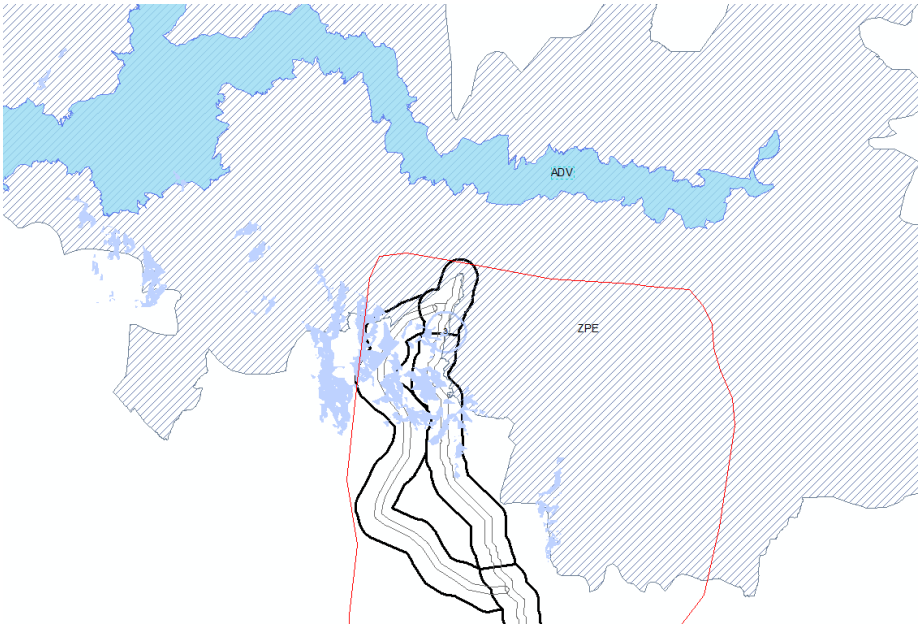


Figure 5-8 - Visual Basin Simulation for Sectioning Station Option 3

On the contrary, for southernmost locations, the visual impact would be higher on the SPA, since the visual basins are extended east and north, encompassing the SPA.

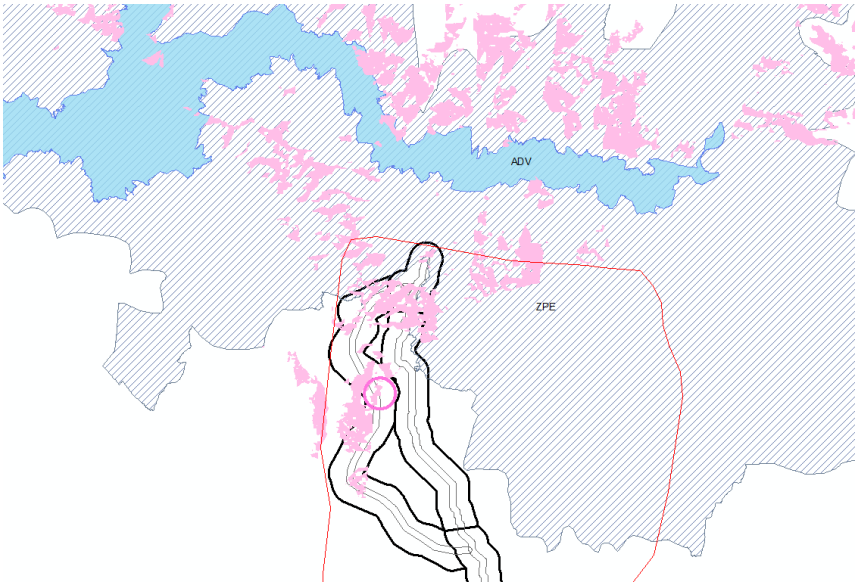


Figure 5-9 - Visual Basin Simulation south of the Sectioning Stations

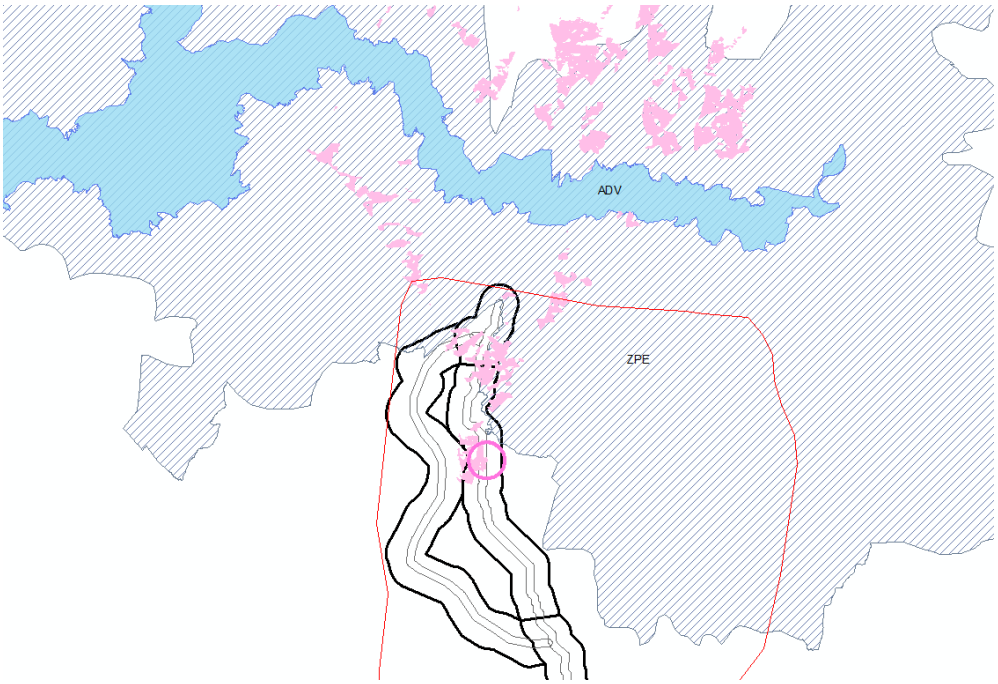


Figura 5-10 - Visual Basin Simulation south of the Sectioning Stations

In this context, and subsequently to the SEA process, in the scope of the feasibility analysis for the Sectioning Station, based on the constraints previously identified in the ARAC, a location was chosen so as to minimize any interference with the SPA of the ADWR. Thus, the Sectioning Station got its final

location – Vilarouco Sectioning Station.

5.3 OPENING OF THE ARMAMAR-LAGOAÇA POWER LINE

The Opening of the Armamar-Lagoaça powerline, 400kV (LAMMLGC), to the Vilarouco Sectioning Station, through the construction of a double line section with 2000m over 5 power line suports, plus two simple power line supports, resulting in the Armamar-Vilarouco powerline (LAMM.VLC), 400Kv, to west, and the Vilarouco – Lagoaça powerline (LVLC.LGC), 400kV, to east. This will require the dismantling of one existing power line support ("APS 070 LAMM.LGC") and renumbering of the power line supports of the Vilarouco-Lagoaça powerline, between P6 and the Lagoaça substation.

5.3.1 POWER LINE SUPORTS

The DL, EL and QA lattice type supports used for the project haven already been licensed as standards for the NTN power lines.

These supports are made of conventional trussed metal structures, consisting of S355JO type steel L sections with equal flanges, connected to each other directly or by means of connecting plates and bolts. The screws are class 8.8 metric thread, according to DIN 7990, a standard generally adopted in Europe with the advantage of having a range of spikes of lengths well suited to use in metal structures and in power line supports in particular.

5.3.2 FOUNDATIONS

Generally speaking, the supports of the steel structures consist of direct foundations made up of four independent reinforced concrete masses, with a footing and prismatic chimney.

As stipulated in the RSLEAT, the foundations associated with the line supports are designed for the highest forces communicated to them by the steel structure, considering all the regulatory combinations of actions. The design of these foundations is, in turn, dependent on the geotechnical conditions of the ground where they are installed.

Thus, by default, the foundations are defined for "average" soil conditions corresponding to a type characterization of "fine and medium sand up to 1 mm grain diameter" to which the following characteristics correspond:

- Volume Mass = 1600 kg/m3;
- Friction Angle ("Natural Slope") = 30 to 32º;
- Admissible Pressure = 100 to 400 kPa.

The materials to be used in the foundations have the following characteristics:

- Class C30/37 concrete;
- Class A500NR reinforcing steel.

The foundations of the supports are designed for traction ("pull-out"), in most cases covered by "average" ground conditions, using the stabilizing ground weight method and disregarding the contribution of the ground friction force.

During the line staking phase, situations are detected which will be subject to specific geometric and geotechnical design. In the first case, the support will have to be adapted to the terrain using uneven legs or specially configured massifs, while in the second case, the massifs will have to be checked and/or resized in relation to the values of the above-mentioned quantities at the sites.

In the first case, it's a matter of adapting the support to the ground by using uneven legs or specially configured massifs, in the second case, it's a matter of checking and/or resizing the massifs in relation to the values that the above-mentioned quantities present in the locations where they are implanted

5.3.3 CABLES

The conductor cables are aluminium-steel ACSR 595 (ZAMBEZE) cables and ACSR 153 (DORKING) guard cables.

The fixation accessories (mooring and suspension clamps), repair accessories (connections and repair sleeves) and damper separators are dimensioned for the mechanical actions transmitted by the cables and for the thermal effects resulting from the maximum fault current range of 50kA.

The unions and clamps for tying ACSR 595 (ZAMBEZE) and ACSR 153 (DORKING) cables are the compression type, consisting of a steel tube that compresses over the steel core and an aluminum tube that compresses on the surface of the conductor cable. Any of these accessories has a breaking load nevertheless than that of the cables, and particularly the unions guarantee that load simultaneously with an electrical resistance lower than a section of cable of the same length. The sizing values therefore lead to an ultimate breaking load of these accessories of no less than 150 kN and a final temperature of the material below the thermal limit for currents of 50 kA for 0,5s.

The OPGW is tied without cutting the cable and using a set of pre-formed rods that provide the necessary tightness.

The suspension clamps for fixing the conductors and guard cables on the suspension supports are AGS -

Armor Grip Suspension type. Clamps of this type, standardized in the RNT lines, fix the cable through a system of pre-formed helical rods and a neoprene sleeve, presenting particularly favorable characteristics regarding reducing or eliminating damage caused to the wires that form the cable in the fixing area, as a result of fatigue caused by wind vibrations.

5.3.4 AERIAL BEACONING

The daytime beaconing of the guard ropes will be done using alternating white and international orange balls, with a minimum diameter of 600mm spaced 60m apart and arranged in a zigzag pattern, roughly in line with the horizontal plane. This way, the orthogonal projections of the balls on the 2 cables, on a vertical plane parallel to the line, will be 30m apart.

The daytime marking of the supports consists of painting the stripes alternately red or international orange and white. The stripes to be painted correspond to modular sections of the structures in order to highlight their shape and dimensions. The end strips are painted red or international orange.

6. ANALYSIS OF THE SPECIAL PROTECTION AREA OF ALTO DOURO WINE REGION IN ITS INTERSECTION WITH THE PROJECT

6.1 RELEVANT ENVIRONMENTAL FACTORS

6.1.1 LAND USE PLANNING AND CONSTRAINTS

The Territorial Management System established by Law no 31/2014 of 30th May (General Basis of Landuse Public Policy, Planning and Urbanism – LBPSOTU) and developed by Decree-Law no 80/2015, of 15th May (Legal Framework for Land use Management Instruments – RJIGT, altered by Decree-Law no 45/2022, of 8th July) consists in a hierarchical or cascade system, structured by different IGT (programs and plans), organized in a "(…) coordinated interaction framework which reconducts itself to national, regional, inter-municipal and municipal scopes, according to the nature and territorial impacts of the pursued public interests" (art. 38th of LBPSOTU). This IGT organization scheme, thoroughly detailed in art. 2nd of RJIGT, is the foundation to identifying the main IGT that impact the proximity of the SPA of ADWR, accompanied by the discrimination of the several legal documents that support them.

Quadro 6-1- Territorial Management Instruments currently in place near the SPA of the ADWR (Source: DGT/SNIT).

SCOPE/ TYPE	TERRITORIAL MANAGEMENT INSTRUMENTS (IGT)		LEGAL DIPLOMA
National	National Program for Land use Planning Policy (PNPOT)		Law no 99/2019, 5th September (revision).
National/ Sectorial	Hydrographic Region Management Plan (PGRH)	Douro Hydrographic Region (RH3)	Rectification Declaration no 22-B/2016, of 18th November (1st rectification); Council of Ministers' Resolution no 52/2016 of 20th September (1st publication).
	Regional Forest Planning Program (PROF)	Trás-os-Montes and Alto Douro (PROF TMAD)	Rectification Declaration no 7-A/2022, of 4th March (2nd rectification); Ordinance no 18/2022 of 5th January (1st Amendment); Rectification Declaration no 17/2019 of 12th April (1st rectification); Ordinance no 55/2019 of 11th February (Revision).
	Municipal Forest Fire Defense Plan		Decree Law no 56/2023 of 14th July (5th version); Decree Law no 49/2022 of 19th July (4th version); Decree Law no 119-A/2021, of 22nd September (3rd version); Rectification no 39-A/2021, of 10th december (2nd version); Decree Law no 82/2021 of 13th October.
Regional	Regional Landuse Planning Plan (PROT)	PROT-North	Council of Ministers' Resolution no 177/2021 of 17th December (under development).
Municipal	Municipal Masterplan (PDM)	São João da Pesqueira	Notice no 4391/2022 of 1st March (1ª Simplified Amendment) Notice no 8947/2018 of 2nd July (revision)
		Vila Nova de Foz Côa	Notice no 7367/2017 of 30th June (1st Amendment by Adaptation) Notice no 12579/2015 of 28th October (Revision)

Notwithstanding, nearby the studied area, about 4,5km and 11,8km are under the Alto Douro Wine Region Inter-Municipal Territory Planning Plan (PIOTADV) and the Regional Landuse Planning Plan of the Douro Surrounding Area (PROZED), respectively.

None of the aforementioned IGT present any specific provisions for the SPA of the ADWR.

Furthermore, it is important to note that the area that interferes with the studied corridor is marginal, just enough to allow the connection between the Armamar – Lagoaça powerline and its connection to the Vilarouco sectioning station.

6.1.2 LANDUSE

The area within which the project will take place is predominantly rural and forested, with artificial areas representing less than 3% of the total of landuse typologies within the study area. There is a large majority of "Bushes", with a total of 2305 acres (44,2% of the total landuse), "Complex Cultural and Parcelled

Mosaics", with 769,9 acres (14,74% of total landuse) and Maritime Pine (*Pinus pinaster*) Forests, with 575,32 acres (11,01% of total landuse).

In a macro analysis of the Level I Landuse categories in the studied area it can be seem that "Bushes" remain the dominant landuse category, with 44,2% of total area. The second most present category is "Forests" (25%), with the third one being Agriculture related areas. The distribution of landuses within the study area can be seen in the chart below.

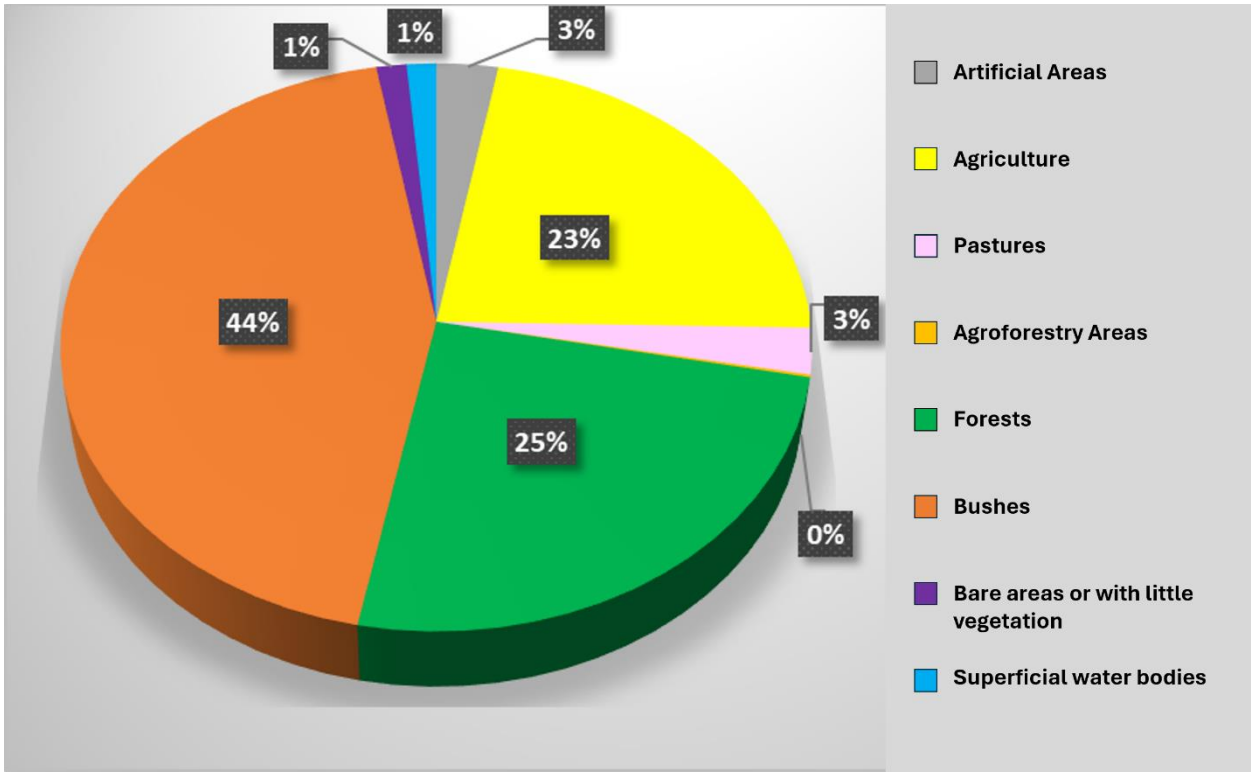


Figure 6-1- Level I Landuse categories in the study area.

In the area where the study area interferes with the ADWR, landuse is comprised mainly of Holm Oak (*Quercus ilex*) Forests and Bushes, as can be observed in the table below.

Quadro 6-2 – Landuse categories within the study area.

COS 2018 Landuse Class (Lvl 4)	Area (ha)	% Total Area
2.2.1.1 Vineyards	2,97	1,3
5.1.1.2 Holm Oak forests	80,99	44,4
5.1.1.3 Other Oak forests	10,75	5,9
5.1.1.5 Eucalyptus Forests	7,95	4,4
6.1.1.1 Bushes	80,40	44,1

Regarding the 1,3% of the area classified as Vineyard, after field work it was noted that this area is, in fact,

an abandoned vineyard, and thus not considered as a permanent agricultural crop.

6.1.3 LANDSCAPE

In order to assess the visual and structural impacts over the ADWR, when it comes to landscape, it was deemed necessary the analysis of the direct and indirect interference of the different project components with the Special Protection Area (SPA).

Regarding the project, the components present in the ADWR's area of visual influence are the opening of the Armamar- Lagoaça Powerline, the Vilarouco Sectioning Station, and the Fundão-Vilarouco Powerline between support P260 until the sectioning station. Of all these componentes, only the final section of the opening of the Armamar- Lagoaça Powerline directly interferes with the SPA, with none of them interfering directly or indirectly with the actual ADWR.

As for the characteristics of this cultural landscape, it naturally includes the Landscape Units of Alto Douro and Douro Wine Region.

This landscape includes the surroundings of the Senhora do Viso ridge, about 3000m south of the Douro River, in its section between the village of São João da Pesqueira and the Teja stream.

This territory is marked by a schist typical undulating relief, structured in a north south direction by a thalweg - interfluve succession that is perpendicular to the Douro River, demarcated by river Torto, the Senhora do Viso ridge and the Teja stream.

The altimetric range is around 650m, with the highest elevations on the aforementioned ridge reaching 814m and the lowest ones 170m in the valleys of direct tributaries of the Douro River, associated with Vale de Covas and Vale do Olmo. The terrain morphology is mainly moderate, with the prevalence of slopes between 12% and 20%. Some gentler slopes can be identified, mainly associated with the typical shale ridges, and some more rugged areas, with slopes often exceeding 30%, associated with the hydrographic network.

Despite the adverse physiographic characteristics, this landscape presents itself as quite humanized, with a prevalence of agricultural occupation. The cultural mosaic is quite diverse, being shared among temporary crops, and above all, orchards, olive groves, and vineyards, with the last one becoming more and more relevant as closer to the Douro.

The agricultural matrix is constantly intertwined with forest and bushes, with the most homogenous areas being the ones in higher altitudes, and therefore less favourable to the dominant crops. The forested

areas largely correspond to cork oak and eucalyptus forests, with the latter ones mainly concentrated in the southern slopes of the EN222 (National Road 222).

The settlement in this landscaped is characterized by small population centres that are located mainly in the highest areas, with some Farm properties, although without the singularity of the ones that are typical to the Douro area. The highlights in this landscape are the villages of Vilarouco and Pereiros in the western slope of Senhora do Viso ridge, and Custóias, Numão, Horta e Cedovim, in the opposite slope.

The little human presence translates into a sparse accessibility network, consisting essentially of rural roads, structured by the national roads EN222 and EN 331-1 and the municipal road EM 541. Both EN222 and EM541 are taken as panoramic roads for the area in question.

Regarding infrastructure, it's important to also mention the two high tension powerlines that cross the northern part of the area, and that constitute significant visual intrusions.

Regarding the values, these are mainly associated with indigenous woodlands, rock outcrops and, with a higher degree of relevance, the cultural mosaic associated with the Douro landscape, to which there are some areas of interest associated with places of worship and viewpoints, in this particular case the Castle of Numão and the Sanctuary of Nossa Senhora do Viso.

In terms of landscape value, this area already presents some degree of artificiality, result of the strong humanization, while still possessing a high scenic and cultural value. The landscape transpires sustainability, showing how activities with high economic importance can, despite the recent changes due to the mechanization of agriculture, keep a balanced relationship with the natural landscape and physiography.

These exceptional characteristics are confirmed by its classification as Special Protection Area of the UNESCO World Heritage Site.

Figure 6-2 – Slopes in the proximity of river Torto

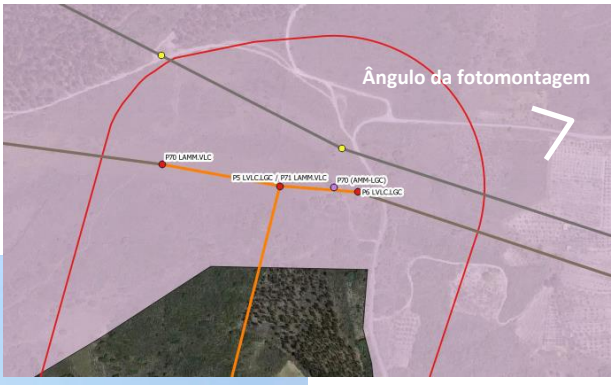
Figure 6-3– View of the landscape from the Senhora do Viso ridge

Figure 6-4 – Surroundings of the Senhora do Viso ridge

Figure 6-5 – Castanheiro Valley (tributor to Vale de Covas stream)

Focusing on the project components, it can be observed that the opening of the Armamar-Lagoaça powerline is only interfering with the limit of the SPA, including only the two power line supports that connect to the already existing line.

In the following figures are represented the current situation in the connection area of Armamar-Lagoaça powerline and a photo simulation of how it will look after the new support construction.



Current Situation

Future Situation – New power line supports P5 LVLC.LGC/71 LAMM.VLC and P6 LVLC.LGC. and dismantling of P70 LAMM.LGC

Figure 6-6 – Photo simulation of the intervention in SPA

Given the uniqueness of this area, it was assured that most of the power line supports did not interfere with land use that grant Outstanding Universal Value to the classified area – oak forests, olive groves,

vineyards, orchards, and rock outcrops. Only one power line support interferes with holm oak forests but having into account the low density of the forest, the impact should be residual.

The Sectioning station was purposedly projected outside of the SPA and, therefore, the Fundão Vilarouco Powerline is also located outside of this Special Protection Area.

Taking into consideration the previous analysis, and the fact that the areas of both the dismantled and proposed power line supports will be subject to recovery within the scope of the Recovery Plan for Intervened Areas, it is considered that the direct impacts of the project on the SPA will present no relevance, since they are limited to three power line supports in an area already impacted by visual intrusion of similar nature.

Quadro 6-3 – Quantification of power line supports interfering with the SPA in the assessed parameters.

LANDUSE				TOTAL
Holm Oak Forest		Bushes		
1		2		3
VISUAL QUALITY				**TOTAL**
Low	Moderate	High	Very High	
0	0	2	1	3
VISUAL ABSORPTION				**TOTAL**
Low	Moderate	High		
0	1	2		3
VISUAL SENSITIVITY				**TOTAL**
Low	Moderate	High		
0	2	1		3

In order to assess the indirect visual impact, a visual basin for the line supports in the area of influence of the SPA was generated, evaluating the coverage of the visual basin and the impact of areas of high scenic value that could suffer a decrease in quality as they are exposed to the new visual intrusion introduced into the territory. Every support in the Armamar-Lagoaça were taken into consideration, as well as the area of the new Sectioning station and all the supports from P260 until the end of the Fundão-Vilarouco Powerline. This analysis is summarized in the table below.

Quadro 6-4 – Quantification of the visual quality covered by the visual basin of the project within the SPA

ANALYZED AREAS	VISUAL QUALITY – AREA (HA)				TOTAL
	Low	Moderate	High	Very High	
Visual Influence area of the project over the SPA	66 ha	627 ha	2801 ha	1537 ha	**5031 ha**
Opening of the Armamar – Lagoaça powerline	14 ha 2%* 21%**	128 ha 16%* 20%**	431 ha 55%* 15%**	208 ha 27%* 14%**	**781 ha 16%****
Fundão – Vilarouco Powerline	34 ha 4%* 51%**	232 ha 28%* 37%**	436 ha 53%* 16%**	122 ha 15%* 8%**	**824 ha 16%****
Vilarouco Sectioning station	6 ha 2%* 9%**	75 ha 26%* 12%**	146 ha 51%* 5%**	61 ha 21%* 4%**	**288 ha 6%****

*percentagem of the basin area | ** percentage relative to the total area of the class in the study area

Observing the previous table, the visual basins of the three project components are not very comprehensive when it comes to the indirect impact on the SPA. Worst case scenario there will be a visual impact of about 16% of this Area and, although there is a greater interference with areas under the high and very high classifications, confirming the value of this classified area, these correspond to just 16% of the areas that are included in these classes within the are of visual influence of the project (radius of 3000m).

Additionally, the generated visual basins correspond to the potential visibility, since there are permanent occupations in the area surroundings that might take the role of visual barriers, which will result in the visual impact being lower than the quantification on the maps.

Taking all of this into consideration plus the fact that most of the potentially affected areas are already exposed to existing High Tension Power lines, it is considered that there will be mostly an increase in the intrusion and degradation of the visual environment of tendentially low magnitude.

Summarizing the analysis of the direct and indirect impacts of the project in the Special Protection Area, it can be concluded that the visual and structural impacts are of low magnitude and low significance, with no further depreciation of the Special Protection Area of the classified site.

6.1.4 CULTURAL AND ARCHITECTURAL HERITAGE

As mentioned before, the area of this project, namely part of the municipalities of Mêda, Vila Nova de Foz Côa, and São João da Pesqueira, are part of the Special Protection Area of the Alto Douro Wine Region, in a landscape area that characterizes the Demarcated Region of Douro, the oldest regulated wine region in the world. It encompasses an area of over 26 thousand acres throughout the Douro river valley and its

tributaries, surrounded by mountains and endowed with very particular physical and climatic characteristics.

The Douro River valley, with its steep slopes and rugged terrain, has been subject to the action of Men since the early days, adapting it to their farming needs, modeling the landscape in terraces, shielding it from erosion and allowing vineyard cultivation, and thus creating an ecosystem with unique value, that produces the famous Port Wine.

"In the Douro, in slopes that until then only sprouted wild bushes, a staircase of terraces aimed at holding the earth, partly created with ground rock, river sludge and baskets of manure starting to arise in the XVII century" (Ribeiro, 1945).

This human investment allowed for the fixation of human settlements in the territory, being considered a humanized landscape since the XVIII century; nevertheless, it is worth noting that in roman times, the region was already known for wine production.

Summarily, the results from the Environmental Impact Assessment, within the scope of Cultural and Architectural Heritage, were as follows:

1. Bibliographic Research

    - Archeological Heritage – 5 sites, inventoried in the Endovelicus and 7 others in the Municipal Masterplan of Trancoso;
    - Architectonic Heritage – 3 sites, two of which classified as Public Interest Sites (IIP), present in Municipal Masterplans, www.património.gov www.monumentos.pt:
    - World Heritage – Alto Douro Wine Region;
    - Ethnographic Heritage – 2 vernacular heritage sites referenced in the Municipal Masterplan of São João da Pesqueira.

2. Archeological Prospection

    - Ethnographic Heritage – 4 sites related to agricultural buildings, 4 wayside shrines/calvaries, 3 hydraulic structures, 9 traditional structures built in dry stone (fences, walls, terraces).
    - Architectonic Heritage – 1 site of architectonic interest;
    - Archeological Heritage – 3 roman time sites and 1 rock art site of indetermined chronology.

Of all the heritage sites mentioned above it is important, in the scope of the present assessment, to approach those to grant cultural attributes to the ADWR, namely terraces, walls, old villages or places of worship with traditional and/or architectonic value. Although there is no interference of these elements with the SPA of ADWR, it's important to identify because of geographic proximity, sites such as: "Ruinas da Cova", "Cercado de São João da Pesqueira" and several terraces or dry stone walls.

6.1.5 ECOLOGICAL SYSTEMS

Where ecological systems are concerned, it's important to note that the project is located in a very relevant region not only in ecological terms but also at a landscape and heritage level; however, the studies area was chosen so as not to affect any area that is included in the National System of Classified Areas (SNAC), structured by Decree-Law no 142/2008, of 24th July, altered and republished by Decree-Law no 242/2015, of 15th October, not being possible to avoid the ADWR area since the project contemplates the connection to the already existing power line, the Armamar – Lagoaça Powerline, which itself is located within the Special Protection Area of the ADWR, as shown in the figure below.

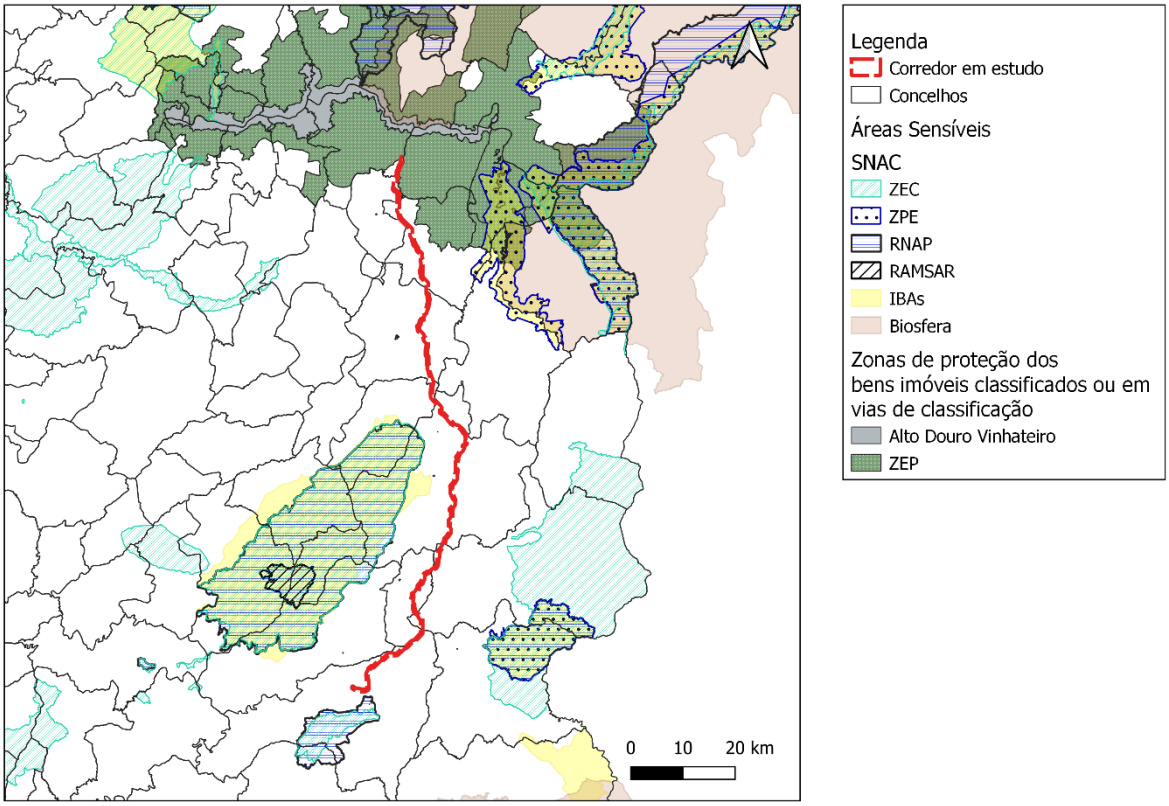


Figure 6-7 – General View of the corridor regarding classified heritage and sensitive areas

Generally speaking, the studied area is located in the interior of the country, with rugged terrain dominated by bushed, agricultural lands, mostly annual crops and pastures, and maritime pine forests. 22 vegetation units were identified: acacia shrublands, rock outcrops, artificialized areas, agricultural land, holm oak forests, oak forests, ponds, eucalyptus forests, watercourses, bushes, *montado*, olive groves, pine forests, *Cupressus* plantations, broadleaves plantations, black walnut plantations, cork tree plantations, orchards, grasslands, cork oak forests, chestnut forests, and vineyards. The corridor is dominated by bushes that account for about 44% of the area, agricultural lands that account for 18% of the area, followed by pine forests which account for 11% of the area.

Having into account the nature of the document and the importance of the ADWR, the following analysis focuses on the floristic component, since the fauna component is mostly irrelevant in this particular case.

Field work was conducted between 5-7 june and 3-5 july 2023, during which the study area was traversed. Both these trips allowed for the identification, characterization and mapping of the vegetation units and habitats included in Annex B-I of Decree-Law no 140/99, of 24th April, altered by Decree-Law 49/2005, of

24th February, that are present in the study area, with all the elements gathered in the field being subsequently inserted in a Geographic Information System (GIS). It further allowed for the inventory of every floristic species present, for which 87 floristic surveys were carried out in all the identified vegetation units. In between surveys it was also possible to take inventory on the presence of species so as to ascertain as much as possible the plant diversity of the area and increase the probability of finding any species with biogeographic status (Lusitanian and Iberian endemism) that have Threatened Status and or are covered by national legislation. In the area were identified a total of nine natural Habitats listed in Decree-Law no 140/99, of 24th April, altered by Decree-Law no49/2005, of 24th February.

Considering the SPA of the ADWR alone, a single natural habitat was identified, namely habitat 9340 – *Quercus ilex* Forests and *Quercus rotundifolia*; pt1 – *Quercus rotundifolia* woods over silicates. This habitat is crossed by the power line in an extension of about 251 m and place of location of one power line support, P6 LVLC.LGC.

Impacts will occur mainly during the construction phase of the powerline, fundamentally linked to the foundation opening actions for the implementation of the power line supports and the opening of roads, which will translate in the removal of vegetation in the directly intervened area. Having into account the little dimension of the area needed for these types of intervention, the magnitude of the impact is low.

During the Operation phase, the main impacts stem from any maintenance operations to the power line, being characterized as indirect impacts and of very low magnitude.

In light of this analysis, it is considered that there won't be direct impact over the ADWR that interferes with its status. The interference with the most relevant areas, from an ecological standpoint in the SPA is also of little significance which, by itself, does not constitute a factor that may cause changes that might depreciate the ADWR.

6.1.6 HYDRIC RESOURCES

connection between the Armamar – Lagoaça powerline and its connection to the Vilarouco sectioning station. For this purpose, two powerlines, Vilarouco-Lagoaça (LVLC.LGC) and Armamar-Vilarouco (LAMM.VLC) will be set up, alongside three new power line supports (P70 LAMM.VLC, P5 LVLC.LGC/71 LAMM.VLC and P6 LVLC.LGC), and the dismantlement of another one, P70 LAMM.LGC.

The area where the new power line interferes with ADWR corresponds to a small section of the project, namely a section of the VIlarouco – Lagoaça powerline (LVLC.LGC) and the Armamar- Vilarouco powerline

(LAMM.VLC). In the SPA three new power line supports will be set up(P70 LAMM.VLC, P5 LVLC.LGC/71 LAMM.VLC and P6 LVLC.LGC). These supports are located in higher altitudes, between 690 and 721 m high, and away from any watercourses existing in the Special Protection Area.

It is important to note that within this area, the nearest water courses to the aforementioned power line supports, are small and mostly torrential in nature. Said watercourses are sub-tributaries to the water body PT03DOU0376, named *Ribeira da Silva*, and sub-tributaries to the water body PT03DOU0374, called *Afluente do Rio Douro*.

Having into account the project typology and that the existing watercourses in the area of the SPA are small and that the supports are away from them, there are no foreseen direct impacts over these watercourses or the ADWR.

In terms of underground hydric resources, the power line is located in the Geological unit that covers most of Portuguese territory, *Maciço Antigo*. The Special Protection area is inserted in the water body identified as *Maciço Antigo Indiferenciado da Bacia do Douro* (PTA0x1RH3), encompassing a total area of 18.735,92 km² and a long-term average annual recharge of 781,92 hm³/year. The project in question does not interfere or impact this water body in the ADWR area.

6.1.7 NOISE AND VIBRATIONS

Noise pollution nowadays constitutes one of the main factors in the degradation of the population's wellbeing and quality of life.

The surrounding territory is characterized by agricultural lands, covered in bushes or forest, and without any sensitive receptors nearby. The closest sensitive receptors of the marginal impact on the ADWR are the village of Pereiros, over 3km away, outside of the SPA od the ADWR, and the village of Custóias over 2km away, within the ADWR; these populations are location well beyond the area of the potential acoustic influence. Besides these villages, there is within the SPA, about 300m from the corridor, the farm estate Casa Álvares.

In the surroundings, the main sources of noise are the road traffic from EN222 and natural sources such as animal communication and plant aerodynamics.

Changes in the local acoustic environment might be originates in both phases of the project:

- Construction phase, due to construction works, specifically soil preparation, vegetation removal, Foundation works, power line support assembly and laying cables

During construction phase, the noise generated by machinery and noisy equipment like hydraulic hammers and bulldozers, as well as heavyweight trucks transporting materials, can reach high levels. However, not all the construction operations will employ such loud machinery and equipment. The noise from the construction phase might affect the surroundings of the power line, however it will take place during a short period of time, considering that there are only 3 power line supports to be constructed inside the ADWR area, the dismantling of one support and the functioning of the already existing line. Any alterations in the acoustic environment might be felt; however, the generated impact will have little significance, both because of the short duration of the works and the distance from landuses that are susceptible to noise.

In any case, and so as to assess the interference with ADWR and its OUV, what matters the most is the impact from the Operation phase, since construction phase impacts are temporary and reversible in nature, and therefore, negligible.

- Operation phase, due to the normal functioning of the powerline and its maintenance operations, including the maintenance of the safety strip.

During the Operation phase, the noise generated by the power line is originated by the crown effect that occurs between the electric power conductors and the surrounding atmosphere. This intensity is higher ("favourable conditions") when there is humid and rainy weather, and lower during dry weather ("unfavourable conditions"). The analysis carried out on the sensitive receptors through modelling shows that noise levels during the operating phase will comply with current legislation, and no significant negative impacts on noise are expected.

In this context there is not impact on the SPA of the ADWR and the ADWR Site itself, maintaining its integrity.

6.2 ASSESSMENT OF THE INTERFERENCE WITH ATRIBUTES THAT GRANT OUTSTANDING UNIVERSAL VALUE (OUV)

Of the project components, the opening of the Armamar-Lagoaça powerline interferes marginally with the SPA, including the power line supports that connect it to the already existent line. Since this connection is foreseen in the project, it was not possible to avoid this sensitive area (point a of art. 2nd of Decree-Law no 151-B/2013, of 31st October, altered and republished by Decree-Law 152-B/2017, of 11th December, in its current form), although the phases prior to the EIA (ARAC and Environmental Feasibility Study), ensured the minimization of the impact on the SPA of the ADWR.

Even though this impact was minimized, the interference of the project in the SPA carries impacts that will be felt following the implementation of the project under study.

As such, the interference of the project in the SPA of the ADWR is analyzed next, with a thorough analysis in the following subchapters regarding the reach of the disturbance in each natural and cultural attribute that grants OUV. The affected area considered for this analysis and quantification in terms of power line supports is presented in the table below.

Quadro 6-5 – Total area occupied by each power line support interfering with the SPA of the ADWR in the different phases of the project.

POWER LINE SUPPORT NUMBER	TOTAL AREA OCCUPIED BY THE POWER LINE SUPPORT IN THE PHASES OF THE PROJECT	
	CONSTRUCTION (m^2)	OPERATION (m^2)
P70 LAMM.VLR	400	71
P5 LVLC.LGC / P71 LAMM.VLR	400	217
P6 LVLC.LGC	400	71

6.2.1 ADWR Natural Atributes

6.2.1.1 Shrublands and Woodlands

As mentioned earlier, the project itself does not interfere with the ADWR and its respective PIOT-ADV, but rather with the Special Protection Area. Still, and from the field work in the scope of the EIA regarding vegetation units and landuse, areas of shrubland were identified in the SPA of the ADWR, with the impacted area regarding the power line supports being summarized in the table below.

Quadro 6-6 - Total area occupied by each power line support interfering with shrubland area in the SPA in the different phases of the project.

POWER LINE SUPPORT NUMBER	TOTAL AREA OCCUPIED BY THE POWER LINE SUPPORT IN THE PHASES OF THE PROJECT	
	CONSTRUCTION (m^2)	OPERATION (m^2)
P70 LAMM.VLR	400	71
P5 LVLC.LGC / P71 LAMM.VLR	400	217

Regarding the power lines, 31m of the new power line goes over shrublands, whereas the modification of the already existing one crosses an extension of 236m.

It is possible to observe that there is minimal impact in areas of shrubland withing the SPA by the power line supports and, regarding the crossing of the line itself, it's considered that there won't be any impact in shrubland areas - these correspond to a type of undergrowth that does not interfere with the operation of the infrastructure, and can remain under the power line without the need for vegetation removal, only occasional maintenance. This impact will occur mostly during the construction phase, and due to the maintenance operations, it will also occur sparingly in the operation phase.

6.2.1.2 Riparian Gallery

A riparian gallery is a linear structure with a tree, shrub and herbaceous composition typical of wetlands, along watercourses, occupying approximately a 5-meter strip on either bank of the watercourse.

Regarding this attribute, none was identified in the area, and thus it can be considered that the implementation of this project will not encompass any interference with riparian galleries, and so this impact will have zero magnitude and significance in the different phases of the project.

6.2.1.3 Geosites

A geosite is characterized as site that possesses, in addition to geological scientific value, educational and touristic value.

According to the Geological Heritage analysis carried out in the Environmental Impact Assessment Report, there is no interference with any geosite, with only two being identified in the proximity of the studied area. Those geosites are as follows:

- **Penha de Águia** – Characterised by the presence of a tor (isolated block of heavily diaclastic rock), from which it is possible to view the surface of Cova da Beira and its contact with the Portuguese Central Mountain Range through the Teixoso-Tordosendo fault. It's high position also allows for the observation of the Belmonte Inselberg
- **Inselberg de Belmonte** – Inselberg is a german originated word that means hill-island. It consists of a residual granite relief that stands out from the flattened surface around it. The result of erosive processes over millions of years, inselbergs are generally characterised by their domed shape, with very steep slopes that come into abrupt contact with the surface. The Belmonte Inselberg peaks at 758m high, distancing itself from the Castelo Branco plain surface, about 380m high, and providing huge defensive advantages which led to the construction of the castle.

As such, it can be concluded that there will be no impact over this attribute in all the different phases of the project.)

6.2.1.4 DOURO RIVER AND RLEVANT RIDGES

As mentioned earlier in other parts of this report, there is no direct or indirect impact of this project on the ADWR itself, which includes the Douro River – a structuring element in this classified area, according to the Alto Douro Wine Region Intermunicipal Land Use Plan.

The project is located about 6000m of this water course, and the new power lines and sectioning station are not visible. Therefore, there are no impacts on the Douro river.

As for the relevant ridges, the main SPA elevations within the study area were identified, as well as it's range of visual influence, that are as follows:

- *Sr.ª do Viso – Srª da Piedade*, orientation North - South with the highest peaks reaching 764 and 814 m.
- *Moinho – Castanheiro do Vento*, orientation Northwest – South/Southeast, with the highest peaks reaching 747 and 764 m.
- *Santa Eufémia (Castelo de Numão)*, orientation Northeast –Southwest, with the highest peak reaching 636 m.

Analysing the aforementioned ridges, only the opening of the Armamar-Lagoaça powerline impacts Srª do Viso – Sr.ª da Piedade ridge, although in an already depreciated area due to the other already existing powerlines. The Fundão Vilarouco power line and the sectioning station, while also impacting the Sra do Viso ridge and the Moinho – Castanheiro do Vento ridge, it is located outside the SPA. The Santa Eufémia Ridge is not impacted by any component of the project.

As for indirect impact, that is, the visual exposure of the SPA to the affected ridges, it is possible to observe through the visual basin of the Fundão-Vilarouco power line[1], that the SPA won't be very affected by the layout of these elevated areas, since the power line runs along the opposite slope to the SPA that extends to the east, and has the Moinho - Castanheiro do Vento ridge on its visual axis towards the area to the north, with its visual basin very much conditioned by these elevations.

As for the opening of the Armamar-Lagoa powerline, the SPA has visibility towards the Moinho – Castanheiro do vento ridge, in an area already compromised by the presence of other Very High Tension power lines, and so there should be no significant increase in the current visual intrusion. The sectioning

[1] Desenho X – Bacia Visual da Linha Fundão - Vilarouco

station is not very visible from the SPA, with the main visibility point to the infrastructure being the Castanheiro do Vento ridge, Moinho peak and the Sra do Viso elevation, both of which are already compromised by the existence of other power lines.

According to this analysis, it is considered that the relevant ridges in the SPA won't be affected in a significant way by the project, and that the visual intrusion caused by its presence, outside of the SPA, won't be significant either, with the impacts being of low magnitude and significance.

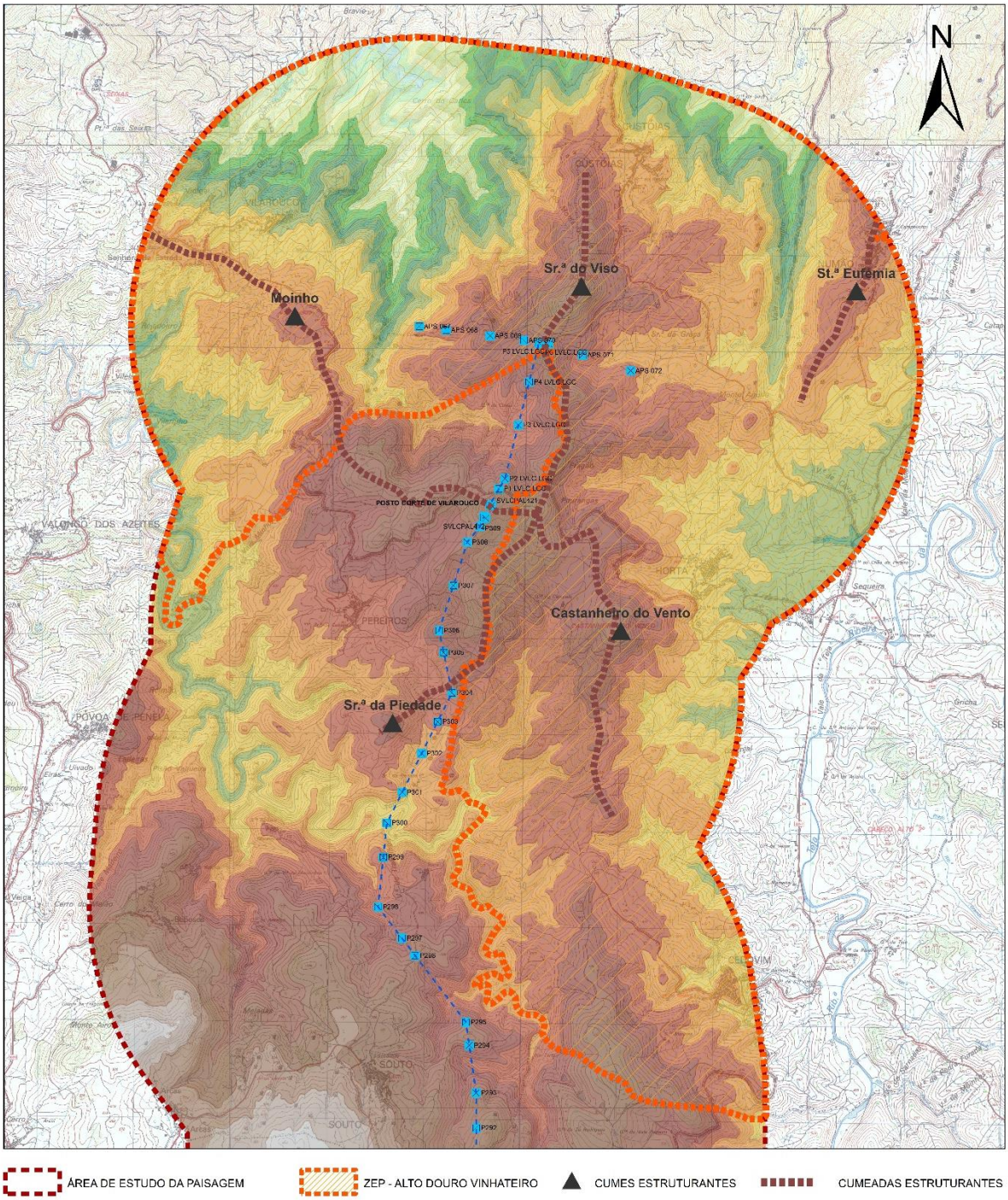


Figure 6-8- Representation of the relevant ridges in the study area

6.2.2 ADWR CULTURAL ATTRIBUTES

6.2.2.1 VINEYARDS (TERRACED VINEYARDS WITH GROUND FRAME SYSTEM OR OTHER GROUND FRAME SYSTEMS)

In the intervention area located within the SPA there are no vineyard areas, and so this is considered a null impact with no significance in all the phases of the project (construction, operation, dismantlement).

6.2.2.2 MORTÓRIOS

In the intervention area located within the SPA there are no mortórios, and so this is considered a null impact with no significance in all the phases of the project (construction, operation, dismantlement).

6.2.2.3 OLIVE GROVES

The Douro landscape is characterized by a vineyard mosaic intertwined mainly with orchards and olive groves, with this type of landscape being present in the area where the project will be implemented.
According to the more thorough landuse analysis in the Environmental Impact Assessment report, there are no olive grove areas within the area of the SPA under assessment.
Therefore, there is no impact of the project on olive grove areas, so this is considered a null impact with no significance in all the phases of the project (construction, operation, dismantlement).

6.2.2.4 ALMOND GROVES

The Douro landscape is characterized by a vineyard mosaic intertwined mainly with orchards and olive groves, with this type of landscape being present in the area where the project will be implemented.
According to the more thorough landuse analysis in the Environmental Impact Assessment report, there are no almond groves areas within the area of the SPA under assessment.
Therefore, there is no impact of the project on almond grove areas, so this is considered a null impact with no significance in all the phases of the project (construction, operation, dismantlement).

6.2.2.5 ORANGE GROVES

The Douro landscape is characterized by a vineyard mosaic intertwined mainly with orchards and olive groves, with this type of landscape being present in the area where the project will be implemented.
According to the more thorough landuse analysis in the Environmental Impact Assessment report, there are no orange groves areas within the area of the SPA under assessment.
Therefore, there is no impact of the project on orange grove areas, so this is considered a null impact with no significance in all the phases of the project (construction, operation, dismantlement).

6.2.2.6 FARM ESTATES

In the intervention area located within the SPA there are no farm estates, and so this is considered a null impact with no significance in all the phases of the project (construction, operation, dismantlement).

6.2.2.7 PATRIMÓNIO IMÓVEL CLASSIFICADO OU EM VIAS DE CLASSIFICAÇÃO

In the intervention area located within the SPA there are no classified heritage site or sites going through classification processes, and so this is considered a null impact with no significance in all the phases of the project (construction, operation, dismantlement).

6.2.2.8 VILLAGES

Generally speaking, there are no villages being impacted by the construction of the project components among the ones located in the surroundings of the intervention area. The alignment sought to go around any settlements, privileging unhabited areas.

6.2.2.9 LOCAIS DE CULTO

In the intervention area located within the SPA there are no places of worship, and so this is considered a null impact with no significance in all the phases of the project (construction, operation, dismantlement).

6.2.2.10 MIRADOUROS E VIAS PANORÂMICAS

Viewpoints and panoramic roads are recognized to be privileged points of interest for observing the landscape, becoming also essential to evaluate the visual impact of the project to these observation points.

In the área of visual influence of the SPA and the project were identified all the viewpoint, natural or otherwise, and panoramic roads, generally associated with high slopes and structural ridges. Not only the viewpoints and roads included in the SPA were selected, but also those identified as being exposed to this Protection Area, in order to check whether the visibility of the EPZ from these points of interest is compromised by the project.

Visibility was assessed through the visual basins of these observation points and the different project components and, according to the distance, the magnitude of the visual intrusion they're subjected to was analyzed. The results of this assessment are summarized in the table below.

Quadro 6-7 – Analysis of the visual intrusion of the project in viewpoints and panoramic roads

Observation points	Visibility and distance			
	< 500 m	500 – 1500 m	1500 – 3000 m	Non-visible
Viewpoints				
Santa Eufémia Chapel 1 (1)				LAAL, LFV e PC
Santa Eufémia Chapel 2 (2)			LAAL	LFV e PC
Viewpoint-Castanheiro do Vento (3)			LFV	LAAL e PC
Viewpoint – Numão Castle (4)				LAAL, LFV e PC
Viewpoint Pitarangas (5)	LAAL, LFV e PC			
Viewpoint Hortas do Douro (6)				LAAL, LFV e PC
Senhora do Viso Sanctuary (7)		LAAL	PC	LFV
Viewpoint SD1 (8)	LFV			LAAL e PC
Viewpoint SD2 (9)			LAAL, LFV e PC	
Viewpoint SD3 (10)	LFV			LAAL e PC
Viewpoint SD4 (11)		LAAL		LFV e PC
Viewpoint road EN222 (12)	LAAL e PC		LFV	
Viewpoint road EN222 (13)				LAAL, LFV e PC
Viewpoint road EN222 (14)		LFV e PC		LAAL
Panoramic Roads				
EN222	LAAL:1560 LFV:0 PC: 1387 m	LAAL:449 LFV:0 PC: 798 m	LAAL:2029 m LFV:2440 m PC: 822	LAAL:7735 m LFV: 11156 m PC: 8707 m
EM541	LAAL:1121 LFV:0 PC:0	LAAL:1059 LFV:0 PC:0	LAAL:260 LFV:0 PC: 0	LAAL:5911 LFV: 1519 m PC:3570 m

Legend: LAAL – Opening Armamar – Lagoaça power line, LFV –Fundão-Vilarouco powerline, PC – Sectioning Station

From the previous table, the following can be noted:

- The Hortas do Douro and Numão Castle viewpoins, part of the SPA, and the viewpoint of Santa Eufémia Chapel 1 and EN222 (13), outside of the SPA, do not have any visibility to the project;

- The Castanheiro do Vento and No Name 2 (SD2), part of the SPA, are potentially exposed to a slight visual intrusion, however they have visibility towards a significant part o the project, and thus there might be a relevant impact in these viewpoints;

- The Santa Eufémia Chapel viewpoint, outside of the SPA, is potentially exposed to a slight visual intrusion, by being over 1500m away from the power line supports, but already has its visual basin compromised by the existing Very High Tension power lines, located in a nearer plane, and as such it's only predicted a slight increase in the current visual intrusion;

- The Senhora do Viso and No Name 4 (SD4) viewpoints are potentially subject to moderate visual intrusion, by being located between 50 and 1500m from the power line supports, but both already have their visual basin compromised by the presence of the existing Very High Tension power lines, located on a closer plane, so only an increase in the current

visual intrusion is expected;

- The road EN222 (14) viewpoint, outside the SPA, is potentially subject to moderate visual intrusion, by being located between 50 and 1500m from the power line supports, however it has residual visibility towards the SPA, and so the impact in his point of interested is deemed as little relevant;

- The Pitarangas and No Name 1 (SD1) viewpoints, included in the SPA are potentially exposed to high visual intrusion, by being located under 500m away from the power line supports, and showing visibility towards a significant part of the Fundão-Vilarouco power line. It is important to note that the second viewpoint is right at the limit of the SPA, whereas the impact on the first viewpoint should be more relevant.

- The No Name 3 (SD3) and road EN222 (12) viewpoints, outside the SPA are potentially exposed to high visual intrusion, by being located under 500m away from the power line supports, but only the first one shows visibility towards both the project and the SPA, and thus this is from the two viewpoints the one with relevant impact.

- As for the panoramic roads, they both have sections that are potentially subject to moderate and high visual intrusion; however, these sections are not located within the SPA. The panoramic views within the area show visibility to the Opening of the Armamar – Lagoaça power line, with their visual basins already compromised by existing power lines located on a closer plane, and so there is no relevant impact in these observation points.

According to the previous analysis, there is only relevant impact in 4 out of the 16 observation points, namely the viewpoints of Castanheiro do Vento, Pitarangas and No Name SD2 e SD3, three of which are within the SPA, and as such the visual impacts will achieve moderate magnitude and significance.

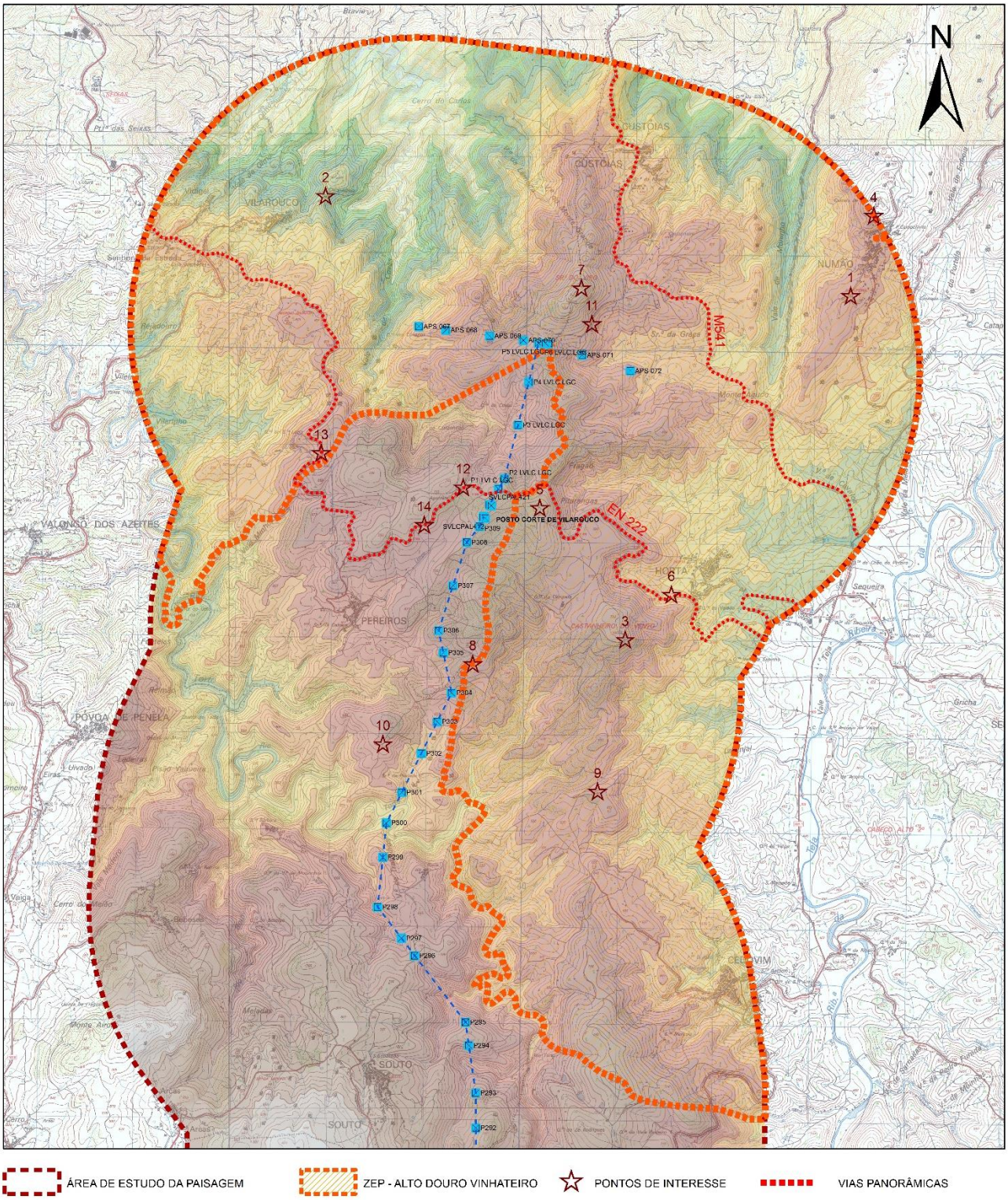


Figure 6-9 – Observation points and panoramic roads within and outside the SPA near the studied area

7. SUMMARY OF THE PROJECT IMPACT ASSESSMENT

In the following tables there is a summary of the impact of the project regarding the different attributes that grant Outstanding Universal Value (OUV) to the Alto Douro Wine Region (ADWR) and whose interference results in the classification of the impact that the project represents on the Alto Douro Wine Region Heritage Asset.

In Annex 1 of the present document there is a distribution of the attributes that grant Outstanding Universal Value (OUV) to the Alto Douro Wine Region (ADWR) in the intervention area (Drawing 6 – ADWR Attributes), namely in the project area that is located within the SPA and that supports the current analysis.

Impact classification was carried out taking into consideration the Very High value associated with this Heritage Site, Alto Douro Wine Region, as according to the guidelines by ICOMOS that classify the impacts according to the significance scale presented in the table below.

Quadro 7-1 – Escala de significância do impacte

VALUE OF THE HERITAGE ATRIBUTE	MAGNITUDE / IMPACT				
	NULL	NEGLECTABLE	LOW	MODERATE	HIG
For World Heritage ite ADWR (Very High Value) – Attributes that grant OUV	SIGNIFICANCE OF THE GLOBAL IMPACT (NEGATIVE OR POSITIVE)				
	NEUTRAL	LOW	MODERATE / HIGH	HIGH / VERY HIGH	VERY HIGH

From the accomplished analysis, firstly in the parameters deemed as important where the project interference with the ADWR is concerned, and secondly focusing on the attributes that grant Outstanding Universal Value, emerged the impact summary presented in the following table.

In the identification of the impacts on this Asset , the weighted average of the classifications obtained for each of the attributes studied is considered, thus enabling an overall classification of the significance of the impact.

As previously mentioned, there is no impact in the ADWR itself, but rather in the corresponding SPA, which is why the significance and magnitude presented is regarding the SPA.

Quadro 7-2 – Síntese de Classificação dos Impactes do Projeto na ZEP do ADV

Attributes that grant OUV to the ADWR		Construction Phase			Operation Phase			Dismantlement Phase		
		Impact Direction	Impact Magnitude	Impact Significance	Impact Direction	Impact Magnitude	Impact Significance	Impact Direction	Impact Magnitude	Impact Significance
Atributos Naturais	Shrublands and Woodlands	-	Negligenciável	Reduzida	-	Negligenciável	Reduzida	+	Negligenciável	Reduzida
	Riparian Galleries	0	Null	Neutral	0	Null	Neutral	0	Null	Neutral
	Geosites	0	Null	Neutral	0	Null	Neutral	0	Null	Neutral
	Douro River	0	Null	Neutral	0	Null	Neutral	0	Null	Neutral
	Relevant Ridges	-	Low	Moderate/ High	-	Low	Moderate/ High	+	Negligible	Low
Atributos Culturais	Terraced vineyards with ground frame system	0	Null	Neutral	0	Null	Neutral	0	Null	Neutral
	Terraced Vineyard with other ground frame systems	0	Null	Neutral	0	Null	Neutral	0	Null	Neutral
	Mortórios	0	Null	Neutral	0	Null	Neutral	0	Null	Neutral
	Olive Groves	0	Null	Neutral	0	Null	Neutral	0	Null	Neutral

Attributes that grant OUV to the ADWR		Construction Phase			Operation Phase			Dismantlement Phase		
		Impact Direction	Impact Magnitude	Impact Significance	Impact Direction	Impact Magnitude	Impact Significance	Impact Direction	Impact Magnitude	Impact Significance
	Almond and Orange Groves	0	Null	Neutral	0	Null	Neutral	0	Null	Neutral
	Farm Estates	0	Null	Neutral	0	Null	Neutral	0	Null	Neutral
	Heritage sites	0	Null	Neutral	0	Null	Neutral	0	Null	Neutral
	Villages	0	Null	Neutral	0	Null	Neutral	0	Null	Neutral
	Places of Worship	0	Null	Neutral	0	Null	Neutral	0	Null	Neutral
	Viewpoints and Panoramic Roads	-	Moderate	High / Very High	-	Moderate	High / Very High	+	Negligible	Low
Total		0	Null	Neutral	0	Null	Neutral	0	Null	Neutral

The results of this assessment, as shown in the previous table, are impact classifications, specifically regarding the opening of the Armamar – Lagoaça powerline which implies intervening in 4 power line supports (three new ones and dismantling another one) and an extension of 122m for the construction of the new power line and and 262m for the modification of the existing power line over the SPA of Alto Douro Wine Region, as follows:

- Construction Phase – null impact, null magnitude e neutral significance;
- Operation Phase – null impact, null magnitude e neutral significance;
- Deactivation Phase – null impact, null magnitude e neutral significance.

Thus, it can be considered that the project is not the precursor of any relevant impact in the Alto Douro Wine Region and its corresponding Special Protection Area that might induce the depreciation of this Asset, plus considering the possibility of minimizing the impacts that were identified through the adoption of minimization measures as described in Chapter 9.

In fact, the whole classification and results concern the interference with the SPA, and not the ADWR itself since there is no direct or indirect impact on the latter.

8. CUMULATIVE IMPACTS

This chapter identifies any existing or foreseen projects in the surrounding area of the current project and that might contribute, cumulatively, to the increase of the environmental impacts already assessed over the SPA, namely other existing power lines.

In the following figure is represented the ADWR and its corresponding SPA , the project and other projects that might contribute cumulatively to impacts on the Asset.

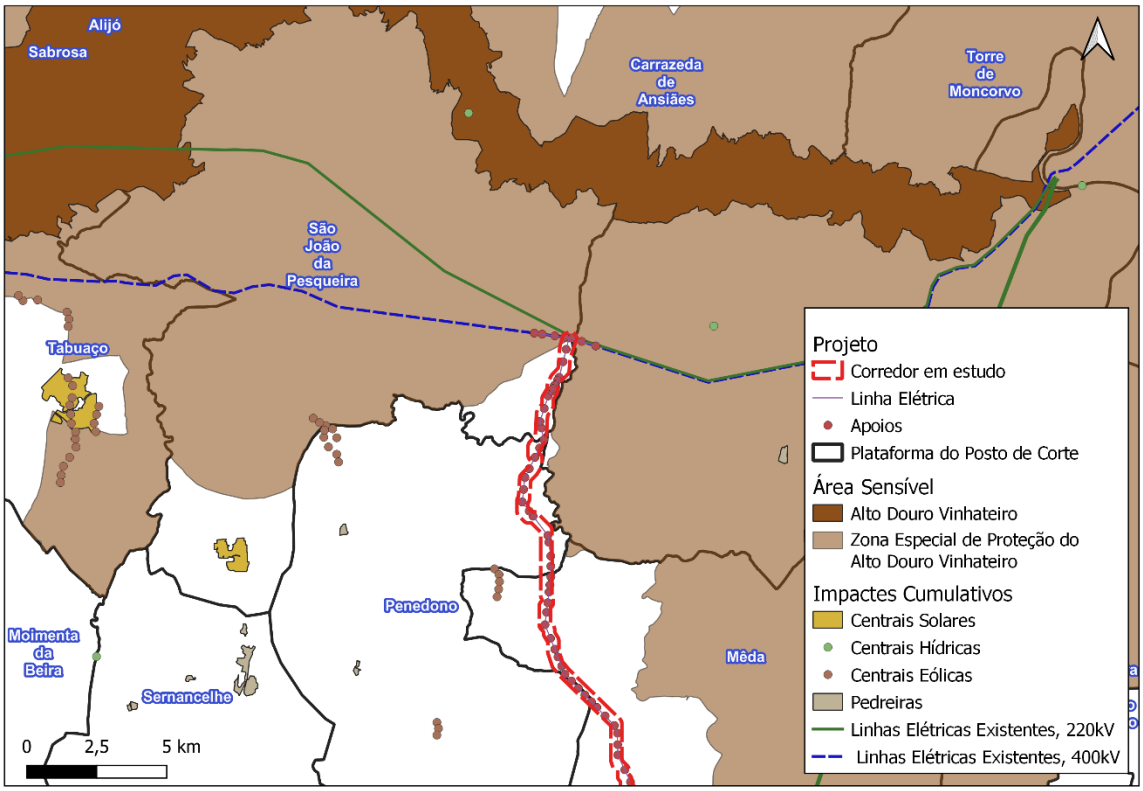


Figure 8-1 – Existing project in the study area surroundings.

The main impacts of the project occur mainly over the construction phase, temporary in nature and for the most part, reversible, and as so they are not generally significant in terms of cumulative impacts.

Regarding the operation phase, the impact stems from the presence and functioning of the power line which limits landuse through the restriction of tree occupation.

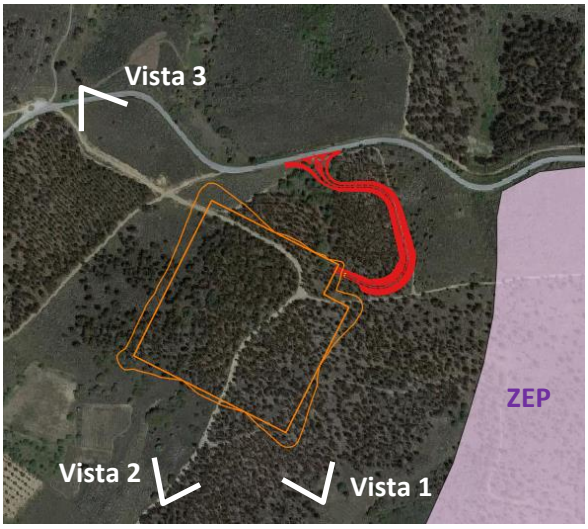
Landscape disturbance is the most relevant impact having into account the type of project and the landscape value of the ADWR. Regarding the project, the components in the area of visual influence of the SPA are the opening of the Armamar-Lagoaça powerline, the Vilarouco sectioning station and the Fundão-Vilarouco Power line, from the power line support P260 to the sectioning station. Of all these components, only the final section of the Armamar-Lagoaça directly interferes with the SPA, with none of the components directly or indirectly interfering with the ADWR itself, and the sectioning station purposedly located outside the SPA, which implies that the Fundão-Vilarouco power line is also outside the SPA. Eventual future connections that are currently unknown might increase the visual impact.

The construction of the new Sectioning Station won't bring a severe visual intrusion, as can be observed

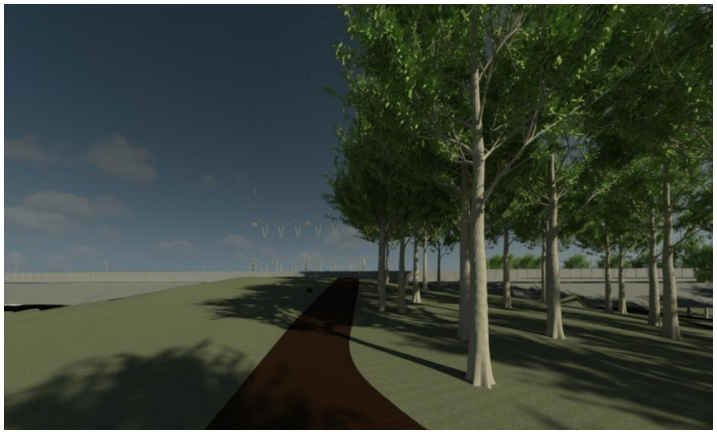
in the following figures.

A construção do futuro Posto de Corte não apresentará uma intrusão bastante marcada, conforme se pode verificar nas Figures seguintes. Eventuais ligações futuras que atualmente não se conhecem atualmente poderão aumentar o impacte visual.

View 1



View 2



View 3

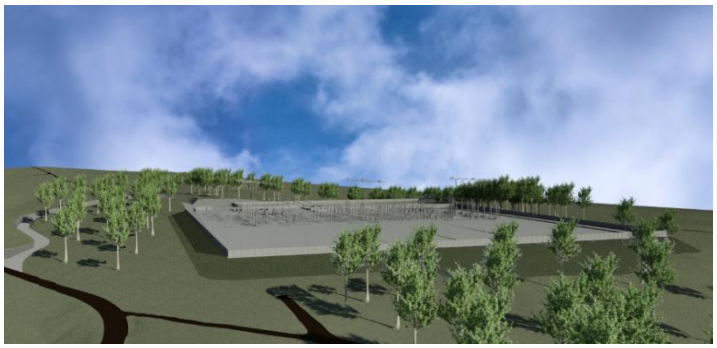


Figure 8-2 – 3D View of the Sectioning Station

The axis subject of these study will cumulatively contribute to the impact on the landscape, although one of the components foresees the opening of the Armamar – Lagoaça powerline which implies intervening in 4 power line supports (three new ones and dismantling another one, in an already existing power line) that are within the SPA of the Alto Douro Wine Region. The new line crosses the SPA in an extension of 122m and the modification of the existing one crosses the SPA about 262m. Since the environment is already disturbed by other power lines, it won't cause high magnitude impacts.

9. MINIMIZATION MEASURES

Of all the minimization measures listed in the Environmental Impact Assessment report, there are some that positively contribute to mitigate the impacts in the SPA of the Alto Douro Vinhateiro Wine Region, namely:

9.1 MEASURES PRIOR TO CONSTRUCTION

<u>Applicable to all project components</u>

- In areas where the power line crosses olive groves, oak forests and other autoctonous tree patches, power line supports should be adjusted so as to avoid affecting any trees to the maximum.
- In areas where there is the need for changes in the natural topography of the terrain (platforms, roads, etc) the slopes must not exceed a ratio of 1/2 (v/h) and must harmoniously match the natural terrain of the surroundings.
- In the final of the construction phase, elaborate the Recovery Plan for Intervened Areas (PRAI) in order to recover all the depreciated areas resulting from the construction works.

<u>Applicable to the Linha Fundão – Vilarouco power line and the Opening Armamar – Lagoaça</u>

- Reconvert the power line safety strips, replacing the existing tree species for small and/or slow-growing native species. In the area in question, it is suggested the plantation of cork oak and Portuguese oak, species that are compatible with the restraints as per the REN document – Reconversion of Safety Strips for NTN Energy Transport Power Lines.

9.2 MEASURES FOR THE CONSTRUCTION PHASE

<u>Applicable to all project components</u>

- The construction phase shall be restricted to the strictly necessary areas, A fase de construção deverá restringir-se às áreas estritamente necessárias, and all the areas to be intervened must be marked.

- Implement a wastewater collection and treatment system within the construction site catered to their needs, taking into consideration the different types of generated wasterwater. Domestic wastewater must be collected in watertight tanks pits and forwarded to the correct treatment facilities.

- Areas for storage of chemical and polluting substances must be waterproofed and covered in order to avoid the production of effluents.

- In periods where the probability of intense precipitation episodes is higher, vegetation removal, soil works, and bare soil exposure should be avoided. The aim of this measure is to mitigate water-based erosion and all the implications it carries, namely sediment transport by surface water that subsequently reaches downstream watercourses.

- Open excavation and soil works should be carried out in a way that minimizes soil exposure in the light of high precipitation episodes, so as to avoid water-based erosion and sediment transport.

- Roads that intersect temporary water courses must account for a correct agreement with the natural terrain, so as not to constitute an obstacle to the water flow, specially in high precipitation periods.

- Ensure the cleaning of water courses whenever there is an obstruction that might be caused by the construction works, so as to maintain the natural flow of the watercourse.

- Provide a kit for collecting any oil and fuel spillages on the construction site and at the work fronts.

- Ensure that the washing of concrete mixers is done only at the concrete pouring central, whereas the concrete waste and concreting troughs must be carried to a designated place within the construction site.

- Areas for storage of chemical and polluting substances must be waterproofed and covered and have a retention basin, isolated from the natural drainage network, so as to avoid accidental oil, fuels, and other dangerous product spills in the soil.

- In the case of a spillage, the contaminated soil must be collected, if necessary, with the help of an adequate absorbent product, and correctly stored and sent to its final destination or collected by a licensed operator.

- Excavation and embankment works must be initiated right after the soils are clean, avoiding repeating the same works in the same areas.

- Excavation and embankment works should be temporarily interrupted in case of a high precipitation episode and the necessary precautions must be taken to ensure the slope stability and avoid landslides.

- Material from excavation works should be used as embankment materials as much as possible, to minimize the volume of surplus soil to be transported out of the intervention

area.

- If excavation materials with contamination traces are found, these should be stored in places that avoid the contamination of soil ad underground water, buy infiltration or rain water run-off, until these materials are forwarded to an adequate final destination.

- Before any soil works, proceed to the removal of the living soil and its storage in *pargas*, for further use in cunstruction affected areas.

- During temporary soil storage, the latter must be protected with waterproof covers. Piles of soil must have height to ensure its stability.

- In case of the need for taking surplus soil into deposit spots, the selection of such areas must exclude the following:

    - Hydric Domain;
    - Flood areas;
    - Underground water protection areas (areas of high infiltration rates);
    - Water catchment protection perimeters;
    - Areas classified as National Agriculture Reserve (RAN) or National Ecological Reserve (REN)
    - Other areas with protection status, namely in the scope of nature conservation
    - Other areas where legally protected flora and fauna species might be impacted, namely cork oak trees and/or holm oak trees;
    - Sensitive places at a geotechnical level;
    - Sensitive places at a landscape level;
    - Agricultural farmlands;
    - Proximity to urban and/or touristic areas;
    - Heritage protection areas.

- The Road Access Plan must be implemented. Favour existing roads and paths to access the construction sites; in the need of opening new paths or improving the existing ones, construction works must be carried out so as to minimize changes in landuse in areas outside the ones that will be permanently occupied by the path.

- Ensure that roads and paths remain unobstructed or in ill condition, allowing for its normal use by the local population, particularly in paths and roads that cross villages, cemeteries or houses.

- Vehicles that leave the construction site and work fronts to public roads must do it so as to avoid dragging mud and soil by vehicle wheels.

- During the construction phase, prior to possible cutting down of cork hoak or holm oak trees, an inspection by the National Institute for Nature and Forests (ICNF) must be carried out to check the aforementioned trees, that must have been previously belted.

- Vegetation management in the undercover of cork oaks and holm oaks must use brush cutters, with the use of harrowing being unauthorized, in line with good forestry practices, so as to avoid root damage (Construction and operation phases).

- Any occasional cutting/decimation of cork/holm oaks that are deemed necessary during the operation phase will have to be subject to authorization as per art.9th of DL 69/2001.

- Deforestation and tree cutting must be limited to the strictly necessary areas, and vegetation removal should be kept at the minimum necessary for the construction works and for abiding by all the safety regulations and other legal framework. This will avoid opening bare spaces that potentiate the settlement of invasive species.

- Soil resulting from exotic species areas cannot be used as plant soil and should be placed at the bottom of the holes.

- Deforestation, clearing, and soil works should be limited to the strictly indispensable areas. If feasible, these areas should be marked or limited, as to highlight that there is no need to affect any adjacent areas. These areas should not be used for support, however, it that's not possible, they should not be cleared of the existing vegetation.

- Tree specimens in the direct surroundings of work fronts should be duly identified and protected by barriers (which ideally should have an area that coincides with the projected canopy).

- Permanent archeological monitoring should be carried out in the construction works that require soil and underground movements.

- Archeological monitoring works should be carried out according to the number of work fronts by an archeologist or team that is accredited for this purpose by the General Directorate of Cultural Heritage, and with proven expertise in works focused on the pre-historic era.

- Ensure that any archeological remains require immediate suspension of onsite work and its communication to the competent authority and other relevant authorities, as per the legal framework. Irreversible damage to archeological remains implies additional archeological and conservations works.

- In all areas that are classified as having low/null visibility of the ground, archeological surveys must be carried out after vegetation removal works, as well as in any other areas that are not within the scope of the present study.

<u>Applicable to the Fundão – Vilarouco power line and the Opening of Armamar – Lagoaça powerline</u>

- The construction sites must be located in an unrestricted area according to the Drawing Restrictions on the location of the construction site and deposit areas. The aforementioned construction site and parks must be fenced off;
- The construction sites must be located in a previously artificialized location. If that's not possible, preference should go to places with nearby access and gentle slopes, to avoid opening new paths and additional soil works. Construction sites must not be located in:
    - National Agriculture Reserve areas (RAN);
    - Agricultural farmlands;
    - Areas matching the AH Cova da Beira;
    - Rock outcrop areas;
    - Emergence and Security Network (SIRESP) protection areas ;
    - National Ecological Reserve areas (REN);
    - RELAPE species Habitat patches;
    - Water courses and corresponding legal restraint of 10m;
    - Special Protection Area of the Alto Douro Wine Region;
    - Proximity to any sensitive receptors or other buildings with noise sensitivity.
    - Communal Interest Habitat areas (Habitats 91E0* e 6220*)
- Management of exotic and invasive species (PGEEI) must take place according to the specifications provided by REN.
- Signaling the heritage sites 17, 18, 26, 29, 30, 32 e 41.

Applicable to the Sectioning Station

- The construction site should be located close to the intervention area.
- Any surplus soil from excavation works should be sent to the adequate final destination.
- Implement the landscape integration plan.

9.3 FINAL PHASE OF CONSTRUCTION WORKS

Applicable to all project components

- Clear and clean all the watercourses, drainage trenches that might have been partially obstructed during the construction phase.

- Reassuring the reposition and/or replacement of any infrastructure, equipment and/or services that exist in the construction work area and any surrounding areas that might be affected during the course of the construction.
- Ensure that roads and paths used during the construction phase are restored to their original condition.
- Implement the Recovery Plan for Intervened Areas (PRAI), which should describe how the depreciated areas must be restored to their natural infiltration, soil decompaction and aeration state.
- Deliver the final archeological report to the competent authority as per the legal regulations.

9.4 MEASURES FOR THE OPERATION PHASE

- Ensuring the maintenance of the Recovery Plan for Intervened Areas for the sectioning station.
- If maintenance works are deemed necessary, safeguard all the heritage sites listed in the Heritage Charter.
- The application of other specific measures will dependo on the archeological survey results in the construction phase.

10. CONCLUSIONS

The present report refers to the Heritage Impact Assessment regarding the project "Fundão – Vilarouco Axis, at 400kV"and stems from the marginal crossing of the Special Protection Area (SPA) of the Alto Douro Wine Region, classified as a National Monument, as per Notice no 15170/2010, of 30th July, in the "Evolving, Living and Cultural Landscape".

As shown throughout this analysis, the actions that might cause bigger interference on the attributes that grand Outstanding Universal Value (OUV) to the Alto Douro Wine Region (ADWR), essentially take place in the Special Protection Area, while the ADWR itself is not affected.

This impact occurs mainly in the natural attribute Shrublands and Woodlands, more specifically shrubland areas, with the set up of two power line supports and dismantling of another. Although it is not an ADWR attribute, it should be noted that one of the power line supports is located in habitat 9340 (holm oak) within the SPA of the ADWR. As such, the direct impact in the ADWR natural attributes that grant OUV are as follows:

- Shrublands: set up of power line supports P70 LAMM.VLR, P5 LVLC.LGC/P71 LAMM.VLR and dismantling of support P70 LAMM.LGC, in a total of 1 600 m^2 in the construction phase, e 288 m^2 in the operation phase.

- Habitat 9340 (Holm oak tree): set up of power line support P6 LVLC.LGC, in a total of 400 m^2 in the construction phase, e 71 m^2 in the operation phase.

Except for Shrubland areas, there is also some impact on the natural attribute of relevant ridges and the cultural attribute Viewpoints and Panoramic Roads.

Regarding the relevant ridges, the main elevations present in the SPA, as well as in its visual influence area (the ridges of Sr.ª do Viso – Srª da Piedade, Moinho – Castanheiro do Vento, Santa Eufémia – Numão Castle), and concluded that only the opening of the Armamar-Lagoaça power line interferes with one of the relevant ridges within the SPA - Srª do Viso – Sr.ª da Piedade, though in an already depreciated area thanks to the existing Very High Tension Power Lines. Still regarding this project componente, the SPA shows visibility towards the ridge Moinho – Castanheiro do Vento, but also in an already compromised area, and thus not constituting a significant increase in the current visual intrusion. The sectioning station is generally not very visible from the SPA, with the highest visibility spots to this infrastructure being the Castanheiro do Vento ridge, Moinho peak and the elevation of Sra do Viso, with the two last ones having their visual environment already compromised by other existing power lines in a nearer plane. Taking all this into consideration, it can be concluded that the relevant ridges within the ZEP won't be affected in a significant way by the project implementation, and that the visual intrusion caused by the infrastructure, outside de SPA, won't bear major significance, with the impacts being considered of low magnitude and significance.

As for viewpoints and panoramic roads, in the area of visual influence of the SPA and the project were identified all the viewpoint, natural or otherwise, and panoramic roads, generally associated with high slopes and structural ridges. Not only the viewpoints and roads included in the SPA were selected, but also those identified as being exposed to this Protection Area, in order to check whether the visibility of the EPZ from these points of interest is compromised by the project. According to the analysis carried out, there relevant impact was only identified in 4 out of the 16 observation points, namely the viewpoints of Castanheiro do Vento, Pitarangas and No Name SD2 e SD3, three of which are within the SPA, and as such the visual impacts will achieve moderate magnitude and significance.

As previously mentioned, impact occurs mainly in the construction phase, being minimizable with the proposed measures, and in the operation phase the impact is by itself very small, even with the overpassing of the power line over the SPA of the ADWR.

The results of this assessment, as shown in the previous table, are impact classifications, specifically regarding the opening of the Armamar – Lagoaça powerline which implies intervening in 4 power line supports (three new ones and dismantling another one) and an extension of 1061 m of the Armamar – Vilarouco power line; 111 m of the Vilarouco – Lagoaça power line e 998 m of the Vilarouco – Lagoaça powr line, over the Special Protection Area of the Alto Douro Wine Region, as follows:

- Construction Phase – null impact, null magnitude e neutral significance;
- Operation Phase – null impact, null magnitude e neutral significance;
- Deactivation Phase – null impact, null magnitude e neutral significance.

Thus, there is not expressive interference with the main values that grant Outstanding Universal Value to the ADWR, since these impacts occur in the Special Protection Area, and are of little expression having into account the obtained results for the intervention area. The proposed minimization measures ensure that the project itself does not compromise either the SPA or the integrity of the Alto Douro Wine Region Asset.

All in all, it can be concluded that these project does not compromise any natural or cultural values in the reason and is therefore compatible with the conservation of the sustainability of the World Heritage Site.

11. REFERENCES

Aguiar, F. B. & Dias, J. (Coord.). (2000). *Candidatura do Alto Douro Vinhateiro a Património Mundial.* Porto: Fundação Rei Afonso Henriques.

Aguiar, F. B. (2002). O Alto Douro Vinhateiro, uma paisagem cultural, evolutiva e viva. Douro - Estudos & Documentos, Vol. VII, 13 , pp. 143-152.

Alto Douro Wine Region. (s.d.). Obtido em Maio de 2016, de UNESCO World Heritage Centre: http://whc.unesco.org/en/list/1046

Andresen, T. & Rebelo, J. (2013). Avaliação do Estado de Conservação do Bem Alto Douro Vinhateiro - Paisagem Cultural Evolutiva Viva, Volume 1 - Relatório de Avaliação. Porto: CCDR-N/EMD, CIBIO UP/UTAD.

Assembleia da República. (2001). Bases da política e do regime de protecção e valorização do património cultural. *Lei n.º 107/2001 - Diário da República n.º 209/2001, Série I-A de 2001-09-08* .

CCDR-N. (2012). Alto Douro Vinhateiro: A História de um Património Mundial.

Domingues, Á. (2001). A paisagem revisitada. Finisterra - Revista Portuguesa de Geografia, Vol. XXXVI, 72 , pp. 55-66.

Encarnação, J. d' (2013). Alto Douro vinhateiro, paisagem cultural. Revista da Faculdade de Letras - Ciências e Técnicas do Património, Vol. XII, pp. 319-329.

Fazenda, N. (Coordenação técnica – CCDRN/ Estrutura de Missão do Douro); Alegria, E. (CCDRN); Gomes, J. (CCDRN); Costa, V. (Estrutura de Missão do Douro). (2008). Plano de Desenvolvimento Turístico do Vale do Douro 2007-2013. Estrutura de Missão do Douro.

ICOMOS. (2011). Guidance on Heritage Impact Assessments for Cultural World Heritage Properties.

Jokilehto, J. (2008). The World Heritage List: What is OUV? Defining the Outstanding Universal Value of Cultural World Heritage Properties. ICOMOS.

Lourenço-Gomes, L. & Rebelo, J. (2012). Alto Douro Vinhateiro património da humanidade: a complexidade de um programa de preservação. *Pasos - Revista de Turismo y Patrimonio Cultural, Vol. 10, 1* , pp. 3-17.

Moura, R. M. (2006). A importância do vale do rio Douro na conservação da paisagem e os problemas de gestão decorrentes. CEPESE-Centro de Estudos da População, Economia e Sociedade.

Noé, P. (2002). *Alto Douro Vinhateiro - Região Demarcada do Douro*. Obtido em Maio de 2016, de Monumentos - Sistema de Informação para o Património Arquitectónico: http://www.monumentos.pt/site/APP_PagesUser/SIPA.aspx?id=10942

Nomination of Alto Douro Wine Region for the World Heritage List. (2000). Alto Douro.

Pereira, P.; Pereira, D. & Alves, M. I. C. (2004). Património geomorfológico: da actualidade internacional do tema ao caso português. *Actas do V Congresso da Geografia Portuguesa.* Guimarães: Universidade do Minho.

Pina, M. H. (2004). A expansão e a reconversão vitícola na Região Demarcada do Douro: algumas problemáticas. Guimarães: Universidade do Minho.

Presidência do Conselho de Ministros. (2003). Plano Intermunicipal de Ordenamento do Território do Alto Douro Vinhateiro. *Resolução do Conselho de Ministros n.º 150/2003 – Diário da República n.º 219/2003, Série I-B de 2003-09-22* .

Região Demarcada do Douro. (s.d.). Obtido em Março de 2020, de Museu do Douro:

http://www.museudodouro.pt/regiao-demarcada-do-douro

Ribeiro, J. A. (2003). Alto Douro - A paisagem agrária e os equilíbrios ambientais. *Douro - Estudos & Documentos, Vol. VIII, 15* , pp. 157-162.

Rota dos Miradouros. (s.d.). Obtido em Outubro 2020, de Douro Valley: http://www.dourovalley.com/poi?id=6961&r=8

Sousa, F. d. (2007). *O Alto Douro. Da demarcação pombalina à classificação de Património Mundial.* Porto: CEPESE-Centro de Estudos da População, Economia e Sociedade.

UNESCO. (2015). Operational Guidelines for the Implementation of the World Heritage Convention.

UNESCO World Heritage Centre. (2015). Operational Guidelines for the Implementation of the World Heritage Convention.

UNESCO World Heritage Centre. (2001). *Report of the 25th Session of the Committee.* Helsínquia.

ANEX 1 - DRAWINGS