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TERMS AND ABBREVIATIONS

buffer zone	designated area of specific width where the environmental survey is carried out, located along the planned project area;
Quaternary	the last period of the Cenozoic era extending from 2,588 million years ago from the end of the Neogene to the present; Divided into: the Holocene and the Pleistocene
fauna	all animal species present in the area;
flora	all plant species present in the area;
species	a group of organisms having common characteristics capable of mating to produce fertile offspring; broader than population (see: *population*); plant and animal species within the scope of the European Community interest whose protection requires to create Special Protection Areas (Annex to the Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora); plant and animal species within the scope of the European Community interest that require strict protection (Annex to the Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora);
species of Annex II of the Habitats Directive	strong polypropylene or polyester fabrics used for soil filtration, separation and reinforcement purposes. Applied in transport infrastructure engineering, in waste landfills and to reinforce and construct: embankments, dykes and flood barriers, river banks and water reservoirs, car parks, manoeuvring grounds, to protect drainage and water supply systems; specialist biologist studying reptiles and amphibians, Greek: herpeton – “creeping”;
species of Annex IV of the Habitats Directive	forests with special natural value;
geotextile	regular qualitative and quantitative measurements or observations of a given phenomenon carried out for a specified period of time to gather data on a given subject;
herpetologist	environmental protection programme in place since Poland joined the European Union. Natura 2000 sites network covers the areas considered as the most important to maintain and protect endangered or rare plant and animal species or characteristic natural habitats crucial for the protection of Europe's natural values;
protective forests	a group of one species organisms (see: *species*) living in a specific environment, interacting with each other and being interdependent, capable of mating to produce fertile offspring;
monitoring	bird species that should be subject to special protection measures including the protection of their natural habitats to ensure their preservation and reproduction (Annex to the Council Directive 79/409/EEC on wild bird species conservation);
Natura 2000 areas	
population	
birds listed in Annex I of the Birds Directive	
land reclamation	restoration of land productivity or natural values (especially forest and agricultural lands) devastated or degraded by human activity;
separators of oil-related substances	device used to separate light fluid contaminants less dense than water and specified in PN-EN 858 standard (oil, gasolines etc.);
habitats listed in Annex I of the Habitats Directive	types of habitats whose conservation requires the creation of Special Protection Areas;
natural habitat	term used in the European Union legal terminology in relation to Natura 2000 programme; introduced to identify land and water areas characterized by specific natural features;
sedimentation well	a chamber with a pit enabling precipitation of mineral origin suspensions – sand and other solid contaminants;
ecological site	remnant of the ecosystem important for the preservation of biodiversity, e.g. mid-field and mid-forest water ponds, swamps, peat lands, dunes, old river beds, natural habitats, rare or protected plant, animal and fungal species stands, their refuge areas, places of breeding and seasonal occurrence;
petroleum hydrocarbons	organic chemical compounds containing carbon and hydrogen, created as a result of petroleum chemical processing;
overall suspension	insoluble, floating and suspended substances extracted from water or sewage to solid mass through the process of filtering, centrifugation or drying in the temperature of 105ºC. Suspensions consist of organic and mineral substances;
MGR	Major Groundwater Reservoir (MGR)
L_{Aeq}	equivalent sound level number of vehicles per day
veh/24 h	traffic flow level(s)
TFL	Environmental Impact Report
EIR	99.8-percentile of 1-hour concentrations annual distribution (concentration not exceeded for 99.8 % of the time)
S99.8	average daily traffic
ADT	Voivodeship Inspector of Environmental Protection
VIEP	Voivodeship Office of Monument Protection
VOMP	

I. SUBJECT, CLASSIFICATION, OBJECTIVE AND SCOPE OF THE REPORT

I.1. **The project's name: Extension of national road No. 8 to reach expressway parameters on the following sections:**

from the Masovian Voivodeship border to the Zambrów ring road and from the Wiśniewo ring road to Jeżewo including the construction of the Mężenin ring road

Investor:

The General Directorate for National Roads and Motorways, Branch in Białystok, 2 Zwycięstwa Street, Białystok

I.2. Project classification

Pursuant to Article 2 (1) (30) of the Ordinance of the Council of Ministers of 9 November 2004 on specifying types of project with potentially significant environmental impact and detailed determinants for a project qualifying for the Environmental Impact Report (Journal of Laws No. 257, 2004, item 2573 and Journal of Laws No. 92, 2005, item 769) amended by the Ordinance of the Council of Ministers of 21 August 2007 (Journal of Laws No.158, 2007, item 1105) – planned project entitled: ***"Extension of national road No. 8 Wrocław – Warsaw – Białystok – Suwałki – Budzisko – state border to reach expressway parameters on the section from the Masovian Voivodeship border to the Zambrów road ring and from the Wiśniewo ring road to Jeżewo including the construction of the Mężenin ring road"*** meets the criteria to be classified as a type of project with potentially significant environmental impact, thus requiring an Environmental Impact Report to be developed.

I.3. Objective and scope of the report

The Report's objective is to determine principal environmental conditions in terms of the designed project's impact on the main environment components, in particular air, water, soil, landscape, acoustic climate and other biodiversity components.

The scope of the report results from the following requirements:

1. requirements specified under Article 66 (1) of the Act of 3 October 2008 on Providing Access to Information concerning the Environment and Environmental Protection, Participation of the Public in Environmental Protection and on Environmental Impact Assessments (Journal of Laws No. 199 item 1227),
2. scope of the prepared design documentation related to the construction of the planned road construction project,
3. technical conditions specified by the administrators of the existing networks and systems,
4. arrangements and opinions reached at the earlier stage of the project's design process.

Conclusions and recommendations constitute an integral part of the Report having regard to environmental protection and conservation methods in terms of all its components. The conclusions and recommendations will be used in further design works related to the project.

II. DESCRIPTION OF THE PLANNED ROAD CONSTRUCTION PROJECT

The planned project consisting in the extension of the existing national road No. 8 to upgrade it to reach expressway parameters is located in its entirety within the area of the Podlaskie Voivodeship.

The project has been divided into two investment tasks:

✓***Task I – from the Masovian Voivodeship border to the Zambrów ring road – km 561+073 – 575+955 (561+073 – 575+834 of the current chainage of national road No. 8)***

– located in its entirety within the area of the poviat of Zambrów, specifically within the area administered by the following communes: Szumowo and Zambrów.

✓***Task II – from the Wiśniewo ring road to Jeżewo – km 586+310.00÷615+960.85 (585+731 – 615+251 of the current chainage of national road No. 8)*** located within the area of three poviats, specifically within the area administered by 5 communes:

- the poviat of Zambrów – the communes of Kołaki Kościelne and Rutki
- the poviat of Białystok – the communes of Zawady and Tykocin
- the poviat of Wysokie Mazowieckie – the commune of Kobylin-Borzymy

The aim of the project is the construction of the S8 dual carriageway expressway along with environmental protection infrastructure and technical facilities in the abovementioned sections – Task I and Task II. The road will be constructed with a reserve strip left for future third lanes on both carriageways from the median of the road (central reservation – 12 m).

At the current design stage the following route variants for the S8 road have been analysed, as presented in graphic form in the general plan in Annex 1 *(in EIR No. 1.1.).*

Task I – the Masovian Voivodeship border – Zambrów ring road:

Variant 1 – incorporates sections of the existing right-of-way of national road No. 8 as a second carriageway of the designed S8 expressway and/or the existing national road No. 8 remains a local road (in such a case a new dual carriageway expressway would be constructed along national road No. 8) including the construction of a diversion for Wyszomierz (new layout).

Variant 2 – the existing national road No. 8 remains as a local road (on the major length) and the S8 dual carriageway expressway is constructed as a parallel route to the existing one along with the construction of a diversion for Wyszomierz and Ostrożne (both in new layout)

Task II – from the Wiśniewo ring road to Jeżewo:

Variant 1 – using most of the sections of the existing right-of-way of national road No. 8 as a second carriageway of the designed S8 expressway, leaving short sections of the existing national road No. 8 as a local road, together with the construction of a northern diversion for Mężenin (new layout) and route correction close to the area of PKP (km ~591) and to the bridge over the Ślina River (km ~612+700).

Variant 2 – using sections of the existing right-of-way of national road No. 8 as a second

carriageway of the designed S8 expressway, leaving the existing national road No. 8 as a local road, together with the construction of a southern diversion for Mężenin, the construction of a diversion for Stare Krzewo and route correction close to the area of PKP (km ~591) and to the bridge over the Ślina River.

Designed technical parameters of the S8 expressway:

Technical class-	**- S**
Design speed	- 100 km/h
Carriageway width	- 2 × 7.00 m
Emergency lane width	- 2 × 2.50 m
Central reservation width	- 12.00 m (incl. shoulders 2 × 0.5 m)
Ground shoulder width	- 2 × 0.75 m
Traffic category	- KR6
Load	- 115 kN/axle
Vertical clearance gauge	- 5.00 m

On the basis of a general traffic measurement made in 2005 the average daily and hourly traffic estimations have been made for the years 2012 and 2025 with changing traffic flow in the sections between junctions taken into account. The table presented below shows the results of the general traffic measurement made in 2005 on the existing national road No. 8 in 3 sections:

- section 1 – from the voivodeship border to Zambrów (km 561+100÷575+900)
- section 2 – from Zambrów to Mężenin (km 583+000÷599+200)
- section 3 – from Mężenin to Jeżewo (km 599+200÷617+700)

Table 1. Average daily traffic (ADT) reported in 2005 on national road No. 8.

Traffic of particular vehicle types						
Vehicle type	**Section 1**		**Section 2**		**Section 3**	
	ADT [veh/24h]	**Percentage [%]**	**ADT [veh/24h]**	**Percentage [%]**	**ADT [veh/24h]**	**Percentage [%]**
motorcycles	11	0.1	10	0.1	9	0.1
passenger cars, minibuses	5,744	50.5	5,977	58.8	4,579	50.3
light trucks	1,081	9.5	925	9.1	810	8.9
trucks without trailers	796	7.0	661	6.5	573	6.3
trucks with trailers	3,640	32.0	2,480	24.4	3,059	33.6
buses	91	0.8	81	0.8	64	0,7
tractors	11	0.1	30	0.3	9	0,1
Total	**11,374**	**100**	**10,164**	**100**	**9,103**	**100**

The table presented below shows the areas to be used in the project development

Table 2. Areas to be used in the project development

Area occupation	**TASK I**		**TASK II**	
	Variant 1	*Variant 2*	*Variant 1*	*Variant 2*
	[ha]			
Complete occupation of the area, including:	179.1	210.9	444.0	405.3
– S8 road – bituminous pavement	- 32.9	- 33.1	- 59.7	- 59.5
– junctions – bituminous pavement	- 1.5	- 1.5	- 3.9	- 4.6
– other roads – bituminous pavement	- 15.0	- 13.0	- 28.5	- 22.9

The expressway will be linked to the public roads through road junctions. Passes and crossings will be constructed for all voivodeship, poviat and commune roads. All existing level crossings on the roads will be reconstructed and the roads will be linked to the service roads.

Task I

Irrespective of the variant, Task I includes only one road junction. It is the **"Szumowo" junction** – a WB-type junction designed at the intersection of the expressway with a poviat road.

Task II

Irrespective of the variant taken into account, Task II includes 4 road junctions. These are:

- ***"Gosie" junction –*** *km 589+507.78,*
- ***"Mężenin" junction***
  - *Variant 1 – km 599+532.55,*
  - *Variant 2 – km 601+217.71*
- ***"Sikory" junction –*** *km 610+457.71,*
- ***"Kobylin" junction –*** *km 614+146.03.*

The following engineering structures will be designed in the framework of the planned project: bridges (M) and viaducts (WE) in the course of the expressway, viaducts over the expressway (WD), passageways for people (PG – over or under the expressway) and for animals (PZ – over or under the expressway). Additionally, bridges and viaducts situated in the course of the expressway (if there were such requirements) can fulfil the ecological function of passageways for animals.

Task I, *Variant 1*

13 engineering structures have been designed within ***Task I***, *Variant 1*:
- structures in the course of the expressway – 6
- structures over the expressway – 7

Task I, *Variant 2*

15 engineering structures have been designed within ***Task I***, *Variant 2*:
- structures in the course of the expressway – 9
- structures over the expressway – 6

Task II, *Variant 1*

34 engineering structures have been designed within ***Task II***, *Variant 1*:
- structures in the course of the expressway – 24
- structures over the expressway – 10

Task II, *Variant 2*

31 engineering structures have been designed within ***Task II***, *Variant 2*:
- structures in the course of the expressway – 21
- structures over the expressway – 10

To ensure traffic safety and provide service areas for drivers and passengers, road related infrastructure has been designed along the entire section of the expressway. These are Passenger Service Points (PSP):

Task I

Individual variants include Passenger Service Points (PSP) planned to be located as follows:

Variant 1

- PSP II "Wyszomierz" approx. at km 563+300 (in the location of the existing bar),
- PSP III "Szumowo" approx. at km 566+500 (in the location of the existing petrol station),
- PSP I "Ostrożne" approx. at km 573+100 (newly designed),
- PSP I "Krajewo Północ" approx. at km
- 574+400 (in the location of the existing bar)
- *Variant 2*
- PSP III "Szumowo" approx. at km 566+400 (in the location of the existing petrol station),
- PSP I "Ostrożne" approx. at km 573+100 (newly designed),

Task II

Individual variants include Passenger Service Points (PSP) planned to be located as follows:

Variant 1

- PSP II "Gosie" approx. at km 589+800 (in the location of the existing petrol station),
- PSP III "Kossaki" approx. at km 593+200 (newly designed),
- PSP II "Rutki" approx. at km 597+100 (in the location of the existing petrol station),
- PSP I "Cibory Północ" approx. at km 607+450 (on the northern side of the road in a newly designed location)
- PSP II "Cibory Południe" approx. at km 607+450 (on the southern side of the road in the location of the petrol station)

Variant 2

- PSP II "Gosie" approx. at km 589+900 (in the location of the existing petrol station),
- PSP III "Kossaki" approx. at km 593+300 (newly designed),
- PSP I "Cibory Północ" approx. at km 607+700 (on the northern side of the road in a newly designed location)
- PSP II "Cibory Południe" approx. at km 607+700 (on the southern side of the road in the location of the existing petrol station)

The construction of the road, both in Task I and in Task II and in all their variants, will not require high voltage power lines to be reconstructed. Still, it will be necessary to reconstruct medium and low voltage power lines. The number of collisions with power lines in each variant is as follows:

Task I
- Variant 1 – 11 collisions
- Variant 2 – 11 collisions

Task II
- Variant 1 – 33 collisions
- Variant 2 – 42 collisions

Within the scope of Task I the planned S8 expressway collides with a high pressure gas pipeline (Wyszków – Zambrów – Białystok) of 250 mm in diameter, which is expected to be reconstructed.Moreover, in Task I (km 565+700) the designed route of the S8 expressway will run above the transit gas pipeline "Jamał". The reconstruction of this pipeline is not necessary.

Within the scope of Task II the designed route does not collide with gas distribution networks.

The variants of the S8 expressway route considered in the design cross also the water supply systems both within the scope of Task I and Task II. The number of collisions with the water supply systems are as follows:

Task I
- Variant 1 – 6 collisions
- Variant 2 – 6 collisions

Task II
- Variant 1 – 12 collisions
- Variant 2 – 14 collisions

Environmental protection equipment

A number of solutions have been designed to minimize the project's impact on the environment. Depending on the environmental component these are as follows:

natural environment:
- fence to be erected on both sides of the road,
- construction of safe passage structures for large and medium-sized animals and culverts for amphibians and small mammals along with facilities directing the animals to the ecoduct (planting, fences directing the animals to crossings/culverts);
- complete land reclamation after the construction is finished.

soil and water environment:
- roadside grass-covered ditches,
- geotextile on the bottom of the roadside ditch to protect the soil and water environment in the sections where the groundwater level is increased,

- sedimentation wells and separators of oil-related substances before final receiving reservoirs such as the Ślina River,
- ecological basins are expected to be necessary in undrained areas with no water outflow,
- separators of oil-related substances near the drains carrying stormwater from Passenger Service Points,
- the design includes the construction of extended roadside ditches equipped with emergency closure (gate) before the receiving reservoir – the Ślina River – in the event of a major fault or breakdown.

Landscape protection

- properly designed green belts fulfilling also a protective function (wind, water, soil protection, biotechnical barrier) around 10-15 m wide,

acoustic climate condition – noise barriers in protected areas:

- the construction of acoustic screens.
- recommended green belts will additionally contribute to increasing the sound absorption coefficient in the environment and provide a protective barrier

III. DESCRIPTION OF THE CONSIDERED VARIANTS OF THE S8 EXPRESSWAY ROUTE.

At the first stage of design works, i.e. at the stage of the Preliminary Programme Concept for the extension of national road No. 8 to upgrade it to reach the parameters of an expressway in the sections starting from the Masovian Voivodeship border to the Zambrów ring road (Task I) and from Wiśniewo to Jeżewo (Task II), the Environmental Protection Team of Transprojekt Gdański developed the Environmental Analysis containing the assessment of two road route variants for each task: ***Task I – <u>the Masovian Voivodeship border – the Zambrów ring road</u>***

- Variant 1 – using the existing right-of-way of national road No. 8 (as a second carriageway or as a local road), diversion planned for Wyszomierz (new layout)
- Variant 2 – using the existing right-of-way of national road No. 8 (as a second carriageway or as a local road), diversions planned for Wyszomierz and Ostrożne (new layout)

Task II – the <u>Wiśniewo ring road – Jeżowo</u>

- Variant 1 – using the existing national road No. 8 to the maximum, second carriageway to be added with northern diversion of Mężenin (new layout) and route correction close to the area of PKP (km ~591) and close to the bridge over the Ślina River.
- Variant 2 – running along the existing national road No. 8 (leaving the major part of the road to be used for local traffic) with the southern diversion of Mężenin, diversion of Stare Krzewo and route correction close to the area of PKP (km ~591) and close to the bridge over the Ślina River.

The results of the analysis have shown that in terms of particular environmental factors it is not always possible to differentiate between the variants, indicate the variant which is clearly better than others and grade the variants being compared. Considering factors such as: noise protection, social conflicts, soil and water environment <u>Variant 2</u> turned out to be the more favourable one in both Tasks. However, as far as the natural environment is concerned <u>Variant 1</u> proved to be the better one.

The summary of the Environmental Analysis points <u>Variant 2</u> ***as the S8 road route variant which is most favourable to the environment in both tasks analysed****.*

On 14 March 2008 the Investor i.e. the Branch in Białystok of the General Directorate for National Roads and Motorways pointed out in its letter No. GDDKiA-O/BI-ZP-P4/265/7/08 that it is necessary to carry out a comprehensive environmental survey to constitute a basis for developing a reliable assessment of the project's impact on the natural environment and wildlife and determining explicitly whether the said impact will be considerable.

Currently, in the Environmental Impact Report, all variants of the S8 expressway construction have been once again assessed in detail as presented in the subsequent chapter III.2 in order to enable the selection of a variant which will be the most favourable to the environment.

The routes and locations of all the assessed variants of the S8 expressway have been presented in graphic Annex No. 1 (*in EIR 1.1*).

III.1. The "0" (zero) variant – non-investment

National road No. 8 (DK8) is an international road marked as E67 with the following route: Słone – Wrocław – Piotrków Tryb. – Warsaw – Białystok – Suwałki – Budzisko. In the area of Białystok the DK8 is connected to the existing road No. 19 running along the eastern border of Poland providing a communication link to Lublin and Rzeszów and further to the border crossing with Slovakia (Barwinek).

National road No. 8 is part of the primary road network in the country. In the section covered by the report the road is of key importance in accommodating traffic flow in this region of Poland – when it comes to traffic volume it is one of the most heavily loaded road sections. The DK8 accommodates transit traffic of heavy vehicles coming from the state border to the centre, as well as industrial traffic and a considerable volume of tourist traffic in the summer season. Heavy vehicles traffic in the analysed section of national road No. 8 constitutes around 40% of traffic according to the measurements made in 2005.

The traffic measurement results obtained in 2005 during the general traffic measurement indicate that:

- ✓ in the section corresponding to the length of Task I – average daily traffic (ADT) amounted to 11,374 veh/24h
- ✓ in the section from Zambrów to Mężenin – ADT amounted to 10,164 veh/24h
- ✓ in the section from Mężenin to Jeżewo – ADT amounted to 9,103 veh/24h

Bad pavement condition (on the major part of the analysed section), the parameters of the road, no environmental protection facilities or badly functioning ones and difficult driving conditions through the towns and villages result in increasingly negative impact on the safety of traffic participants and on the areas adjacent to the road (e.g. protected built-up areas). The expected further increase in the number of vehicles will cause significant disruptions in the traffic flow and result in higher emission of exhaust fumes.

National road No. 8 runs mainly through agricultural areas, to a lesser extent through forests. The existing national road crosses towns and villages and their residential areas located close to the road and thus exposed to the impact of above-standard road traffic noise. During the field inspection no protection of residential areas against excessive traffic noise coming from the right-of-way was reported.

After the S8 expressway is constructed the existing national road will be used for accommodation of the local traffic.

Therefore, the principal objective of the project is the construction of a road having the parameters of an expressway together with expressway related infrastructure. This will enhance the safety of the road users, facilitate the traffic flow and improve the condition of the environment in the adjacent areas.

Impact of the existing road on the environmental condition

<u>Natural environment</u>

In the analysed section the existing national road No. 8 does not cross any environmental protection or nature conservation sites within the meaning of the Act on the Protection of Nature (Journal of Laws No. 92/2004 item 880). The nearest site of this kind is located approx. 700 m further (ecological site of the Moczary swamp), thus no negative impact of the existing road No. 8 on this area has been determined. The existing road also crosses an area of protective forests. The described section of national road No. 8 crosses areas used mostly for the purposes of agriculture such as fields and farmlands, grasslands and pastures.

If the planned S8 expressway is not constructed, increased and intensified traffic is expected to be observed on the existing national road No. 8 and thus increased contamination resulting from higher exhaust fumes emission and dust produced by increasingly damaged and

worn road pavement. This will deteriorate the natural environmental condition within the area of the road.

The expected changes will cause further degradation of the already separated habitats – their condition and structure will worsen and plant species susceptible to contamination will shrink.

National road No. 8 crosses major animal migration paths, inter alia ecological corridors enabling the migration of large animals such as wolves, elk and deer, as well as many animal species of water environment such as beavers and otters (Jędrzejewski et al. 2006). Since national road No. 8 has no fencing, animals can cross it along its entire length, which is a cause of collisions with vehicles. Also, it poses a serious risk to the safety of drivers and passengers.

Soil and water environment

The analysed section of the existing road No. 8 is located within the Vistula River basin. There are no big lakes in the area around the existing road, only small water ponds are to be found locally at a distance of around 200 m. The Project crosses: seepage spring areas of the Orz River, the area of the Łętówka River watershed, the Leśnica and Kołomyje rivers, tributary from Mężenin, the Ślina River and many channels.

One multiaquifer formation has been found in the surveyed area: groundwater in Quaternary formations. The formation consists of one or two overlying aquifers. One of them is discontinuous and located within the layers and lenticles of sand and moraine gravel at the depth of 10 to 40 m. This aquifer has rather limited capacities. The aquifer found at the depth of 30 to 120 m is of crucial importance. It is normally found under the above described discontinuous level, sometimes however it constitutes the first useful aquifer. The aquifers found in the discussed area have various thickness values ranging from 10 to approx. 40 m. The useful aquifers found in the surveyed area are fully insulated from the surface with a thicker layer of glacial clay.

In Wyszomierz and Szumowo the survey of groundwater intakes with a designated intermediate protection zone was carried out and the inventory was made accordingly. The existing national road No. 8 is located outside the protection zones designated for these water intakes at a distance of 75 m from the water intake protection zone in Wyszomierz Wielki and 1,125 m in Szumowo. The existing road is located outside the range of Major Groundwater Reservoirs.

Operation of the existing road No. 8 may lead to contamination of surface water and soil with substances contained in stormwater such as: overall suspension, petroleum hydrocarbons, heavy metals and chlorides used in winter maintenance counteracting slippery road surface.

In the area around the existing national road No. 8, in the section of the planned investment, the contamination level of stormwater running off the road was not tested. The closest location tested is Zambrów. Still, the tests performed there covered national road No. 63. Similar tests for national road No. 8 were carried out in Chorodrówka Nowa, Suchowola and Augustów. The tests results for these locations showed admissible levels of overall suspension and petroleum hydrocarbons.

Soil

The analysed section of the existing national road No. 8 runs through typically agricultural areas with patches of forests. Favourable soil conditions provide a rather good environment for land cultivation and farming (III–V soil valuation class).

Approx. 85÷90% of soil in the direct vicinity to DK8 is classified as IV–VI soil valuation class, whereas approx. 10÷15% is class III. The dominant soil types here are: brown soils typical, leached and acidic, black earths and pseudo-podzolic soils, as well as local patches of high class grasslands and forest areas.

Road operation is connected mainly with chemical degradation of soil resulting from traffic related contaminants and pollutants: stormwater running off the road, exhaust fume components, secondary emission of dust caused by traffic (pavement, tyres and metal car part wear) and chemical agents used in winter road maintenance (mainly mixtures of NaCl with sand or $CaCl_2$).

The available data indicates that in the discussed area no tests of soil adjacent to the road were carried out. On the basis of a 1:25,000 scale soil distribution and agricultural maps and pursuant to Annex No. 4 of “Good practice guide for environmental reports concerning national roads” commissioned by the General Directorate for National Roads and Motorways, the resistance of soil to traffic related contamination along the current DK8 was evaluated as weak (level 4 on a 5-level scale).

Cultural heritage

The existing national road No. 8 crosses towns and villages with conservation areas entered into the register of historic sites and monuments or conservation officer's register.

In Żabikowo Rządowe located in the Szumowo commune in the vicinity of DK8 there is a military cemetery dating back to the First World War, entered into the historic sites and monuments register and protected under “B” conservation zone. In the commune of Rutki Kossaki the DK8 runs in the vicinity of Zambrzyce and Mężenin with sites entered into the voivodeship conservation register. In the commune of Kobylin Borzymy the existing national road DK8 runs close to villages based on historically developed and protected settlement systems – Sikory Wojciechowięta and Sikory Pawłowięta.

High traffic volume (especially of heavy vehicles) and high speeds may permanently affect the culturally valuable sites due to contamination, dust and vibrations caused by such heavy road traffic.

Aerosanitary condition

The existing national road No. 8 is currently a source of contamination and pollution emitted by vehicles moving on the road. Thus, residential areas located in the direct vicinity of the road may be exposed to increased air pollution level. The unsatisfactory standard of the road's technical parameters in relation to the steadily increasing traffic volume will mean that the emission of contaminants and pollutants remains at a high level. Moreover, there are problems when it comes to manoeuvring a vehicle due to limited traffic flow capacity of the road and resulting traffic jams, which will also contribute to the emission increase.

Major fault risk

Due to its heavy traffic volume, especially of heavy vehicles, the existing national road No. 8 is a scene of many collisions. It is assumed that vehicles carrying hazardous cargo also use the existing road and accidents involving such vehicles cause extraordinary risk both to the environment and to people. Due to low technical parameters and insufficient traffic flow level, vehicles carrying hazardous cargo on the existing road pose a risk to people living nearby and to the surrounding environment.

Acoustic climate

The most measurable factor, crucial in terms of social perception and possible to be expressed numerically, is the impact of noise emitted by vehicles moving on the existing road.

The pattern of how the environmental condition will change around the existing national road No. 8 has been presented below for the locations where diversions are planned i.e. in Ostrożne within **Task I** and in Mężenin **in Task II**. The changes in the acoustic climate parameters based on the predicted traffic volume are given as an example.

Several variants of the predicted traffic volume have been analysed, all in relation to the S8 expressway with the diversions of Ostrożne and Mężenin (investment variant – iv) or without (non-investment variant – niv). The time horizons taken into account are: 2008, 2012, 2025. In each case two situations have been analysed:

expressway in operation (iv) (excluding 2008)

no expressway (niv)

The construction of the S8 expressway – investment variant – and the resulting decreased traffic volume on the existing national road No. 8 will considerably improve the acoustic climate condition in the areas surrounding the road. It is expected that the range of noise impact on national road No. 8 in individual sections will decrease in the following manner:

passing through Ostrożne

- during daytime in 2012 from 51 m to 0 m and in 2025 from 52 m to 0 m
- at night in 2012 from 136 m to 13 m and in 2025 from 141 m to 11 m

passing through Mężenin

- during daytime in 2012 from 44 m to 0 m and in 2025 from 45 m to 0 m
- at night in 2012 from 114 m to 14 m and in 2025 from 117 m to 16 m

The decrease in traffic volume on the existing national road No. 8 after completion of the S8 expressway will cause a reduction in road traffic noise emitted to the environment at night:

passing through Ostrożne – from 17.3 to 19.0 [dB]
passing through Mężenin – from 16.4 to 17.7 [dB]

The changes have been presented in graphic form in Annex No. 5 *(in EIR Annexes 6.7, 6.8, 6.9 and 6.10).*

III.2 Description of investment variants

The planned investment project is located in its entirety within the area of the Podlaskie Voivodeship. The report takes account of different variants of the S8 expressway. The road has been divided into two tasks:

Task I

Starting from the Podlaskie and the Masovian Voivodeship border and ending at the Zambrów ring road. Two investment variants have been analysed for this task.

- Variant 1 – 14.80 km long section
- Variant 2 – 14.88 km long section

Task II

Starting from the Wiśniewo ring road and running to Jeżewo. Also for this task two variants have been analysed.

- Variant 1 – 29.73 km long section
- Variant 2 – 29.65 km long section

III.2.1. Task I (Masovian Voivodeship border – Zambrów)

Variant 1

The variant assumes using as much of the existing right-of-way of the national road as possible together with a northern diversion for Wyszomierz Wielki and a crossing through Szumowo and Ostrożne (on the line of the existing national road No. 8). The use of the existing lane of national road No. 8 requires 2 residential buildings to be demolished along with the Fire Service building in Ostrożne. The variant is a section starting at km 561+073. Up to km 564+500 a northern diversion for Wyszomierz Wielki has been designed (the existing national road will be used as a local road). In the section at km 564+500÷568+000 the designed expressway runs on the southern side in parallel to the existing national road No. 8. The current road will be used partly as a local road and partly as a service road distributing traffic from the “Szumowo” junction. In the section at km 568+000 to 569+000 the expressway diverts Żabikowo Rządowe on its northern side. At km 569+300÷575+955 (start of the Zambrów ring road) the right-of-way of the existing road is to be fully used.

The implementation of this variant involves the construction of four Passenger Service Points as well as the construction of 13 engineering structures.

Variant 2

In this variant the existing national road No. 8 is to remain as a local road in residential areas. Therefore, in this variant the existing right-of-way is to be used to a lesser extent. The diversion of Wyszomierz and Ostrożne is designed on the northern side. In the section starting from km 561+073 to km 564+500 a northern diversion for Wyszomierz Wielki has been designed – the existing national road to be used as a local road. In the section at km 564+500÷568+000 the designed expressway runs on the southern side in parallel to the existing national road No. 8. The current road will be used partly as a local road and partly as a service road distributing traffic from the “Szumowo” junction. In the section at km 568+000 to 570+000 the expressway diverts Żabikowo Rządowe on its northern side running in parallel to the current road which is to be used for local traffic. In the next section at km 570+000÷573+600 a northern diversion of Ostrożne has been designed – the existing national road to be used as a local road. In the final section from km 573+600 to approx. 575+955 (the end line of the designed section) the design assumes the construction of additional carriageway on the southern side of the existing national road No. 8.

This variant involves the construction of two Passenger Service Points and 15 engineering structures.

III.2.2. Task II (ring road Wiśniewo – Jeżowo)

Variant 1

In this variant the existing national road is to be used to the maximum extent possible. In the section from km 586+310 to km 589+655 a carriageway is to be added on the southern side. The existing national road No. 8 is to be used as the second carriageway. In 589+655÷592+335 near the railway crossing, two carriageways are to be constructed on the northern side and the existing DK8 is to be included in the route of a local road. Then, up to km 596+620 a carriageway is to be added on the northern side and subsequently up to km 597+900 a carriageway on the southern side.

The existing national road No. 8 is to be used as the second carriageway. From km 597+900 to km 602+000 there will be a diversion of Mężenin from the northern side – construction of a new dual carriageway expressway. Then, the expressway runs on the southern side of the existing DK8, whose section is to be used for local traffic near Zambrzyce. In the section starting from km 605+370 to km 611+600 a carriageway will be added on the northern side. Near the crossing over the Ślina River two lanes of the expressway are to be added on the northern side of the existing DK8. Then, in the section from km 613+650 to km 616+036.69 one lane is to be added on the northern side.

Five Passenger Service Points and 34 engineering structures are to be constructed.

Variant 2

In this variant the extent to which the existing national road No. 8 is to be used as the second lane of the designed expressway is more limited. In some sections the construction of two new carriageways is planned with the existing road left to accommodate local traffic e.g. the diversion of Mężenin and Stare Krzewo. In the section from km 586+310 to km 589+655 a carriageway is to be added on the southern side. At km 589+655÷592+335 near the railway crossing, two carriageways are to be constructed on the northern side and the existing carriageway is to be included in the route of a local road. In the further section a carriageway is to be added on the northern side. In the section from km 593+960 to km 597+060 near Tartak two carriageways are to be added on the northern side. From km 597+060 to km 597+300 one carriageway is to be added on the southern side. Then, at km 597+300÷602+230 a diversion for Mężenin is planned on the southern side – construction of two new carriageways of the expressway. Further, the dual carriageway expressway runs on the southern side of the existing DK8, which is to be used for local traffic in the area of Zambrzyce. In the section from km 606+420 to km 607+460 one carriageway of the expressway is to be constructed on the northern side of the existing DK8. Then, the dual carriageway expressway diverts Stare Krzewo on the northern side, leaving the existing road No. 8 for local traffic at km 607+460÷611+144. Near Sikory at km 611+144÷611+435 a carriageway is to be added on the northern side. In the area of the crossing over the Ślina River up to the designed Kobylin junction (km 611+435÷614+260) both carriageways of the expressway are to be constructed on the northern side of national road No. 8. From km 614+260 to km 615+230 both carriageways are to be constructed on the southern side. Then, at the section from km 615+880 to 615+960.85 (the end line of the designed section) one carriageway is to be added on the northern side.

Variant 2 involves the construction of four Passenger Service Points and 31 engineering structures.

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IV. CALCULATION AND RESEARCH METHODS APPLIED WITH INDICATION OF LIMITATIONS AND SHORTCOMINGS

Road work projects are ones with potentially negative impact on natural habitats and plant and animal species in the areas surrounding the planned route of the road, including Natura 2000 areas. The environmental survey performed on the routes of individual variants has taken account of the occurrence of natural habitats mentioned in the Ordinance of the Minister of the Environment dated 16 May 2005 on types of natural habitats as well as plant and animal species that require protection in the form of designating Natura 2000 areas, and included in Annex I of the Habitats Directive. Account has also been taken of the occurrence of other protected plant and animal species mentioned inter alia in Annex II and Annex IV of the Habitats Directive and in Annex I of the Birds Directive. Therefore, the research methodology and the assessment of the impact of the S8 expressway on the environment follow the guidelines contained in the communication issued by the European Commission: "*Assessment* of plans and *projects* significantly affecting *Natura 2000* sites". Methodological guidelines related to the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC and "Good practice guide" issued by the General Director of National Roads and Motorways.

The expected concentration of soil and water environmental contamination was calculated according to the Polish standard PN-S-02204/1997 – Roads. Road drainage. The method applied takes account of the relationship between the concentration of contaminants in stormwater sewage and traffic volume, the road prism width, land development and climate conditions. The method is simple and thus it is not a precise tool to evaluate the time variability of contamination concentration values in runoff water. Nevertheless, it is sufficiently accurate to allow decisions regarding the protection of water against road traffic related contamination to be made.

The methodology of developing models of substance concentrations in the air is based on the Ordinance of the Minister of the Environment of 5 December 2002 on reference values for some *substances* in the *air* (Journal of Laws No. 1 of 8 January 2003, item 12). The computer simulation was based on AERO 2003 software – Analysis of air pollution condition (ecological projects and information technology office – SOFT P, W. Pełka). The applied calculation methods are based on a formula. The formula however fails to take account of typical road traffic related conditions connected with the movement of emission sources and low position of the exhaust. Pollutant emission from motor vehicles is classified under the so-called line sources. All vehicles moving on the analysed section of the S8 expressway are considered pollution emitters. Due to the specificity of the emission source the current methodology makes the calculated ranges represent the worst scenario possible to take place in the area of the road.

The methodology of traffic noise prediction models in the environment is in line with PN-ISO 9613-2 – Acoustics. Attenuation of sound during propagation outdoors. General method of calculation. The calculation of traffic noise propagation in the environment was performed with computer software SoundPlan 6.4.

IV.1. Summary and statement of limitations and shortcomings

The methodologies and software used in this Report to perform calculations have been accepted by environmental protection bodies competent to grant such acceptance, in this case the Regional Directorate for Environmental Protection and the Ministry of the Environment.

The main difficulties encountered in the course of developing the Report were:

- the lack of unambiguous, preference calculation methodologies used for prediction models of the environmental impact of traffic pollution coming from an emission source such as a road,
- considerable prediction error, especially in relation to daytime – night distribution of traffic volume – ADT with traffic structure taken into account,
- the lack of measurement data regarding the effectiveness of stormwater and snow melt water pre-treatment devices,
- the lack of currently valid Natura 2000 areas' protection plans containing the list of protection tasks and the ways of fulfilling these tasks as well as the scope of environmental supervision.

Computer software commonly applied to perform prognostic calculations has certain limitations related to the assumed calculation models and the inability to accurately determine all scenarios of urban development in the environment along the line source – receiver. In the case of air pollution, the results corresponding to substance concentrations coming from low emitters are considerably overstated, thus distorting the evaluation of the impact on air quality.

Therefore, it needs to be noted that there might be errors in the estimations and predictions regarding the noise and air pollution impact range.

Computer simulations related to traffic impact calculation are based mainly on predicted traffic volumes which may involve errors resulting from the lack of currently updated measurement data regarding traffic volumes on the roads outside urban areas. Imprecise traffic volume data results in a permanent methodological error in the calculation of water environment contamination, air pollution and, most of all, sound propagation outdoors, which has a considerable effect on the selection of appropriate protective measures.

The results of post-implementation reviews performed on a number of national road and motorway sections clearly point to incorrect predictions of traffic volumes. The above regards in particular night time when the speed of vehicles is much higher, as well as the percentage of heavy goods vehicles, which is even twice as high as the predicted value.

V. NATURAL ENVIRONMENTAL CONDITION WITHIN THE EXPECTED ENVIRONMENTAL IMPACT AREA

V.1. Geomorphology and topography of the area

The analysed project is located in the Podlaskie Voivodeship. The project area is situated in the Wysokomazowiecka Upland and the Biebrza Valley, which together constitute a larger region of the North Podlasie Lowland. The landscape is marked by hills – the altitude does not exceed 140 m a.s.l. Locally there are 224 m high elevations. The Biebrza Valley in turn is a vast valley (approx. 100 m a.s.l.) where the Narew and the Biebrza rivers flow.

V.2. Geological structure

The subsoil in the project area is composed of Quaternary deposits. These are mainly glacial deposits consisting of clay, sand and gravel. Sand deposits are to be found locally in the upper clay layer in the region of Rutki and Mężenin. The thickness of these formations ranges from 120 m to approx. 240 m.

V.3. Mineral resources

The project area is located in the vicinity of five natural aggregate deposits. These are: “Wyszomierz”, “Szumowo”, “Tartak Nowy”, “Rutki” and “Mężenin”. The deposits listed above are either in the process of mining or awaiting proper permits.

V.4. Soil

The designed S8 expressway, in both tasks analysed and all their variants, runs through typically agricultural areas with patches of forests. Particular sections of the route cross marshy meadows and small clusters of mixed forests. Favourable soil conditions provide a rather good environment for land cultivation and farming (III–V soil valuation class).

Approx. 85÷90% of soil in the direct vicinity to the DK8 is classified as IV-VI soil valuation class, whereas approx. 10÷15% is class III. The dominant soil types in this area are brown soils typical, leached and acidic, black earths and pseudo-podzolic soils as well as local patches of high class grasslands and forest areas.

The soil structure analysis was based on 1:25,000 scaled soil distribution and agricultural maps (EIR Annex No. 4), cadastral maps and data obtained at the administrative offices in individual communes where the expressway is to run.

Task I

In this task the project covers areas with a mosaic soil series structure – ranging from good and very good wheat and rye cultivation soil series to cereal-fodder strong series to rye weak and very weak series. Peat soils as well as muck-peat soils have also been found on medium grasslands.

Task II

The dominant soil series in the area covered by this variant are rye, wheat and cereal series ranging from very good to weak. A cereal-fodder strong soil series has also been surveyed in the area of black earths typical and brown soils. In limited sections the designed road crosses medium grasslands.

V.5. Hydrogeological conditions

One multiaquifer formation has been found in the surveyed area: groundwater in Quaternary formations. Unconfined groundwater is found in sand and gravel formations and depending on the terrain altitude filtration may be observed, still, it is mostly at the depth from 1.0–5.0 m below ground level. The useful water levels in the whole area are protected by impermeable formations. The area subject to the report is located outside of the range of Major Groundwater Reservoirs.

V.6. Hydrogeological conditions (surface water)

The road sections that are to be reconstructed are located in the Vistula River basin and the Narew and the Bug rivers' watersheds. There are no big lakes in the area around the existing road, only small ponds are to be found locally at a distance of around 200 m. The watercourses crossing the road are as follows: the Kołomyja, the tributary from Mężenin, the Śliwówka, the Ślina (left-bank tributary of the Narew River). The tests carried out on the Ślina River showed that its water is class IV in terms of its physical and chemical condition.

V.7. Climate conditions

The climate in the analysed area is typical for the northeastern part of Poland. It shows a moderate transient climate with clear continental influence characterized by severe conditions.

V.8. Environmental protection areas and other valuable natural areas

The planned sections of the S8 expressway do not cross any environmental protection or nature conservation sites within the meaning of the Act on the Protection of Nature (Journal of Laws No. 92/2004, item 880 as amended). Such areas and sites are located a long distance from the planned route. These are: a nature reserve, a landscape park buffer zone, Natura 2000 areas, an ecological site and natural monuments.

However, the project crosses other valuable natural areas i.e. ecological corridors and protective forests.

The table below shows the surveyed areas together with conservation objectives and conflicts or the distance from the planned variants of the S8 expressway.

Table 1. Protected areas and other valuable natural sites, conservation objectives and conflicts with the planned route of the S8 expressway.

Item	Road chainage (km)	Protected area	Conservation objective	Conflict
PROTECTED AREAS AND SITES				
Nature reserves				
1	586+300	“Grabówka”	multi-species deciduous forest representing a subcontinental forest group	Task II (both variants) runs at a distance of 4,700 m from the reserve
Landscape parks				
2	591+500	the Łomżyński Landscape Park of the Narew Valley buffer zone	the valley and its surroundings have landscape, educational and aesthetic values	Task II (both variants) runs at a distance of 4,700 m from the buffer zone

Natura 2000 sites				
4	570+000	Special Protection Area Czerwony Bór pltmp205	5 natural habitats listed in Annex I to the Habitats Directive, 4 bird species mentioned in Annex I to the Birds Directive and 2 mammal species included in Annex II of the Habitats Directive have been identified	Task I (both variants) runs at a distance of approx. 850 m from the site
3	590+000	Special Protection Area for natural habitats and birds “the Valley of the Narew River Gorge” PLC200003	protection of bird species important at the level of the European Community	Task II (both variants) runs at a distance of approx. 8,100 m from the site
4	600+000	Special Protection Area for natural habitat “the Biebrza Valley” PLH200008	particularly valuable natural areas (bird refuge area, peat areas and swamps); 15 priority habitats	Task II (variant 1) runs at a distance of approx. 9,000 m from the site
5	600+000	Special Protection Area for birds “Bagno Wizna” PLB200005	protection of bird species important at the level of the European Community	Task II (variant 1) runs at a distance of approx. 2,600 m from the site
6	600+000	Special Protection Area for natural habitat “Ostoja Narwiańska” PLH20 04	Protection of a valley characterized by a limited extent of changes to its river system with a number of meanders and old river beds still maintained	Task II runs at a distance of approx. 7,500 m from the site
Natural monuments				
7	589+200	field elm *Ulmus minor*	-	Task II (both variants) runs at a distance of approx. 1,040 m from the monument
8	587+000	cluster of trees – junipers *Juniperus sp.*	-	Task II (both variants) runs at a distance of approx. 1,600 m from the monument
Ecological sites				
9	565+250	“Moczary” swamp	conservation of the mid-forest peat area flora	Task I (both variants) runs at a distance of approx. 700 m from the site
OTHER VALUABLE NATURAL AREAS				
Ecological corridors				
10	562+000÷566+000	the Omulwia Valley the Northeast Corridor GKPnC-5B	corridor included in the Main North-Central Corridor, important migration path	Task I project (both variants) crosses the corridor along the length of 4,000 m
11	592+000÷ 597+000	the Narew Valley Central Corridor KPN-23	part of the Main Northern Corridor; connects large and particularly valuable natural forest areas	Task II project crosses the corridor along the length of 5,000 m

12	600+000	Puszcza Piska (the Pisz Forest) – the Biebrza Valley Southern Corridor GKPN-1C	part of the Main Northern Corridor; important migration path	Task II project (variant 1) borders on the corridor; variant 2 runs at a distance of approx. 1,200 m from the corridor
13	609+000 ÷615+960 (end of the Task II)	marshy Valley of the Narew River – the Narew River Valley Gorge KPN-23D	ecological corridor of international and national importance	Task II project (both variants) borders on the corridor along the length of 6,950 m
14	612+665	local corridor of the Ślina River	the Ślina River is a tributary of the very valuable Narew River	Task II project (both variants) crosses the River at the level of Kobylin – Kruszywo
15	615+960	international core area – 25M the Upper Narew Valley	core area of international importance	Task II project (both variants) runs at a distance of approx. 3,000 m from the core area
Protective forests				
16	569+600-570+800 (Task I Variant 1) 569+580-570+870 (Task I Variant 2)	protective forests	forests of particular natural value being a valuable part of the native environment	project crosses the protective forest along the section of 1,200 m (Variant 1) and 1,290 m (Variant 2).
17	km 565+000 Task I, both variants; km 588+000 Task II, both variants	protective forests	forests of particular natural value being a valuable part of the native environment	Task I runs at a distance of 700 m from the forest, Task II runs at a distance of 1,200 m from the forest

The areas crossed by the project have been marked by shading.

The location of the discussed protection areas and sites and of other valuable natural areas (protective forests and ecological corridors) have been presented on the maps scaled 1: 90,000 and 1: 50,000 – Annex No. 2 (EIR 2.1. and 2.2.).

V.9. Landscape values

The planned project crosses the area of several communes characterized by quite a uniform landscape. Both Task I and Task II run mainly through agricultural lands and pastures. Thus, the flora consists of plant species characteristic for fields and meadows.

The landscape surrounding the existing national road No. 8 is enriched by forest complexes and patches as well as mid-field tree clusters and avenues consisting mostly of lime and ash trees.

V.10. Flora and fauna

The analysed tasks related to the construction of the S8 expressway run through the area of three poviats: the poviats of Zambrów, Białystok and Wysokie Mazowieckie. The poviat of Zambrów covers large forest areas, riverside meadows and pastures as well as fertile fields creating favourable conditions for many animal species. The poviat of Białystok is located in the mid-eastern part of the Podlaskie Voivodeship bordering on Bielarus in the east. Farmlands constitute more than a half of the overall area of the poviat of Białystok and 39% of the poviat's area is covered by forests and forestlands.

High afforestation rate together with picturesque rivers and water reservoirs make the area attractive in terms of its natural environment. The poviat of Wysokie Mazowieckie is located in the southwestern part of the Podlaskie Voivodeship on the Wysokomazowiecka Upland between the valley of the upper Narew River and the Bug River gorge in Podlasie. It is a typical agricultural region.

The data presented above shows the general natural environment in the poviats crossed by the project sections. The detailed description of the flora and fauna in the area of the project has been presented in chapter VI.

V.11. Cultural heritage sites

Along the route of the designed variants of the S8 expressway and in its vicinity there area sites and monuments under the protection of the Voivodeship Monument Conservation Officer in Białystok. These are conservation zones and archaeological sites as well as established cultural heritage sites and monuments.

Established cultural heritage sites and monuments:

Task I – a military cemetery dating back to the First World War located in the village of Żabikowo Rządowe on the southern side of the planned project (km 568+740-568+770) at a distance of approx. 50 m from both variants considered.

Task II – there are no monuments or sites under conservation officer's protection to be crossed by either of the variants or located in their vicinity.

Non-permanent cultural heritage sites and monuments

Task I – the following archaeological sites have been identified to be either crossed by the project or to be lying in its vicinity

- Wyszomierz, Modern Age settlement, archaeological excavation site No. 19, both variants cross the site,
- Wyszomierz, Modern Age settlement, archaeological excavation site No. 20, both variants cross the site,
- Szumowo Nowe, traces of settlement (the Middle Ages – the Modern Age), archaeological excavation site No. 26, distance from both variants – approx. 100 m, southern side,
- Ostrożne, settlement dating back to the Middle Ages, archaeological excavation site No. 33, distance from Variant 2 (diversion of Ostrożne) approx. 200 m, southern side,

Task II – the following archaeological excavation sites have been identified to be either crossed by the project or to be lying in its vicinity

- Kossaki Borowe, Modern Age settlement, archaeological excavation site No. 1, distance from both variants is approx. 1,000 m, southern side,
- Kossaki Borowe, traces of settlement (the Iron Age), archaeological excavation site No. 2, distance from both variants is approx. 1,200 m, southern side,
- Kossaki Borowe, traces of settlement (probably the Mesolithic period), archaeological excavation site No. 3, distance from both variants is approx. 1,500 m, southern side,
- Kossaki Borowe, traces of settlement (the Stone Age), archaeological excavation site No. 4, Modern Age settlement (probably), distance from both variants is approx. 350 m, southern side,
- Mężenin, settlement (late Middle Ages – the Modern Age), archaeological excavation site No. 11, traces of settlement (early Middle Ages), distance from Variant 2 > 200 m, southern side,
- Wiśniówek – Wiertycze, traces of settlement (early Middle Ages – the Modern Age), archaeological excavation site No. 13, distance from both variants – approx. 600 m, northern side,

- Milewo Kolonia, camp (the Mesolithic period – the Iron Age), settlements (the Middle Ages – the Modern Age), archaeological excavation site No. 34, both variants cross the site,
- Kobylin – Kruszewo, settlement (the Bronze Age), archaeological excavation site No. 35, distance from both variants is approx. 100 m, southern side,
- Kobylin – Kruszewo, traces of settlement (the Mesolithic period – the Iron Age), archaeological excavation site No. 36, distance from both variants is approx. 50 m, southern side,
- Kobylin – Kruszewo, camp/settlement (the Bronze Age), archaeological excavation site No. 38, both variants cross the site,

The locations of the abovementioned cultural heritage sites have been presented in the general plan in Annex No. 1 (EIR 1.1.).

V.12. Project's area aerosanitary conditions

The assessment of the air condition performed in the period from 2002 to 2006 by the Voivodeship Inspector of Environmental Protection with participation of the National Sanitary Inspectorate indicate that the main source of air pollution is fuel combustion for heating and industrial purposes. The tests showed that the admissible concentration level had been exceeded only in the case of PM10 particles. Moreover, the data obtained from the Voivodeship Inspector of Environmental Protection in Białystok (the Regional Office in Łomża) on the background of air pollution in the area of the designed expressway indicate that in the area of the poviats to be crossed by the project the concentration of nitrogen dioxide does not exceed the admissible level and ranges in the limits of 23.0–52.5% of the reference value. The concentration of sulphur dioxide is much lower and amounts to 10.3–16.0% of the reference value.

V.13. Acoustic climate condition

The noise measurement carried out by the Voivodeship Inspector of Environmental Protection in Białystok in the framework of monitoring tests on the roads in the Podlaskie Voivodeship in the period from 2002 to 2006 showed that admissible levels had been exceeded. The tests were carried out for Kolno, Szypliszki, Białystok and Sejny as well as other locations along the route of national road No. 8: Zambrów – Białystok – Augustów – Suwałki – Budzisko. Traffic noise tests were not performed in the section of national road No. 8 located in the area of the planned project. The acoustic climate condition was determined according to the results of noise measurement for Zambrów, which is located between Task I and Task II of the planned project. The test results showed that admissible traffic noise levels had been exceeded in Zambrów by approx. 12 dB during the daytime and approx. 19 dB at night, which results from heavy vehicles constituting a considerable part of traffic at night (>50%).

V.14. Natural environmental condition evaluated by measurement

The data provided by the General Directorate for National Roads and Motorways in Białystok indicates that in 2008 there were traffic noise tests and stormwater and snow melt water contamination tests carried out on the national roads in the Podlaskie Voivodeship.

- **Acoustic climate**

In 2005, in the framework of periodic noise measurements carried out on national roads, the General Directorate for National Roads and Motorways in Białystok measured traffic noise in: Zambrów, Mikołajówka, Białobrzegi, Augustów. None of the abovementioned is located within the route of the analysed project.

The results of noise measurements are presented below: L_{AeqD} = 70.9 dB from 6 a.m. to 10 p.m. / reference time bracket = 16 h / L_{AeqN} = 69.5 dB from 10 p.m. to 6 a.m. / reference time bracket = 8 h/

For butli-up areas the admissible traffic noise limit is 60 dB during the daytime and 50 dB at night. The test results showed that admissible traffic noise levels had been exceeded by approx. 11 dB during the daytime and approx. 19 dB at night, which results from heavy vehicles constituting a considerable part of traffic at night (>50%).

- **Soil and water environment**

No tests were carried out on the existing national road No. 8 in the sections of the planned project. Tests were performed on national road No. 8 in locations distant from the project i.e. Chorodrówka Nowa, Suchowola and Augustów.

The results of contamination tests in all the abovementioned locations were similar (the content of petroleum related hydrocarbons < 0.2 mg/l, the content of petroleum related substances < 0.05 mg/l, the content of overall suspension max. 60 mg/l) and the results of tests performed before the reservoir in the form of flowing surface water had not exceeded the admissible limits specified under 19.1 of the Ordinance of the Minister of the Environment of 24 July 2006 (Journal of Laws No. 137, item 984 as amended).

Therefore, the conclusion is that on the existing national road No. 8 in the location of the planned project the admissible limits of contaminants in storm and snow melt water were not exceeded.

VI. NATURAL ENVIRONMENTAL SURVEY AND ASSESSMENT OF THE S8 EXPRESSWAY ENVIRONMENTAL IMPACT ON NATURAL HABITATS AND SPECIES OF FLORA AND FAUNA

The survey covered the right-of-way of the variants considered for Task I and Task II of the S8 expressway along with the 500 m wide buffer strip (250 m on each side of the road).

The discussed area is mainly agricultural. The forests in this region are managed timberlands with limited variety of tree species. The trees planted here are mainly pine and birch. There are also small areas of mid-field forests as well as tree avenues along the existing national road, small water reservoirs and drainage ditches.

Task I

Within Task I, in its both variants, the natural habitats as described in Annex I of the Habitats Directive were not surveyed, similarly to plant species mentioned in Annex II thereof and species under strict protection. Only one plant species under partial protection was identified. It is the common buckthorn. Quite numerous stands of this species have been found in the forest complex at km 570+400÷570+700 in the buffer strip of both variants (outside of the road boundaries).

As far as birds are concerned the most populous are the species associated with human settlements and farmlands (the common house martin, the lark, the white wagtail) and tree-covered areas (the great tit, the common chaffinch). When it comes to the bird species mentioned in Annex I of the Birds Directive the only one identified is the middle spotted woodpecker. Still, no reliable nesting site of this species was identified in the analysed buffer strip.

The investment implementation will require the occupation of parts of the birds' natural habitats. In the case of Variant 1 four species will be affected: the common house martin, the great tit, the willow warbler and the common chaffinch). In case of Variant 2 seven species will be affected: the common house martin, the great tit, the willow warbler, the common chaffinch, the common wood pigeon, the Eurasian wren and the black redstart).

The bird species structure observed along the route of both variants is similar, thus the implementation of both variants will have a similar impact on birds.

7 species of amphibians have been identified in the surveyed area, including 3 species mentioned in Annex IV of the Habitats Directive (the European tree frog, the moor frog, the pool frog) and 4 species under strict protection as per the Ordinance of the Minister of the Environment of 28 September 2004 (the smooth newt, the edible frog, the common frog, the common toad).

The implementation of Variant 1 and Variant 2 will require the occupation of one amphibian's habitat – the edible frog (Variant 1: at km 574+830, Variant 2: at km 574+720). Additionally, the implementation of Variant 2 will require the occupation of the habitats of the moor frog, the pool frog, the smooth newt, the common frog and the edible frog at km 572+070 and the moor frog at km 572+350.

The implementation of both variants will also involve the necessity to cross animal migration paths.

Other taxonomic groups of fauna protected in Poland have also been surveyed: arachnids (the wasp spider).

Task II

One natural habitat from the list presented in the Ordinance of the Minister of the Environment of 16 May 2005 on types of natural habitats as well as plant and animal species that require protection in the form of designating Natura 2000 areas has been identified within Task I. It is a tall oat-grass meadow (6510-1) with two patches reported (the first amounting to 0.2 ha – Variant 1 and the second amounting to 0.6 ha – Variant 1).

The first patch will be completely occupied by the investment area, whereas the second one will be crossed by the planned road with a small part of the habitat destroyed.

Within the boundaries of Task II neither any of the plant species mentioned in Annex II of the Habitats Directive nor any species vanishing or endangered in Poland were identified. Two plant species under strict legal protection have been reported though (the broad-leaved helleborine and the common hepatica) together with four species under partial protection (the lily of the valley, the common buckthorn, the yellow water lily and the guelder rose) as per the Ordinance of the Minister of the Environment of 9 July 2004 on wild species of plants under protection.

The abovementioned species (except for the yellow water lily in the Ślina River) are associated with different types of forest. In the case of broad-leaved helleborine and guelder rose only single specimens have been reported. The populations of other species are numerous.

When it comes to birds, similarly to Task I, the most populous species are those associated with human settlements and farmlands as well as tree-covered areas or forest complexes. As for the bird species mentioned in Annex I of the Birds Directive the middle spotted woodpecker and the white stork were identified. In the case of the middle spotted woodpecker no reliable nesting site was found. The places where the abovementioned bird species have been found to live are located outside the boundaries of the expressway variants and no considerable negative impact is expected for these species.

The investment implementation will require the occupation of parts of the birds' natural habitats (breeding or feeding grounds). In the case of Variant 1 16 species will be affected: the common blackbird, the great tit, the sparrow, the common house martin, the buzzard, the common chaffinch, the chiffchaff, the lark, the common reed bunting, the European robin, the raven, the Eurasian nuthatch, the corn bunting, the jackdaw, the great spotted woodpecker and the Eurasian wren. In the case of Variant 2 13 species will be affected: the common blackbird, the great tit, the sparrow, the common house martin, the Eurasian nuthatch, the European robin, the raven, the common chaffinch, the chiffchaff, the lark, the fieldfare, the buzzard and the common reed bunting.

The bird species structure observed along the route of both variants is similar, thus the implementation of both variants will have a similar impact on birds.

10 species of amphibians have been identified in the surveyed area, including 1 species mentioned in Annex II of the Habitats Directive (the northern crested newt), 5 species listed in Annex IV of the Habitats Directive (the common spadefoot, the European green toad, the European tree frog, the moor frog, the pool frog) and 4 species under strict protection as per the Ordinance of the Minister of the Environment of 28 September 2004 (the smooth newt, the edible frog, the common frog, the common toad).

The implementation of Variant 1 will cause 2 natural habitats of amphibians to be destroyed (the edible frog habitat at km 607+070 and the common spadefoot, the European green toad and the European tree frog habitat at km 607+550). In the case of Variant 2, the habitat of the edible frog mentioned above will be destroyed (km 606+930) together with the reservoir where the common toad has been identified (km 608+930).

Moreover, the wasp spider and two nests of the red wood ant have also been found in the surveyed area. Both species are under protection pursuant to the national law (the Ordinance of the Minister of the Environment of 28 September 2004 on protected wildlife animals).

The areas in the closest vicinity to the planned road No. 8 (both Task I and Task II) are important ecological corridors connecting valuable natural sites. The international animal migration path (GKPn-23) runs between Wiśniewo and Mężenin, starting from vast forest complexes in Bielarus and extending to the Białowieża Forest (*Puszcza Białowieska*), the Narew River valley and the Pisz Forest (*Puszcza Piska*) towards western Europe. The corridor is linked to another international migration path connecting the Biebrza Valley with the White Forest (*Puszcza Biała*) (GKPnC-5B).

Therefore, the valley of the Narew River between Łomża and Zambrów is an important knot connecting the latitudinal corridor (GKPn-23) and the longitudinal one (GKPnC-5B).

The corridors are import ant migration paths for many rare animal species such as wolf, lynx and the European bison. Despite the fact that the habitats of these animals are distant from the designed road (during the conducted survey no traces of these animals living in the surveyed area were found), they may occur in close vicinity to the road or even cross it when migrating along the ecological corridors.

During the survey no traces of wolves, lynxes or European bisons were found in the surveyed area. Nevertheless, there may be migration paths of these animal in the surveyed area.

The conclusions as to the possibility of wolf, lynx and European bison migration in the area of the project have been issued by experts on the basis of their long research. In the experts' opinion the migration of these animals in the area of the project is already a fact or is very probable in the future.

The populations of European bison living in Puszcza Białowieska, Puszcza Knyszyńska and Puszcza Borecka already show such migratory tendency and in the future we should expect this migration to intensify. Numerous instances of European bison migrations have been reported to date in Poland (reaching up to 600 km).

When it comes to wolves, conclusions as to their migration are based mainly on genetic tests (unpublished data) showing that genes are being transferred between all populations of wolves in the country. In the marshy areas in the east of Poland wolves migrate towards the west and the populations from Puszcza Knyszyńska, Puszcza Białowieska and Puszcza Augustowska are key to recolonising western Poland.

There are also elk habitats in the marshy area, in the valleys of the Narew River and the Biebrza River. The migration paths of this species are numerous along the whole section of the planned route.

There are also many other species of the water environment living in the marshy areas of the region such as: beaver, otter, common shrew, Eurasian water shrew and European water vole. Animals such as roe deer and boar are to be found in all forests, even the small ones, as well as in areas with a mosaic of fields and forests. In the forest complexes red deer may be found.

The results of the environmental survey conducted in the discussed area have been presented on the maps scaled 1:5,000 in Annex No. 2 (EIR 2.3. and 2.4.).

Photographic documentation of the area is included in Annex No. 2 (EIR 2.5.).

VII. ASSESSMENT OF THE S8 EXPRESSWAY ROUTE VARIANTS – TASK I AND TASK II, CHOOSING THE BEST VARIANT

In the present chapter the identified environmental impact of the S8 expressway – Task I and Task II – is presented with individual variants taken into account: Variant 1 and Variant 2. The list of protective actions and measures is also presented in relation to individual components of the environment differentiated by assessment value and weight in the development of multi-criteria analysis intended to be the basis for choosing the variant which would be the most favourable to the environment.

VII.1. Environmental protection areas and other valuable natural areas

The planned sections of the S8 expressway (Task I and Task II) do not cross any environmental protection or nature conservation sites within the meaning of the Act on the Protection of Nature (Journal of Laws No. 92/2004, item 880).

The protected areas and sites are located a long distance from the planned route.

For ***Task I*** these are:

- Natura 2000 site: Habitats Special Protection Area Czerwony Bóbr pltmp205 at a distance of approx. 850 m from Task I (both variants) at km 570+000,
- ecological site: the Moczary swamp at a distance of approx. 700 m from Task I (both variants) at km 565+250,

In ***Task I*** the project crosses other valuable natural areas though, such as:

- migration corridor: the Omulwia Valley, the Northeast Corridor GKPnC-5B (in Task I, both variants, the project crosses the corridor along a section of 4,000 m at km 562+000÷566+000),
- protective forests [the project crosses protective forests along a section of 1,200 m (Variant 1) at km 569+600÷570+800 and 1,290 m (Variant 2) at km 569+580÷570+870].

Therefore, trees need to be cut down within the boundaries of the road which will expose the edge of the forest. In order to compensate the loss of protective trees, native species of various heights are to be planted. The detailed description of this plan will be presented at the next stage of design works (Building Permit Design).

The following are the protected areas and sites located a long distance from the planned route – ***Task II***:

- nature reserve “Grabówka” at a distance of approx. 4,700 m from Task II (both variants) at km 586+300,
- the Łomżyński Landscape Park buffer zone at a distance of approx. 4,700 m from Task II (both variants) at km 591+500,
- Natura 2000 sites:
  - Special Protection Area for natural habitats and Special Protection Area for birds: the Valley of the Narew River Gorge (*Przełomowa Dolina Narwi*) PLC200003 at a distance of approx. 8,100 m from Task II (both variants) at km 590+000,
  - Special Protection Area for natural habitats: the Biebrza Valley (*Dolina Biebrzy*) PLH200008 at a distance of approx. 9,000 m from Task II (Variant 1) at km 600+000,
  - Special Protection Area for birds: the swamps of Wizna (*Bagno Wizna*) PLB200005 at a distance of approx. 2,600 m from Task II (Variant 1) at km 600+000,
  - Special Protection Area for natural habitats: the Refuge of the Narew River (*Ostoja Narwiańska* PLH20_04) at a distance of approx. 7,500 m from Task II (Variant 1);
- natural monuments;
  - the field elm at a distance of approx. 1,040 m from Task II (both variants) at km 589+200,
  - cluster of trees – junipers, at a distance of approx. 1,600 m from Task II (both variants) at km 587+000,

Therefore, the project is not expected to have a negative impact on these areas or monuments.

In ***Task II*** the project crosses other valuable natural areas though, such as ecological corridors:

- the Narew Valley (*Dolina Narwi*), Central KPN-23 – along the section of 5,000 m at km 592+000÷597+000),
- the Pisz Forest (*Puszcza Piska*) – the Biebrza Valley (*Dolina Biebrzy*), Southern GKPN-1C (in Task II, Variant 1 the project borders on the corridor at km 600+000, Variant 2 is at a distance of approx. 1,200 m from the corridor),
- Marshy Valley of the Narew River (*Bagienna Dolina Narwi*) – the Valley of the Narew River Gorge (*Przełomowa Dolina Narwi*), KPN-23D (in Task II, both variants, the project borders on the corridor along a section of 6,950 m at km 609+000÷615+960 – end line of Task II),
- local corridor of the Ślina River (in Task II, both variants, the project crosses the river at the level of Kobylin – Kruszywo at km 612+665),
- international core area – 25M – the Upper Narew Valley (in Task II, both variants, the project runs at a distance of approx. 3,000 m from the core area at km 615+960).

Both variants of Task II are located 1,200 m from the protective forests.

The construction and operation of the S8 expressway in Task I and Task II will not have any negative impact on the environmental protection and conservation sites that are the closest to the road (up to 1 km) i.e. the Natura 2000 “Czerwony Bór“ site and the ecological site. This is based on the calculations of traffic pollution dispersion which indicate that the standards of quality of the environmental condition on the border lines demarcating the investment will be met for most of the analysed environmental components.

Ecological corridors are the areas that are at risk of direct conflict with the investment.

To eliminate the negative impact of the S8 expressway on the valuable natural areas in Task I and Task II the following remedial measures should be implemented.

Construction stage:

- the minimum width of the construction area should be determined in such a way as to minimize the area of potential destruction to flora;
- the duration of construction works in valuable natural areas should be maximally reduced;

- the construction site and its facilities should be well-maintained by keeping e.g. a proper number of waste containers installed in suitable locations on site, washing facilities and toilets and by proper management of materials to prevent contamination;
- the construction site facilities and warehouses should be located in areas that are unattractive for animals, outside of ecological corridors;
- special attention should be paid during construction works to the protection of the Ślina River water (Task II) to prevent materials used for construction from falling into the river e.g. use working platforms and landings.

Operational stage:

- design animal bridges, underpasses and culverts (eco ducts) to provide for safe crossing through the ecological corridors,
- the passageways for small and medium-sized animals should have specially designed greenery to direct animals to the safe passageway (trees, bushes, shrubs), native species are recommended, mainly fruit types (attractive for animals), on both sides of the road, creating a kind of a crater narrowing as it approaches the passageway;
- anti-glare screens have to be installed at all passageways; the screens should be properly connected with the fence directing animals to the passageway;
- the road should be fenced on both sides to prevent animals from entering the road unexpectedly;
- secure the road with low fencing installed at all culverts to direct amphibians to the safe passageway and prevent them from entering the road.

VII.2. Flora and fauna

Vegetation cover

When it comes to species under legal protection, within the area of Task I one species has been found of those mentioned in the Ordinance on protected wildlife plant species (Journal of Laws No. 168, 2004, item 1764). It is the **common buckthorn**, a species under partial legal protection. Quite numerous stands of this species have been found in the forest complex at km 570+400÷570+700 in the buffer strip of both variants (outside of the road boundaries).

The following plant species under strict legal protection (s.p.) and under partial legal protection (p.p.) have been identified within the area of Task II: the broad-leaved helleborine (s.p.), the common hepatica (s.p.), the lily of the valley (p.p.), the common buckthorn (p.p.), the yellow water lily (p.p.), the guelder rose (p.p.).

The abovementioned species (except for the yellow water lily found in the Ślina River) are associated with various forest types. In the case of broad-leaved helleborine and guelder rose only single specimens have been reported. The populations of other species are relatively numerous.

Of the natural habitats mentioned in Annex I of the Habitats Directive the only ones identified in close vicinity to the planned project are two patches of **tall oat-grass meadow** (habitat marked with code **6510-1**) – Task II. No natural habitats defined in Annex I of the Habitats Directive have been found within or close to the area of Task I.

Within the boundaries of Task I and Task II of the project neither any of the plant species mentioned in Annex II of the Habitats Directive nor any species vanishing or endangered in Poland were identified.

Potential risks with a negative impact on the condition of the flora present in the area are expected at the stage of road construction and during its operation.

Construction stage:

- complete occupation of natural habitat – a patch of tall oat-grass meadow *Arrhenatheretum elatoris* (6510-1) with an area of 0.2 ha at km 599+600 close to the existing voivodeship road No. 679 – **Task II**, Variant 1;
- occupation of a part of natural habitat – tall oat-grass meadow *Arrhenatheretum elatioris* (6510-1) at km 608+800÷608+900 close to the existing national road No. 8; the area of the patch is approx. 0.6 ha; the occupied section is approx. 0.13 ha which amounts to approx. 21.7% of the overall area of the meadow patch – **Task II**, Variant 1;
- further fragmentation of forest complexes (an area of more than 4 ha) or patches of forests (an area of less than 4 ha).

  The scope of tree cutting activity in terms of the affected forest area [ha] for the variants of **Task I** is as follows: *Variant 1* – 29.1 ha; *Variant 2* – 39.22 ha, and for ***Task II:*** *Variant 1* – 56.79 ha and *Variant 2* – 66.23 ha.
- destruction of farmlands and woodlands flora within the project boundaries, among other things as a result of ploughing,
- removal of mid-field forests and roadside tree avenues;
- changing the conditions in the habitats surrounding the road as a result of heavy equipment activity, storage of construction materials, location of technical facilities etc.

Operational stage:

Since it is expected that the admissible air pollution concentration levels, as defined in the Ordinance of the Minister of the Environment of 5 December 2002 on reference values for some substances in the air, will not be exceeded, no negative impact of traffic related pollutants on the flora is expected.

The construction of the planned route of the S8 expressway, following the design analysed, should not have a considerable negative impact on the flora found in this area as the flora has grown under the influence of the already existing national road No. 8. Moreover, the agricultural character of this region limits the diversity of the flora.

To protect the flora at the stage of construction and operation of the road the following protective measures need to be implemented:

Construction stage

- the minimum width of the construction area should be determined in such a way as to minimize the occupation of the area covered by flora, especially in Task II for the tall oat-grass meadow at km 608+800÷608+900 (Variant 1);
- during construction works, trees located in the vicinity of the project that are not to be cut down should be protected with boards installed on the trunks, straw or reed mats wrapped around the trees;
- the holes left in the ground after cutting down trees have to be backfilled (they may cause changes in soil and water conditions on the border of the road),
- avoid dropping and gathering the dug up material around trees and bushes;
- maintain the construction site and its facilities in good order by keeping e.g. a proper number of waste containers, washing facilities and toilets and by proper management of materials to prevent contamination;

Operational stage

As it is necessary to cut down trees to clear the area for the planned investment, further fragmentation of forest complexes or patches of forest will take place, which will make them more exposed to the effects of wind, air pollution, intensified sunlight etc.

Via a letter of 6 April 2009, ref. GDDKiA-O/BI-ZP-P4-265DŚU/39 and 44/09 the General Directorate for National Roads and Motorways, the Regional Office in Białystok informed that clarification had been provided by the Regional Directorate of the National Forest Holding – State Forests in Białystok regarding the creation of ecotones for the dense forest edge exposed as a result of tree cutting activity. There was information that after cutting down trees and exposing the forest edge as a result of various investments, the State Forests each time would take up works related to the creation of the necessary protective strip as part of their duties. The abovementioned works consist mainly in performing proper tree thinning within the exposed tree stands and introducing special undergrowth species.

Considering the above clarification as well as the fact that in the locations where the project crosses forest complexes, the Investor applies the principle of minimal land occupation (to limit tree losses as much as possible), which in turn provides no space for the introduction of additional greenery to compensate the losses in density, no recommendations have been made as to protective measures to be taken for the tree stands. Nonetheless, necessary landscaping greenery strips have been indicated (chapter VII.4.3.).

Animals

The most populous bird species identified in the surveyed area of Task I and Task II were the species associated with human settlements, farmlands and tree-covered areas, such as: the lark, the common house martin, the yellowhammer, the great tit and the common chaffinch.

One of the bird species listed in Annex I of the Birds Directive has been found within the area of Task I: the middle spotted woodpecker, and two species listed in Annex I of the Birds Directive have been found in Task II area: the middle spotted woodpecker and the white stork.

7 species of amphibians have been identified in the surveyed area, including 3 species mentioned in Annex IV of the Habitats Directive (the European tree frog, the moor frog and the pool frog) and 4 species under strict protection as per the Ordinance of the Minister of the Environment of 28 September 2004 (the smooth newt, the edible frog, the common frog and the common toad).

10 species of amphibians have been identified in the surveyed area of Task II, including 1 species mentioned in Annex II of the Habitats Directive (the northern crested newt), 5 species listed in Annex IV of the Habitats Directive (the common spadefoot, the European green toad, the European tree frog, the moor frog and the pool frog) and 4 species under strict protection as per the Ordinance of the Minister of the Environment of 28 September 2004 (the smooth newt, the edible frog, the common frog and the common toad).

Other taxonomic groups of fauna protected in Poland have also been surveyed: insects (red wood ants) in the area of Task II and arachnids represented by the wasp spider in Task I and Task II).

In both Tasks the road crosses migration paths of such animals as wolves, elk, red deer, roe deer and boar. There are also many other species of the water environment living in the marshy areas of the region such as: beaver, otter, common shrew, Eurasian water shrew and European water vole.

The construction and operation of the planned expressway will have a negative impact on animals and their migration routes.

Construction stage:

- animals (especially birds and mammals) unable to adapt to the conditions encountered during the construction, the inability to adapt results from human presence and activity as well as the operation of construction equipment;
- mechanical and chemical waste on the areas covered by the investment (e.g. storage of construction materials and equipment);
- soil and flora destruction and thus destruction of the living space for animals;
- occupation of the area to be used for the purpose of investment within the project boundaries and thus reduction of feeding grounds (affecting mainly mammals and birds) etc.;
- vibrations and noise generated by working equipment may periodically disturb the migration of amphibians, reptiles and mammals and scare birds;
- animals killed accidentally at the construction sites and access roads (small mammals, amphibians, reptiles);
- excavations may become traps especially for amphibians and small mammals;
- destruction of amphibians' living grounds:

  TASK I

  Variants 1 and 2:

  - km 574+730 (Variant 1), km 574+820 (Variant 2). 20 specimens of the edible frog were found in the habitat. The estimated area of the destructed reservoir is approx. 350 m².

  Variant 2:

  - km 572+070 (the following species were found in the habitat: 2 specimens of moor frog, 1 pool frog, 1 smooth newt, 1 common frog, 10 specimens of edible frog – 15 specimens in total); The estimated area of the destructed reservoir is approx. 250 m²);
  - km 572+350 (1 specimen of moor frog was found in the habitat); The estimated area of the destructed reservoir is approx. 200 m²).

  TASK II

  Variants 1 and 2:

  - km 607+070 (Variant 1), km 606+930 (Variant 2). 50 specimens of edible frog were found in the habitat. The estimated area of the destructed reservoir is approx. 500 m².

  Variant 1:

  - km 607+550 (1 specimen of the common spadefoot, 11 specimens of the European green toad and 1 specimen of the European tree frog were found in the habitat); The estimated area of the destructed reservoir is approx. 450 m²);

  Variant 2:

  - km 608+930 (1 specimen of the common toad was found in the habitat); The estimated area of the destructed reservoir is approx. 200 m²);
- periodic deterioration of the habitat conditions for animals (amphibians, beaver, otter etc.)

e.g. due to potential water contamination during the construction works

Operational stage

- permanent occupation of the area for the purpose of the investment, which means taking up part of the living grounds of animals (breeding and feeding grounds, resting places);
- crossing migration paths (large, medium-sized and small mammals, reptiles, amphibians) may cause
  - blocking or disrupting periodic migration;
  - isolating from breeding grounds and winter habitats (especially amphibians);
- animal deaths resulting from collisions with vehicles (mammals, amphibians, reptiles);
- anxiety caused by noise generated by cars;
- risk of surface water contamination with chemicals etc. as a result of breakdown or accident (birds, mammals, amphibians, reptiles). Thus, a safeguarding system is required to prevent the consequences of a potential breakdown.

The existing migratory routes of animals are already crossed by the existing national road No. 8. Animals are able to cross the existing road along its entire length which leads to frequent accidents. The implementation of the planned project will permanently separate animal habitats from the road with a fence. This will eliminate the possibility of vehicles colliding with animals. It is also necessary to provide animals with safe crossings to the other side of the road by constructing appropriate passageways along with the elements directing the animals to these safe passageways (i.e. greenery, fencing).To minimize the impact of the S8 expressway on animals the actions and protective measures listed below should be taken:

Construction stage

- the width of the construction area should be assumed in such a way as to occupy as little of the area of animal habitats as possible;
- organizing construction sites, storing equipment and materials with such measures applied as to prevent amphibians from entering construction sites, i.e. the erection of plastic fencing around the construction site starting from 1 March to 30 June;
- new breeding grounds are planned to be prepared (water reservoirs) in the locations of destroyed habitats of amphibians as part of the corrective action plan; the reservoirs should be located in the surroundings characterized by similar habitat conditions, approx. 100 m from a variant's axis. It is suggested that the area of one reservoir be approx. 500 m². New reservoirs will be located within the boundaries of the variants, in the locations given below:

  Task I: *Variants 1 and 2:*
  - approx. 575+100, in the area of the suggested culvert (underpass) at km 575+150 (Variant 1), 575+250 (Variant 2);

  Variant 2:

  approx. 572+350, in the area of the suggested culvert at km 572+350.

  Task II:

  In Variants 1 and 2, to compensate for the destroyed reservoirs at km 607+070 (Variant 1), 606+930 (Variant 2) and 607+550 (Variant 1) it is proposed to construct one reservoir measuring approx. 500 m2 at km approx. 607+000 (Variant 1), 606+900 (Variant 2) close to the proposed underpass for animals. The reservoir should be located on the northern side of the road, approx. 100 m from the road's axis.

  The suggested location of the reservoir is to be once again verified at the stage of further design works (Building Permit Design).

  In the case of Variant 2, due to the fact that there was only 1 specimen of common toad found in the reservoir to be destroyed at km 608+930, there is no need to introduce any remedies or corrective action for this reservoir. The destruction of the reservoir will not affect the size of the common toad population in this area.

  The suggested location of the reservoirs is to be once again verified at the stage of further design works (Building Permit Design).

Operational stage

- the right-of-way of the S8 expressway should be fenced on both sides, along its entire length to prevent animals from entering the road;
- to protect the migration corridors, bridges for large and medium-sized animals have to be constructed along with underpasses for small animals; these ecoducts should be equipped with concrete shelves covered with soil;
- anti-glare screens have to be installed at all passageways for large and medium-sized animals; the screens should be properly connected with the fence directing animals to the passageway;
- planting greenery specially designed to direct animals to the passageways;
- securing the road against the risk of amphibians entering the road – fencing designed to direct animals;
- applying proper devices preventing contaminants from infiltrating the water (chapter VII.5.).

The construction of passageways for animals will enable the connection of habitats and migration corridors insulated by the already existing national road No. 8.

Animal bridges may be used by all animals, but they have been designed with large and medium-sized mammals in mind – which are sensitive and timid. Underpasses and extended bridges with large dimensions are meant to be used by large and medium-sized mammals. Medium-sized animals will also be able to use the structures with smaller dimensions. Extended culverts will provide the possibility of crossing the road to small mammals, amphibians and reptiles. Due to the fact that the river valleys are often used as migratory paths, the construction of extended bridges is suggested on all watercourses. Extended culverts are suggested to be built on small drainage ditches and in marshy areas. Passageways for medium-sized and small mammals are suggested in the area of the field and forest mosaic. In marshy areas amphibian culverts have also been designed.

The locations of animal passageways for Task I and Task II have been presented in Annex No. 2 (EIR 2.3. and 2.4.).

Table 3. Location of animal passageways on the route of the S8 expressway – Task I.

No.	Facility name	Chainage – km	Passage type	Minimal parameters of space available to animals (width × height) [m]	Animals for which the passage is proposed
Variants 1 and 2					
1	PZ-2	561+797	Extended bridge	10 × 2.5	Roe deer, boar, fox, wolf, lynx, small mammals, amphibians
2	-	562+360	Culvert	3 × 2	Fox, raccoon dog, polecat, weasel, insectivorous animals, rodents, reptiles, amphibians
3	PZ-4	564+200	Bridge	width 50 m	Elk, red deer, roe deer, boar, lynx, wolf, otter, badger, mink, fox, raccoon dog, polecat, weasel, hare, insectivorous animals, rodents, reptiles, amphibians
4	-	566+000	Culvert	5 × 2	Fox, raccoon dog, polecat, weasel, insectivorous animals, rodents, reptiles, amphibians
5	PZ-6	567+674	Combined	6 × 3	Roe deer, boar, fox, wolf, lynx, small mammals, amphibians
6	-	568+900	Culvert	3 × 1.5	Fox, raccoon dog, polecat, weasel, insectivorous animals, rodents, reptiles, amphibians
7	-	569+650	Culvert	3 × 2	as above
8	PZ-9	570+130 (Variant 1) 570+230 (Variant 2)	Bridge	width 50 m	European bison, elk, red deer, roe deer, boar, lynx, wolf, small and medium-sized predators, insectivorous animals, rodents, reptiles
9	M/PZ-10	570+760– (Variant 1) 570+752 (Variant 2)	Extended bridge	30 × 3.5	Red deer, roe deer, boar, lynx, wolf, small and medium-sized predators, insectivorous animals, rodents, reptiles, amphibians
10	PG/PZ-12	571+950 (Variant 2)	Combined	15 × 3.5	Roe deer, boar, fox, wolf, lynx, small mammals, amphibians
11	-	572+350 (Variant 2)	Culvert	3.5 × 1.5	Amphibians

12	-	572+650 (Variant 1)	Culvert	3 × 2	Fox, raccoon dog, polecat, weasel, insectivorous animals, rodents, reptiles, amphibians
13	PZ-14	573+500 (Variant 1) 573+595 (Variant 2)	Combined	15 × 3.5	Roe deer, boar, fox, wolf, lynx, small mammals, amphibians
14	-	572+150 (Variant 1) 575+250 (Variant 2)	Culvert	2 × 1.5	Fox, raccoon dog, polecat, weasel, insectivorous animals, rodents, reptiles, amphibians

Table 4. Location of animal passageways on the route of the S8 expressway – Task II.

No.	Facility name	Chainage – km	Passage type	Minimal parameters of space available to animals (width × height) [m]	Animals for which the passage is proposed
Variants 1 and 2					
1	PZ-1	586+880	Extended bridge	20 × 4	Red deer, elk, roe deer, boar, lynx, wolf, otter, small and medium-sized predators, insectivorous animals, rodents, reptiles, amphibians
2	PZ-2	587+600	Bridge	width 50 m	Red deer, elk, roe deer, boar, lynx, wolf, otter, small and medium-sized predators, insectivorous animals, rodents, reptiles, amphibians
3	-	588+016	Culvert	3.5 × 1.5	Fox, raccoon dog, polecat, weasel, insectivorous animals, rodents, reptiles, amphibians
4	-	589+230	Culvert	3.5 × 1.5	as above
5	-	590+750	Culvert	3.5 × 1.5	as above
6	WE/PZ-6	590+990	Combined	6 × 3.5	Roe deer, boar, lynx, wolf, small and medium-sized predators, insectivorous animals, rodents, reptiles, amphibians

7	-	591+560	Culvert	3.5 × 1.5	Fox, raccoon dog, polecat, weasel, insectivorous animals, rodents, reptiles, amphibians
8	WE/PZ-7	592+510	Combined	15 × 4	European bison, elk, red deer, roe deer, boar, lynx, wolf, small and medium-sized predators, insectivorous animals, rodents, reptiles
9	-	593+730	Culvert	3.5 × 1.5	Fox, raccoon dog, polecat, weasel, insectivorous animals, rodents, reptiles, amphibians
10	PZ-9	594+736	Underpass	15 × 3	Roe deer, boar, lynx, wolf, small and medium-sized predators, insectivorous animals, rodents, reptiles, amphibians
11	-	595+200	Culvert	1.5 × 1.5	Amphibians
12	WE/PZ-10	596+055	Combined	6 × 3	Roe deer, boar, lynx, wolf, small and medium-sized predators, insectivorous animals, rodents, reptiles, amphibians
13	-	596+970	Culvert	1.5 × 1.5	Amphibians
14	-	599+715	Culvert	3.5 × 1.5	Fox, raccoon dog, polecat, weasel, insectivorous animals, rodents, reptiles, amphibians
15	-	600+168	Culvert	3.5 × 1.5	as above
16	PZ-17	601+200	Extended bridge	15 × 3	Roe deer, boar, lynx, wolf, small and medium-sized predators, insectivorous animals, rodents, reptiles, amphibians

Variant 1

Variant 2					
17	-	599+440	Culvert	3.5 × 1.5	Fox, raccoon dog, polecat, weasel, insectivorous animals, rodents, reptiles, amphibians
18	WE/PZ-14	600+327	Combined	15 × 4	Red deer, roe deer, boar, lynx, wolf, otter, small and medium-sized predators, insectivorous animals, rodents, reptiles, amphibians
Variants 1 and 2					
19	-	603+200 Variant 1, 603+050 Variant 2	Culvert	3.5 × 1.5	Fox, raccoon dog, polecat, weasel, insectivorous animals, rodents, reptiles, amphibians
20	M/PZ-16	603+422 Variant 1, 603+288 Variant 2	Extended bridge	15 × 3	Roe deer, boar, lynx, wolf, small and medium-sized predators, insectivorous animals, rodents, reptiles, amphibians
21	-	604+770 Variant 1, 604+632 Variant 2	Culvert	3.5 × 1.5	Fox, raccoon dog, polecat, weasel, insectivorous animals, rodents, reptiles, amphibians
22	-	605+635 Variant 1, 605+498 Variant 2	Culvert	3.5 × 1.5	as above
23	PZ-21a	605+780 Variant 1 605+630 Variant 2	Underpass	15 × 3	Roe deer, boar, lynx, wolf, small and medium-sized predators, insectivorous animals, rodents, reptiles, amphibians
24	PZ-22	606+720 Variant 1, 606+582 Variant 2	Underpass	15 × 3	as above
25	-	607+050 Variant 1, 606+905 Variant 2	Culvert	3.5 × 1.5	Fox, raccoon dog, polecat, weasel, insectivorous animals, rodents, reptiles, amphibians
Variant 1					
26	PZ-27	608+563	Extended bridge	15 × 3	Roe deer, boar, lynx, wolf, small and medium-sized predators, insectivorous animals, rodents, reptiles, amphibians
27	-	609+400	Culvert	3.5 × 1.5	Fox, raccoon dog, polecat, weasel, insectivorous animals, rodents, reptiles, amphibians

Variant 2					
28	WE/PZ-25	609+005	Combined	5 × 2	as above
29	PZ-26	609+428	Underpass	6 × 3	Roe deer, boar, lynx, wolf, small and medium-sized predators, insectivorous animals, rodents, reptiles, amphibians
Variants 1 and 2					
30	-	610+590 Variant 1, 610+513 Variant 2	Culvert	3.5 × 1.5	Fox, raccoon dog, polecat, weasel, insectivorous animals, rodents, reptiles, amphibians
31	-	610+990 Variant 1, 610+910 Variant 2	Culvert	3.5 × 1.5	as above
32	WE/PZ-28	612+263 Variant 1, 612+185 Variant 2	Combined	6 × 3	Roe deer, boar, lynx, wolf, small and medium-sized predators, insectivorous animals, rodents, reptiles, amphibians
33	M/PZ-29	612+742 Variant 1 612+665 Variant 2	Extended bridge	15 × 4	Red deer, roe deer, boar, lynx, wolf, beaver, otter, small and medium-sized predators, insectivorous animals, rodents, reptiles, amphibians
34	-	613+000 Variant 1, 612+900 Variant 2	Culvert	3.5 × 1.5	Amphibians

35	-	613+442 Variant 1, 613+361 Variant 2	Culvert	3.5 × 1.5	Otter, beaver, badger, mink, fox, raccoon dog, ermine, polecat, marten, weasel, hare, insectivorous animals, rodents, reptiles, amphibians
36	PZ-32	614+700 Variant 1, 614+630 Variant 2	Bridge	width 50 m	European bison, elk, red deer, roe deer, boar, lynx, wolf, small and medium-sized predators, insectivorous animals, rodents, reptiles
37	-	615+400 Variant 1, 615+325 Variant 2	Culvert	3.5 × 1.5	Fox, raccoon dog, polecat, weasel, insectivorous animals, rodents, reptiles, amphibians

The chainage (km) marking the location of animal bridges, underpasses and culverts is a rough estimation based on current knowledge. It may be slightly changed at subsequent design stages (Building Permit Design) due to more technical details becoming available and most of all due to the map scale.

VII.3. Landscape

The landscape of the area of the planned investment is already dominated by a linear infrastructure element (national road No. 8). Therefore, there will be no considerable change to the existing landscape.

The construction stage of the planned investment will be related to:

- transforming the land surface by levelling works;
- removal and physical transformation of soil, removal of the flora (including roadside trees along the existing national road No. 8);

- further fragmentation of forest complexes and patches of forest;
- setting up construction site facilities, works performed with heavy equipment, storing construction materials etc.
- potential construction related waste to be found in the construction site surroundings.

Operational stage

Due to the earlier anthropogenic transformation of the terrain resulting from the construction of national road No. 8, the new investment will not change the landscape in this area.

Properly designed green belts integrated into the landscape will make the roadsides more attractive. The green belts should be 10-15 m wide and consist mainly of native species adapted to the habitat conditions in the analysed region. Moreover, the green belts have a protective function and serve as new environments. These functions result from the effect of trees on other components of the natural environment (climate, soil, water).

Green belts are not recommended in the sections of the expressway where the excavations/embankments are deeper/higher than 3 m. In such cases the greenery would not fulfil its principal functions and would be ineffective.

The estimated locations where landscaping greenery is to be planted have been presented on the 1:5,000 scale map in Annex No. 5.

The detailed locations of the landscaping greenery will be presented at further stages of the design works (Building Permit Design).

VII.4. Soil and water environment

In terms of surface water and groundwater conservation in the area of the planned project the following environmental conditions are to be taken into account:

- The area subject to the report is located outside of the range of Major Groundwater Reservoirs. The designed road sections are located in the vicinity (on the western side) of the Tertiary *MGR No. 215 – Warsaw subbasin.*
- In neither variant does the road cross the protective zones of groundwater intakes. Two intermediate protection zones of water intake have been identified within the areas of the designed variants: in Wyszomierz and Szumowo. All wells are used to access deep water from a well-insulated aquifer and they are located at a safe distance from the designed road.
- groundwater table occurring in sand formations at the average depth > 1.0 to 5.0 m below the ground in both variants,
- Task I, both variants, crosses the Szumowo – Łętownia Channel.
- Task II, both variants, crosses the following rivers: the Kołomyja, the Mężynianka, the Śliwówka, the Ślina.
- Five deposits have been identified within the area of Task I, both variants: exploited, unexploited or awaiting exploitation. The unexploited deposit in Wyszomierz is located approx. 100 m from the route of both variants, the exploited deposits (Szumowo, Szumowo II, Szumowo IIIA, Szumowo IV) are located approx. 500 m from the route of both variants, they are not in conflict with the route,
- Three deposits have been identified within the area of Task II: exploited, unexploited or awaiting exploitation. The unexploited deposit in Tartak Nowy is located approx. 600 m from the route of both variants, the deposit in Rutki awaiting exploitation is located approx. 700 m from both variants, the exploited deposit in Mężenin is adjacent to the area of Variant 2 of the planned investment,
- The groundwater table of water in an unconfined state has been identified within the area of the planned investment together with weak soils either already found or expected to be found along the following sections (lengths):

Table 1. Length of sections with identified groundwater table and weak soil – Task I and Task II.

TASK I		
	Variant 1	**Variant 2**
Groundwater table		
Section length [km]	4	5.4
Weak soil		
Section length [m]	1,127	1,587
TASK II		
	Variant 1	**Variant 2**
Groundwater table		
Section length [km]	9.71	7.66
Weak soil		
Section length [m]	2,370	1,370

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The boundaries of the deposits identified, as well as the locations of the groundwater deposits, have been marked on the map developed by AGH contained in Annex No. 3 (EIR 3.1.).

The impact of the planned investment (both tasks) and the methods of safeguarding the soil and water environment at the construction and operational stage are presented below. Due to the similarity of the two variants they have not been described separately.

Construction stage:

The construction of roads, along with the related engineering structures, is associated with the risk of unfavourable impact on the soil and water environment. The potential sources of contamination are: sanitary and industrial sewage and process wastewater from the construction site. However, it is a temporary source of sewage.

The contaminants generated at the construction works stage are: substances washed from construction material storage sites, leaks of lubricating oil and fuel from vehicles used for transport and from construction machines etc. Considering the risk of contamination, special caution must be observed during the performance of construction works and the required protective measures must be planned in advance to prevent hazardous substances from penetrating the soil and water environment.

At the construction stage, intensified supply of suspensions into the surface water should be anticipated.

Operational stage:

The main contaminants found in the stormwater running off the roads are: overall suspension, petroleum hydrocarbons, heavy metals and chlorides used in winter maintenance counteracting slippery road surface.

Due to the fact that the differences in the routes of both variants are insignificant for the present considerations, the calculations of the expected concentration and load values for contamination that may occur upon permitting the expressway for operation have been made for both tasks divided into sections but without stating the variant.

On the basis of the expected traffic volumes the values of overall suspension concentration have been calculated and the required reduction of these concentrations has been determined:

for 2012:

- *Task I* – the concentration of overall suspensions ranges from 175 to 177 mg/l, the contamination is to be reduced by 43 to 44%.
- *Task II* – the concentration of overall suspensions ranges from 166 to 170 mg/l, the contamination is to be reduced by 40 to 41%.

for 2025:

- *Task I* – the concentration of overall suspensions ranges from 204 to 205 mg/l, the contamination is to be reduced by 51%.
- *Task II* – the concentration of overall suspensions ranges from 191 to 196 mg/l, the contamination is to be reduced by 48 to 49%.

The admissible limits for petroleum related substances (15 mg/l) are not expected to be exceeded, thus there will be no need for reducing the contamination.

This means that when building a stormwater system it has to be taken into account that before the runoff water is drained to external reservoir (watercourses, channels, soil) the concentration of suspensions must be reduced by at least 40%. Such effectiveness of reduction (or even greater – estimated average of 70%) will be ensured by settling ponds (sedimentation wells) designed to be located before the inlet to a receiving reservoir of surface flowing water.

The existing soil and water conditions in the analysed area and the nature of the designed variants' impact on the environment require protective and minimising measures to be taken at individual stages of project implementation.

Construction stage

- ✓ portable toilets must be installed at the construction sites as a preventive measure against contamination and to minimize the risk of sanitary and industrial sewage spill;
- ✓ construction site facilities and portable toilets must not be installed in the spring area of the Orz River at km ~ 561+073÷564+000 and within the Ślina valley at km ~ 612+000÷613+000;
- ✓ access (service) roads to the construction site should be planned based on the existing network of communication routes;
- ✓ all precautions should be taken during the performance of construction works to prevent and counteract the penetration of petroleum related substances to the soil;
- ✓ due to the temporary occurrence of intensified supply of suspensions to the surface water it is recommended to reinforce the embankments and ditch slopes by sowing grass (or sodding) as soon as they are completed

in order to limit surface erosion and thus reduce the supply of sand and suspensions;

Operational stage

- ✓ the stormwater run-offs from the road should be designed in alignment with the surface level of roadside ditches or as sections of the stormwater system (road bends, engineering structures),
- ✓ the design must take account of the need to include properly selected pre-treatment devices before stormwater is drained to the final reservoirs i.e. drainage ditches, channels and rivers,
- ✓ stormwater pre-treatment to eliminate suspensions and petroleum related substances is suggested to be performed with the use of:
  - grass-covered ditches,
  - sedimentation wells before the inlets to bigger watercourses and channels,
  - petroleum derivative separators installed before the run-offs of treated stormwater to rivers,
- ✓ should it be impossible to drain treated stormwater directly to the receiving reservoirs (no watercourses), the application of ecological reservoirs is considered,
- ✓ in the event of a major fault or breakdown in the area of bridges, the application of emergency closures (gates) is suggested in order to block the run-off of potential contaminants to the watercourses,
- ✓ in order to protect the soil and water environment, in places where the depth of the groundwater table in sand formations is < 5 m below ground level, it is recommended to use geotextile. The sections to be protected with geotextile are presented in the table below; the sections have been selected on the basis of the archived test data and the prepared geotechnical documentation; GEOTECH, October 2007.

Table 2. Sections to be protected with geotextile.

TASK I		
	Variant 1	**Variant 2**
Road chainage – km	562+500÷564+950 566+500÷567+460 574+200÷574+490	562+500÷564+950 566+500÷567+460 570+650÷570+950 571+700÷572+850 574+200÷574+490
Total length [km]	3.7 km	5.1 km
TASK II		

	Variant 1	**Variant 2**
Road chainage – km	586+420÷587+200 588+750÷589+060 597+350÷597+600 599+000÷601+800 602+720÷604+350 612+100÷613+500	586+420÷587+200 588+750÷589+060 597+350÷597+600 602+720÷604+350 608+700÷609+350 612+100÷613+500
Total length [km]	7.17 km	5.02 km

Due to the fact that on the routes of the analysed variants of the investment the soil and water conditions are similar, it cannot be unequivocally determined which variant would be the most favourable to the environment.

VII.5. Soil

The designed S8 expressway its Task I (from the Masovian Voivodeship border to the Zambrów ring road) and Task II (from the Wiśniewo ring road to Jeżewo incl. the construction of the Mężenin ring road) in both variants crosses agricultural areas including tree-covered areas and forests.

The most valuable lands in terms of agricultural usefulness and soil productivity have been identified within the area of the investment – Variants 1 and 2 on the basis of soil distribution and agricultural maps (Annex No. 4 to EIR), as well as cadastral maps included in the land register.

The table below shows the locations (chainage) where such lands occur and the length of the sections where the planned project (both tasks) crosses complexes 2 and 2z and farmlands evaluated as class III. Additionally, the estimated total area of occupied class III lands is presented.

Table 1. The list of crossed wheat soil series – good class (2) and grasslands – mid-class (2z) as well as farmlands – class III along with the area occupied within Task I and Task II.

Task I		
	Variant 1	Variant 2
Wheat soil series – good class (2) and grasslands – mid-class (2z)		
Total length [m]	2,520	2,970
Farmlands – class III		
Total length [m]	1,100	950
Estimated total area [ha]	4.3	7.8
Task II		
	Variant 1	Variant 2
Wheat soil series – good class (2) and grasslands – mid-class (2z)		
Total length [m]	7,150	6,260
Farmlands – class III		
Total length [m]	1,550	1,700
Estimated total area [ha]	10.4	7.9

Within both tasks and in their vicinity, irrespective of the variant of the S8 expressway, there are soils classified as good and medium in terms of agricultural usefulness and productivity. Along a considerable section of Task I and Task II the S8 expressway will partly incorporate the existing national road No. 8. The remaining section will involve a new layout of the expressway and occupation of new areas for the purpose of construction.

The impact of the planned investment (both tasks) and the methods of safeguarding the soil at the construction and operational stage are presented below. Due to the similarity of the two variants they have not been described separately.

Construction stage

The biggest and often irreversible changes affecting the soil will take place during the construction of the S8 expressway when the macro- and microlevelling works are to destroy the soil surface not only within the area of the route but also in the adjacent areas.

Both tasks included in the construction of the S8 expressway will have the same impact on the soil at this stage. It is assumed that the biggest direct impact may take place in the area from 0÷40 m from the road axis, which is within the boundaries of the project.

The road construction works will have the following effects:

- removal of the surface soil layer,
- disruption of the ground level related to the earthworks performed in the construction of the road and other structures such as embankments and bridges,
- destruction of the soil structure and porosity by heavy equipment used for mechanical compaction of the surface soil layer,
- potential, short and temporary lowering of the groundwater table as a result of the necessary weak soil replacement.

The impact of construction works on the soil environment will be short-lasting and temporary (except for the permanent occupancy of a strip of land to be used for road investment and related engineering structures). Direct impact on the ground level and the soil during construction will be local. Complete destruction of soil at the construction stage will be observed in locations newly occupied for the purpose of road investment, the extent of damage will be more extensive in the junction areas and in the areas occupied for the purpose of road drainage system facilities. The farmland area will be reduced as a result of construction works. The total area to be transformed and permanently occupied:

Task I – approx. 180 ha (Variant 1) and 212 ha (Variant 2);

Task II – approx. 550 ha (Variant 1) and 395 ha (Variant 2);

Operational stage

The impact on soil at the road operational stage may be both direct and indirect. Road operation is connected mainly with chemical degradation of soil resulting from traffic related contaminants and pollutants.

Soil located along the road may be contaminated by: stormwater running off the road, exhaust fume components, secondary emission of dust caused by traffic (pavement, tyres and metal car part wear) and chemical agents used in winter road maintenance (mainly mixtures of NaCl with sand or $CaCl_2$).

The impact related to road traffic is direct and long-term with mostly irreversible consequences. The factors that have an indirect, long-term effect on soil are the agents used for winter maintenance of roads.

The road impact on soil is largely dependent on local conditions and the physical and chemical properties of the soil (mechanical composition, humus content, soil reaction – pH), as well as the quantity of contaminants. The analysis of subject-related literature points to a rapid (hyperbolic) decrease in the concentration of contaminants with increased distance from the road.

To sum up, the road operation may have the following effects: preservation of the changes introduced to the landscape starting from the construction stage, accumulation of contaminants and limiting the possibility of productive land use in the areas adjacent to the road.

The objective to be followed in the road design in general is to occupy areas with the least share of valuable soils. Due to the heterogeneity of soil distribution in Poland it is difficult to meet the above condition, therefore it is necessary to determine the resistance of soils found in and around the planned investment area and select proper protective measures accordingly.

According to Annex No. 4 of "Good practice guide for environmental reports concerning national roads", commissioned by the General Directorate for National Roads and Motorways, the resistance of soil to traffic related contamination was evaluated (on a 5-level scale). On the basis of the soil analysis for both tasks, the soil resistance to traffic related contamination was evaluated as weak (4) irrespective of the task or the variant considered.

Considering the identified permanent (occupation of the area for the purpose of road construction) and short-term changes to soil, certain protective measures are recommended to minimize the negative impact of Task I of the S8 expressway on the area at the construction and operational stages.

Construction stage

The impact on soil outside the project boundaries during construction is in most cases reversible. Still, the construction stage requires taking certain measures to minimize the impact of the construction process and the impact of material and machine storage sites, namely:

- hardening the ground of the construction site facilities (e.g. Jumbo slabs);
- proper organization of the construction site facilities including construction material storage sites and car parks for employees;
- removal of the humus layer and using it later in land reclamation activities after road completion.

Sewage and waste generated during the construction process should be removed from the construction site and disposed of in accordance with applicable legal provisions and standards.

Operational stage

Minimising the negative impact of the selected variant on soil will consist mainly in limiting the dispersion of contaminants (mainly heavy metals and petroleum derivatives). Reduction of the soil contamination risk related to pollutant runoff will be ensured by the proposed drainage system carrying stormwater away from the road and the water treatment system. In order to limit the concentration of contaminants in stormwater, it is recommended that the road maintenance rules be observed.

The calculations of air pollution dispersion based on the predicted traffic volumes (for 2012 and 2025) do not indicate that there is a risk of exceeding admissible levels in the areas outside the project boundaries, thus they do not show any risk of contaminating soil adjacent to the road.

Landscaping greenery belts to be executed along the route of the planned investment will provide additional protection to soil during the road operational stage.

Due to the fact that on the routes of the analysed variants of the investment the soil conditions are similar, it cannot be unequivocally determined which variant would be the most favourable to the environment.

VII.6. Historic monuments and cultural landscape

The opinions sent by the Voivodeship Office of Monument Protection in Białystok, the Regional Office in Łomża, indicate that in the vicinity of the analysed route of road No. 8 there are in total 15 sites under protection of the conservation officer (according to the opinion of the monument protection officers). The table below shows the sites and monuments located in the area of investment.

Table 1. Cultural heritage sites and monuments along the route of the planned investment.

	Total number of sites	Temporary sites	Permanent sites	Number of temporary sites crossed by the project
TASK I (Masovian Voivodeship border – Zambrów ring road)				
Variant 1	5	3	1	2
Variant 2		4	1	2
TASK II (Wiśniewo ring road – Jeżowo)				
Variant 1	10	9	-	2
Variant 2		10	-	2

The planned investment will affect the historic monuments and sites and the cultural landscape both at the stage of construction and in operation.

Construction stage

The construction of the road and the implementation of the planned investment will require the performance of earthworks. As a result, the existing archaeological sites may be exposed and uncontrolled earthworks may cause complete or partial destruction of these sites.

It is assumed that the implementation of the planned investment, in particular the necessary earthworks, may cause a number of risks to cultural heritage objects buried under the ground. These will be:

- complete destruction or removal of such objects caused mainly by earthworks;
- partial destruction or irreversible damage to such objects caused e.g. by machines and heavy equipment working at the site;
- temporary negative impact on the surroundings of a historic object related to the construction works being performed.

On the basis of the opinion issued by archaeology officials, records entered in land development documents and available registers kept by the conservation officer, 15 sites under protection of the conservation officer have been identified in the vicinity of the planned investment.

Considering the fact that both tasks of the planned investment are in direct collision with the archaeological sites (two for each task), the implementation of the project may cause the

destruction of these sites.

Operational stage

At the stage of road operation the negative impact on the cultural heritage has regard mainly to permanent sites of cultural heritage and is mostly related to pollution, dust and vibrations caused by intensive traffic and speed of vehicles. Vibrations caused by traffic may occur within the zone extending up to 20 ÷ 40 m from the road.

The analysis of the location of a permanent cultural heritage site (Task I – military cemetery dating back to the First World War) suggests that at the operational stage the investment will not have a negative impact on this cultural heritage site.

To protect the identified cultural heritage sites as per Article 52 (1)(7)(a) of the Environmental Protection Law, first of all it will be necessary to carry out archaeological rescue test excavations.

According to the opinion issued by the Voivodeship Office of Monument Protection in Białystok, the Regional Office in Łomża, in a letter dated 13 August 2008, ref.: ZAŁ MK/40120/55/08 (Annex No. 7.1) considering that there are archaeological sites in the area of the planned investment it is necessary to conduct archaeological investigation and survey before the implementation of the investment plan is started. Potential archaeological works should be performed by an archaeologist accepted by the Voivodeship Office of Monument Protection, Regional Office in Łomża. Also, the works require a permit issued by this office.

Archaeological supervision should be continued at the construction stage during the performance of earthworks in the area where the recorded cultural heritage sites are located.

As both variants cross the same number of archaeological sites it is not possible to differentiate between them and select the variant which would be more favourable to the environment.

VII. 7. Aerosanitary condition

Temporary pollution emissions will take place during the construction of the analysed section of the S8 expressway in both tasks and in each of the two proposed investment variants. The pollution will result from the operation of heavy equipment. Some substances are also released in the process of laying bituminous pavement (e.g. hydrocarbons and tarry substances). Additionally, different types of dust will be generated when transporting and unloading the substances used in road construction. Since the particle fractions of the emitted dust are rather big, dust fall rates are considerable and thus the impact will continuously decrease with increasing distance from the source of dust.

The emissions generated at the construction site will be similar for *Variant 1 and Variant 2* in ***Task I*** as well as for *Variant 1 and Variant 2* in ***Task II***. Moreover, the emissions will change locations with the progress of construction and will cease upon completion of construction works.

The predicted air pollution emission levels in the analysed investment variants have been estimated for five major pollutants: nitrogen dioxide, carbon monoxide, sulphur dioxide and aromatic and aliphatic hydrocarbons.

The calculations indicate that there is a risk of exceeding the reference values for nitrogen dioxide in 2012 max. 6 m from the edge of the carriageway. When it comes to other pollutants analysed, both in 2012 and in 2025 the admissible levels are not expected to be exceeded.

The calculations were based on the predicted traffic volumes in the years mentioned above. Therefore, the impact of the analysed variants of the expressway on the aerosanitary condition of the areas adjacent to the road in relation to gas emissions to the atmosphere is not a differentiating factor distinguishing either of the analysed variants from the other.

Emissions generated at Passenger Service Points have not been taken into account in the calculations due to limited traffic intensity. The emissions in these places will not contribute to the overall impact of pollutants related to the road.

VII.8. Road traffic noise impact on environment

The S8 expressway in the sections from the Masovian Voivodeship border to Zambrów and from Wiśniewo to Jeżewo runs in the vicinity of national road No. 8 or, in some section, incorporates the national road as one of its carriageways.

The surroundings of the road are varied in terms of urbanization and investment level, ranging from agricultural land and wasteland to dispersed built-up areas with mainly one- and two-storey residential buildings and insulated housing estates.

During construction of the expressway, irrespective of the variant and in both tasks, there will be temporary, short-term acoustic effects caused by the operation of heavy construction equipment and by passing vehicles transporting materials. The works have direct, short-term impact on the area where they are performed.

At the operational stage noise will be generated by the vehicles using the road. The calculated range of such noise for all variants in ***Task I*** and ***Task II*** of the planned expressway goes beyond the boundaries of the designed road.

The ranges of road noise for the proposed variants in both tasks have been presented in graphic form in Annex No. 5 (6.1., 6.2 in EIR – Task I and 6.4, 6.5 in EIR – Task II).

Acoustic screens have been proposed as a noise protection measure to be applied in the discussed investment variants: ***Task I***, *Variant 1* (4,390 m), *Variant 2* (3,020 m), ***Task II***, *Variant 1* (8,935 m) and *Variant 2* (6,980 m).

Additionally, the recommended green belts whose principal function is to integrate the road into the existing landscape will contribute to reducing the emission of road noise to the environment. The green belts may contribute to increasing the sound absorption coefficient in the environment and create a barrier shielding the source of noise, which is an important “psychological” factor related to the perception of this kind of noise.

In order to compare individual variants in terms of the traffic noise impact on people living near the road, the potential number of people exposed to above-standard noise level has been determined. The number of residential buildings within the area demarcated by isoline $LA_{eq}N = 50$ dB was calculated for the year 2032, the average number of residents per single building was 6 (mainly homes with one- and two-storey buildings). The result represented the number of people potentially at risk of above-standard noise impact: ***Task I***, *Variant 1* -240 people, *Variant 2* – 216 people, ***Task II***, *Variant 1* – 552 people, *Variant 2* – 438 people.

VII.9. Waste

The construction of the expressway will include necessary demolition works. Irrespective of the variant; in each task of the project similar works will be performed and thus it is expected that the same kinds of waste will be produced during road construction and operation.

Hazardous and non-hazardous waste characteristic of this kind of project will be produced during construction. This will be waste classified under group 17 (Construction, reconstruction, repair and dismantling of building structures and road infrastructure). The conducted survey provided estimated amounts of some of the waste. Before demolishing or dismantling the road pavement a contractor has to test the composition of the road asphalt for tar in order to classify the produced waste as hazardous or non-hazardous waste.

It is expected that the demolition of engineering structures and buildings may produce some waste containing asbestos. Such waste is classified as hazardous waste and it may come from e.g. roof and wall plates containing eternit. A properly certified company with the technology required for disposal of this kind of waste should be employed to gather, transport and manage such waste.

Other construction related waste will come from utilities used by employees, this will be municipal and municipal-like waste classified under group 20 03.

During road operation the produced waste will be related to maintenance of the treatment devices for water running off the road as well as to winter maintenance of the expressway. Production of municipal type waste is also possible as a result of the road surroundings pollution by drivers and passengers. Some specific kind of waste will be produced on road-related infrastructure such as Passenger Service Points.

Waste management must be in line with the provisions of the Act on Waste (Journal of Laws No. 62, item 628 of 20 June 2001 as amended) and the Act on Packaging and Packaging Waste) (Journal of Laws No. 63, item 638 of 22 June 2001 as amended) as well as with applicable ordinances and regulations. Irrespective of the selected investment variant, the management of the waste produced will be the same.

VII.10. Public consultations

The implementation of a linear project running through residential areas usually triggers many different kinds of social conflict.

Since the planned variants of the S8 expressway run partly on the route of the existing national road No. 8 the demands voiced by residents during public consultations regarded mainly the division of plots and guarantees that access to farmlands will be ensured.

Upon submission of this Environmental Impact Report the procedure related to the assessment of the project's environmental impact with participation of the community will be started. This will be the stage when requests, comments and objections of the engaged parties will be issued.

VII.11. Major faults

Major faults or breakdowns on communication routes are rather rare, which does not exclude the need to be fully prepared to deal with such incidents. I.Incidents that may take place on the expressway are as follows: accidents involving tankers, loss of tightness of the packaging of transported goods, explosions, fires and car accidents.

The expressway has been designed in such a way as to minimize the risk of a major fault. Places that are especially exposed to the effects of a road disaster are highly hydrated areas where contamination of groundwater or surface water should be expected. Water running off the road will be drained into roadside ditches or to the stormwater system on the engineering structures. Rivers, drainage ditches and channels will be the final receiving reservoirs. Bridges are the places where the risk of contamination is the greatest.

Transport of hazardous cargo (it is assumed that the expressway will be used also to transport this kind of cargo) is regulated by international law under the ADR agreement and by Polish law.

In order to keep the expressway passable in the event of a major fault or repair works, emergency passages have to be executed allowing the closure of one carriageway and directing the traffic to the other carriageway where two-way traffic will be temporarily introduced. Additionally, there will be entrance roads to allow rescue service to enter the road. Such entrances will be equipped with a locked gate available to be used only by authorized services.

The Act on the State of Natural Disaster imposes the following obligations on the offices at different administrative levels:

- taking actions aimed at preparing the team to coordinate activities in critical circumstances,
- monitoring occurring natural disasters and predicting further developments,
- implementing procedures and programmes describing the response in the event of natural disaster,
- developing and updating emergency/crisis management plans,
- cooperating with poviat crisis management centres with regard to the crisis response system,
- planning support activities for the bodies responsible for managing the actions at a lower public administration level,
- permanent contact with the institutions responsible for continuous environmental monitoring

VII.12. Existing technical infrastructure

The route of the designed expressway in ***Task I*** and ***Task II*** in their variants collides with existing technical infrastructure such as: low and medium voltage power lines, high pressure pipelines and water supply networks.

In ***Task I***, both in Variant 1 and Variant 2, the route of the road collides with a high pressure pipeline which will have to be restructured. In ***Task I*** the variants also cross the Jamał – Europe pipeline (restructuring of this pipeline is not required though), power lines and water supply networks. The route in ***Task II*** collides with power lines and water supply networks.

Negative impact on the environment in all variants will be observed only at the stage of potential restructuring works and in relation to the risk of fault occurring during operation. This limited impact results from the road being located at a considerable distance from the residential areas.

VII.13. Cross-border impact

The analysis of the expected impact on the environment indicates that the construction and operation of the S8 expressway in both tasks and in all variants considered will not cause any trans-border impact on the environment.

VII.14. Demolition of the road

Demolition is the process reverse to construction. Currently, it is difficult to consider demolition of the road which in principle is to be used as long as possible – the durability of linear structures in operation, such as a road, is counted in hundreds of years.

Demolition of a linear structure (road) would require proper administrative decisions permitting industrial use of the environment. Demolition of approx. 15 km long Task I and 30 km long Task II of the road would generate waste and require land reclamation in the area of the

demolished road.

During the demolition works the following difficulties and nuisances may affect the environment:

- waste produced from demolishing structures, including hazardous waste (e.g. bitumen, soil contamination);
- emission of pollutants into the air,
- noise emission into the environment;
- storm waste water;
- risk of contamination of soil and groundwater.

Pollution and the difficulties related to the demolition works will not have a negative impact on the environment, if the construction works contractor organizes the earthworks properly and applies appropriate supervision measures to ensure the observance of environmental protection principles.

VII.15. Variant comparison with the use of multi-criteria analysis and choosing the best variant for the environment

In order to present the most objective assessment of variants of the route of the designed S8 expressway in both tasks analysed, *the detailed standardized indicators method – the so-called multi-criteria analysis* – was used. It is a relative assessment – identifying a variant as "the worst" in the analysis means that its negative impact is the greatest among the analysed variants.

The selection of indicators to be applied in the analysis is an important part of the assessment process – this is what the result depends on. The indicators may be very detailed or general. Most of the indicators used in this method are general. The method used environmental indicators characterising the impact on the natural and social environment.

It is crucial that all environmental impacts cannot be treated as ones of equivalent importance. In order to reflect the greater significance of some of the applied environmental indicators a system of weights was used. The least significant components were given the lowest weight (i.e. 1) and the most significant were given the highest weight (i.e. 5).

The assessment of environmental conditions of the planned investment area showed that the main parameters differentiating the analysed variants, both in Task I and Task II of the project include:

- the impact of traffic noise (both tasks),
- the number of buildings to be demolished (both tasks),
- the area of the destroyed habitats of amphibians (both tasks),
- crossing protective forests (Task I),
- occupation of natural habitats mentioned in Annex I to the Habitats Directive (Task II),

Appropriate weight was assigned to a given environmental indicator on the basis of the following analysis:

- residential buildings to be demolished were weighted with 5 – crossing human settlements causes numerous protests and the demolition of buildings creates the need of relocating the people,
- the number of people exposed to above-standard noise was weighted with 5 – similarly to the demolition case the impact of noise causes numerous conflicts, additionally continuous close presence to the source of noise poses a health risk and causes many kinds of disease,
- protective forests were weighted with 4 – these areas are already crossed by the existing national road No. 8 – there is no primary but only secondary interference, thus the weight assigned to these indicators is not higher,
- occupation of natural habitats mentioned in Annex I to the Habitats Directive (weight 4) – both patches of the natural habitat are located very close to the existing roads: the first is located by voivodeship road No. 679, the second, by national road No. 8, thus the habitats are under anthropogenic pressure, which lowers their value as nature sites. Moreover, the habitats are not extensive – the first one, to be completely destroyed, represents an area of only 0.6 ha, the second one is to be crossed by the investment and the area to be destroyed represents less than 22% of a meadow section (0.13 ha). Therefore, the highest weight was not assigned to this indicator.
- The area of destroyed habitats of amphibians (weight 4) – the habitats are not located within a Natura 2000 area nor any other protected area; amphibians listed in Annex II to the Habitats Directive were not recorded in these habitats, thus the highest weight was not assigned to this indicator.

Considering the above, the discussed indicators were assigned either the highest weight – 5 or the next in line i.e. 4.

Conclusions of the analysis

The assessment of the variants of ***the S8 expressway*** route ***in Task I – section from the Masovian Voivodeship border to Zambrów*** – performed with the use of the standardized indicators and weights method showed that:

1. The variant which is the most favourable in terms of environmental impact is Variant 1.
2. Considering only the social factors, the most favourable variant is Variant 2.
3. After collecting all partial results and performing global analysis of these results, the following outcome was obtained – *considering the impact on the environment, **Variant 2** is the most favourable variant of the S8 expressway route in Task I*.

On the basis of the calculations, predictions and assessment of environmental impact of the S8 expressway in **Task I** in the section from the Masovian Voivodeship border to Zambrów it has been concluded that Variant 2 should be the variant indicated for implementation.

The assessment of the variants of ***the S8 expressway route in Task II – section from Wiśniewo ring road to Jeżewo*** – performed with the use of the standardized indicators and weights method showed that:

1. The variant which is the most favourable in terms of environmental impact is Variant 2.
2. The variant which is the most favourable in terms of social impact is Variant 2 as well.
3. After collecting all partial results and performing global analysis of these results, the following outcome was obtained – *considering the impact on the environment **Variant 2** is the most favourable variant of the S8 expressway route in the section starting from the Wiśniewo ring road and ending in Jeżewo*.

On the basis of the calculations, predictions and assessment of environmental impact of the S8 expressway in **Task II** it has been concluded that Variant 2 should be the variant indicated for implementation.

VIII. ENVIRONMENTAL IMPACT AND ENVIRONMENTAL PROTECTION METHODS FOR THE CHOSEN VARIANT

VIII.1. Short description of the chosen variant

As described above, *Variant 2* is the optimal variant which is the most favourable to the environment in ***Task I*** of the S8 expressway. *Variant 2* is also the most favourable in ***Task II*** from the Wiśniewo ring road to Jeżewo:

Task I (the Masovian Voivodeship border – the Zambrów ring road) – *Variant 2* – the existing national road No. 8 remains as a local road (on the major length) and the dual carriageway S8 expressway is constructed as a parallel route to the existing one along with the construction of a diversion for Wyszomierz and Ostrożne (both in new layout).

Task II (from the Wiśniewo ring road to Jeżewo) – *Variant 2* – using sections of the existing right-of-way of national road No. 8 as a second carriageway of the designed S8 expressway, leaving the existing national road No. 8 as a local road (construction of a new dual carriageway expressway in parallel to national road No. 8), together with the construction of a southern diversion for Mężenin, the construction of a diversion for Stare Krzewo and route correction close to the area of PKP (km ~591) and to the bridge over the Ślina River.

Total area to be occupied for the purpose of the S8 expressway in Task I from the Masovian Voivodeship border to the Zambrów ring road is 210.9 ha. In Task II from the Wiśniewo ring road to Jeżewo the total area to be occupied for investment purposes is 405.3 ha.

In both tasks the expressway in the chosen variant will have the following technical parameters:

- Technical class - S
- Design speed - 100 km/h
- Carriageway width - 2 × 7.00 m
- Emergency lane width - 2 × 2.50 m
- Central reservation width - 12.00 m (incl. shoulders 2 × 0.5 m)
- Ground shoulder width - 2 × 0.75 m
- Traffic category - KR6
- Load - 115 kN/axle
- Vertical clearance gauge - 5.00 m

The following scope of construction works is expected for the implementation of the planned investment i.e. the construction of a section of the S8 expressway.

- construction of the expressway consisting of 2 × 2 lanes (ultimately 2 × 3 lanes) with the length of: ***Task I*** – 14.88 km and ***Task II*** – 29.65 km
- construction of junctions (interchanges) to connect the expressway to the surrounding road network: ***Task I*** – 1 junction (“Szumowo” junction) and ***Task II*** – 4 junctions (“Gosie”, “Mężenin”, “Sikory” and “Kobylin”).
- construction of Passenger Service Points
  Task I
  - “Szumowo” III (in the location of the existing petrol station),
  - “Ostrożne” I, ***Task II***
  - “Gosie” II (in the location of the existing petrol station),
  - “Kossaki” III,
  - “Cibory North” I (on the northern side of the road in a newly designed location),
  - “Cibory South” (on the southern side of the road in the location of the petrol station).
- construction of two-level, free-flowing flyover or under ramps for roads crossing the expressway,
- construction of service roads,
- construction of engineering structures – 46 in total,
  Task I – 15, including
  - structures in the course of the expressway – 9
  - structures over the expressway – 6

  Task II – 31, including
  - structures in the course of the expressway – 21
  - structures over the expressway – 10
- construction of road culverts and stormwater system,
- environmental protection and road safety facilities,
- restructuring/reconstructing roads colliding with the expressway,
- restructuring power and telecommunication facilities colliding with the expressway,
- restructuring drainage networks colliding with the expressway,
- restructuring gas networks colliding with the expressway (collision with 1 high pressure gas pipeline has been identified – reconstruction required),
- restructuring water supply networks colliding with the expressway,
- restructuring stormwater drainage and sanitary sewage systems colliding with the expressway,
- cutting down sections of forest – total area to be cut down 15.6 ha.

VIII.2. Natural environment

Protected areas

The chosen variant (most favourable in terms of its environmental impact) does not cross any protected area within the meaning of Article 6(1) of the Act on the Protection of Nature (Journal of Laws No. 92/2004, item 880). The route in this variant runs at a considerable distance from protected areas. These are: a nature reserve, a landscape park buffer zone, Natura 2000 areas, an ecological site and natural monuments. The ecological site is a natural protected area located the closest, i.e. at a distance of 700 m from Task I (at km 565+250).

No negative impact of the investment is thus expected on the abovementioned areas or sites. This is based on the calculations of traffic pollution dispersion which indicate that the standards of quality of the environmental condition on the border lines demarcating the investment will be met for most of the analysed environmental components.

Nevertheless, the investment crosses other valuable natural areas such as ecological corridors (included in the network of Main Corridors used as major migration paths – Task I and

Task II) and protective forests (Task I).

Table 1. Protected sites and other valuable natural areas, type of collision with the planned route of the S8 expressway – Task I and Task II – the variant most favourable to the environment.

No.	Km of road	Protected area	Collision type
TYPES OF PROTECTED NATURAL AREAS			
Nature reserves			
1	586+300	"Grabówka"	In Task II the investment in the location closest to the protected area is approx. 4,700 m from the reserve
Landscape parks			
2	591+500	Buffer zone of the Łomżyński Landscape Park – the Narew Valley	In Task II the investment in the location closest to the protected area is approx. 4,700 m from the Park's buffer zone
Natura 2000 areas			
3	600+000	Area of Special Protection of Birds the swamps of Wizna (*Bagno Wizna*) PLB200005	In Task II the investment in the location closest to the protected area is approx. 2,600 m from the Special Protection Area
4	570+000	Area of Special Protection "Czerwony Bór" natural habitat pltmp205	In Task I the investment in the location closest to the protected area is approx. 850 m from the Special Protection Area
5	600+000	Area of Special Protection of Natural Habitats the Biebrza Valley (*Dolina Biebrzy*) PLH200008	In Task II the investment in the location closest to the protected area is approx. 9,000 m from the Special Protection Area
6	590+000	Area of Special Protection of Habitats and Area of Special Protection of Birdsthe Valley of the Narew River Gorge (*Przełomowa Dolina Narwi*)PLC200003	In Task II the investment in the location closest to the protected area is approx. 8,100 m from the Special Protection Area
Natural monuments			
7	589+200	field elm	In Task II the investment is approx. 1,040 m from the natural monument
8	587+000	cluster of trees – junipers	In Task II the investment is approx. 1,600 m from the natural monument
Ecological sites			

9	565+250	"Moczary" swamp	In Task I the investment in the location closest to the protected area is approx. 700 m from the ecological site
OTHER VALUABLE NATURAL AREAS			
Ecological corridors			
10	562+000÷ 566+000	the Omulwia Valley, the Northeast Corridor GKPnC-5B	In Task I the investment crosses the corridor along a 4,000 m long section
11	592+000÷ 597+000	the Narew Valley, Central Corridor KPN-23	In Task II the investment crosses the corridor along a 5,000 m long section
12	600+000	the Pisz Forest – the Biebrza Valley, Southern Corridor KPN-1C	In Task II the investment is approx. 1,200 m from the corridor (diversion of Mężenin)
13	609+000 ÷615+960 (end of Task II)	Marshy Valley of the Narew River (*Bagienna Dolina Narwi*) – the Valley of the Narew River Gorge (*Przełomowa Dolina Narwi*), KPN-23D	In Task II the investment borders on the corridor along a 6,950 m long section
14	612+665	local corridor of the Ślina River	In Task II the investment crosses the river at the level of Kobylin – Kruszewo
15	615+960	International core area – 25M of the Upper Narew Valley	In Task II the investment is approx. 3 km from the core area
Protective forests			
16	569+580÷ 570+870 (Task I)	Protective forests	In Task I the investment crosses the protective forest along a 1,290 m long section
17	Task I at km 565+000 Task II at km 588+000	Protective forests	Task I is 700 m from the forest Task II is 1,200 m from the forest

The areas crossed by the project have been marked with shading.

To eliminate the negative impact of the S8 expressway on valuable natural areas the following remedial measures should be implemented.

Construction stage:

- the minimum width of the construction area should be determined in such a way as to minimize the area of potential destruction to flora;
- the duration of construction works in valuable natural areas (ecological corridors) should be maximally reduced;
- the construction site and its facilities should be well-maintained by keeping e.g. a proper number of waste containers installed in suitable locations on site, washing facilities and toilets and by proper management of materials to prevent contamination;
- the construction site facilities and warehouses should be located in areas that are unattractive for animals, outside ecological corridors;
- special attention should be paid during construction works to the protection of the Ślina River water to prevent materials used for construction from falling into the river e.g. use working platforms and landings.

Operational stage:

- design animal bridges, underpasses and culverts (eco ducts) to provide for safe crossing through the ecological corridors,

- the passageways for small and medium-sized animals should have specially designed greenery to direct animals to the safe passageway (trees, bushes, shrubs), native species are recommended, mainly fruit types (attractive for animals), on both sides of the road, creating a kind of a crater narrowing as it approaches the passageway;
- anti-glare screens have to be installed at all passageways for large and medium-sized animals; the screens should be properly connected with the fence directing animals to the passageway;
- the road should be fenced on both sides to prevent animals from entering the road unexpectedly;
- secure the road with low fencing installed at all culverts to direct amphibians to the safe passageway and prevent them from entering the road.

Proper passageways (ecoducts) will be designed in locations where traces of animal migrations have been identified (for large, medium-sized and small mammals, reptiles, amphibians).

The following types of ecoducts for animals have been designed for the chosen variant in Task I and Task II:

Task I:

- Bridges – 2
- Combined – 3
- Extended bridges – 2
- Culverts – 6

Task II:

- Bridges – 2
- Underpasses – 4
- Combined – 6
- Extended bridges – 3
- Culverts – 17

The chainage (km) and parameters of the abovementioned ecoducts have been presented in chapter VII.1.

The locations of ecoducts for animals are indicated in Annex No. 2.

The chainage (km) marking the location of animal bridges, underpasses and culverts is a rough estimation based on current knowledge. It may be slightly changed at subsequent design stages (Building Permit Design) due to more technical details becoming available and most of all due to the map scale.

Greenery intended to direct animals to safe passageways

Landscaped areas, even if they do not form dense forest complexes, are important in supporting animal migration. They provide refuge for animals during long- and short-distance migrations.

The principal function of designed greenery is to guide animals to the safe passage over or under the expressway. Planting this kind of greenery will improve the way animals use the ecoducts and mitigate negative consequences of the road impact.

The greenery planted at and near a given ecoduct depends on the type of this ecoduct and the area where it is located.

An ecoduct should be integrated with the fencing around which dense rows of shrubs and climbers are to be planted (length: 100 m – 50 m on each side from the axis of the passageway). In direct vicinity of the passageways, the greenery should be planted in rows turning towards a passageway.

Trees should be growing on the inside of the strips and bushes on the margins (on the inside of the strips there is too little light for bushes and shrubs). The strip of shrubs should be wider on the side of the road.

In open spaces the green belts will be relatively attractive habitats for many animal species and they will function as a protective wall for animals walking towards an ecoduct.

The native species of trees and bushes recommended to be planted on and near the ecoducts are e.g. rowan, silver birch, Norway maple, willow, hazel, black elder, hawthorn and dog rose.

Monitoring of impact minimising facilities (ecoducts for animals)

The aim of monitoring ecoducts for animals is to gather data regarding the use of these passageways in order to implement, where possible, corrections to a given structure (e.g. extending a structure, stabilising shelves, better connection to the ground, drainage of the culverts etc.) or to change the development of the existing passageways and their surroundings to provide for more intensive use of ecoducts by animals and reduce the investment impact (road as a barrier to migration) on fauna.

As described in chapter V.8.3., the planned investment borders on and crosses ecological corridors classified as main corridors – having international significance, which mark the migration directions in the whole country and in Europe. The corridors may be used for migrations of large animals such as wolves, elk, roe deer and red deer as well as many other species associated with water environment such as beavers and otters (Jędrzejewski et al. 2006).

Due to the significance of the crossed corridors it is necessary to monitor the proposed ecoducts, in particular those intended to be used by large and medium-sized animals (extended bridges, bridges, underpasses, combined structures) whose height is **>**3 m. These passageways will be used by all animal groups.

The monitoring of passageways for large and medium-sized animals should be continued for at least 4 years.

The proposed methodology for the monitoring activities should include: winter tracking for traces of newly fallen snow e.g. twice in the winter season, recording the traces found on sand – installation of a shallow channel filled with sand (e.g. 2 inspections per year).

As the analysed area is an important migration path for small animals, including amphibians, the monitoring activities should encompass culverts located in the areas where amphibians' habitats have been identified (especially in the area of destroyed habitats where new reservoirs will take over the function of habitats for amphibians). It is suggested that the following culverts be monitored:

- Task I: 562+350, 563+180, 568+900, 572+350, 575+250;
- Task II: 595+200, 596+970, 599+440, 606+905, 612+900, 615+325.

The monitoring of culverts for amphibians should be continued for at least 1-2 years, in three periods each year:

- 1 March – 30 April;
- 1 June – 30 June;
- 15 August – the end of September.

The research aims at determining the species of fauna using a given passageway and evaluating the significance of a given structure for animal migration.

The monitoring should be carried out for several days (depending on weather conditions), during the periods of increased activity of amphibians, i.e. in the evening and after dusk, especially when humidity is high.

The detailed methodology describing the monitoring activities will be developed by an organization performing such activities on animal passageways.

Flora

Construction stage

Potential risks with a negative impact on the condition of the flora present in the area are expected at the stage of road construction works.

- further fragmentation of forest complexes (an area of more than 4 ha) or patches of forests (an area of less than 4 ha). The area occupied for the purpose of investment:
  - Task I – 39.2 ha,
  - Task II – 66.23 ha.
- destruction of farmland and woodland flora within the project boundaries, among other things as a result of ploughing,
- removal of mid-field forests and roadside tree avenues,
- changing the conditions in the habitats surrounding the road as a result of heavy equipment activity, storage of construction materials, location of technical facilities etc.

At the stage of road operation, since it is expected that the admissible air pollution concentration levels, as defined in the Ordinance of the Minister of the Environment of 5 December 2002 on reference values for some substances in the air, will not be exceeded, no negative impact of traffic related pollutants on the flora is expected.

The construction of the planned route S8 expressway in the analysed variant should not have a considerable negative impact on the flora. This stems mainly from the fact that the flora has developed and grown in this area under the influence of the already existing national road. Additionally, the agricultural character of this region limits its diversity.

Except one populous plant species found within the area of Task I, which is a species under partial protection found beyond the boundaries of the road (common buckthorn), there are no other species protected either under national or European law. Within Task II, single specimens of the broad-leaved helleborine and the guelder rose (species under strict protection) have been identified beyond the boundaries of Task II of the designed S8 expressway, therefore the investment is not a risk to these species.

To protect the flora at the stage of construction and operation of the road the following protective measures need to be implemented:

Construction stage

- during construction works, trees located in the vicinity of the project that are not to be cut down should be protected with boards installed on the trunks, straw or reed mats wrapped around the trees;
- the minimum width of the construction area should be determined in such a way as to minimize the area of potential destruction to flora;
- the holes left in the ground after cutting down trees have to be backfilled (they may cause changes in soil and water conditions on the border of the road),
- avoid dropping and gathering the dug up material around trees and bushes;
- the construction site and its facilities should be well-maintained by keeping e.g. a proper number of waste containers installed in suitable locations on site, washing facilities and toilets and by proper management of materials to prevent contamination.

Operational stage

As it is necessary to cut down trees to clear the area for the planned investment, further fragmentation of forest complexes or patches of forest will take place, which will make them more exposed to the effects of wind, air pollution, intensified sunlight etc.

Via a letter of 6 April 2009, ref. GDDKiA-O/BI-ZP-P4-265DŚU/39 and 44/09 the General Directorate for National Roads and Motorways, the Regional Office in Białystok informed that clarification had been provided by the Regional Directorate of the National Forest Holding – State Forests in Białystok regarding the creation of ecotones for the dense forest edge exposed as a result of tree cutting activity. There was information that after cutting down trees and exposing the forest edge as a result of various investments, the State Forests each time would take up works related to the creation of the necessary protective strip as part of their duties. The abovementioned works consist mainly in performing proper tree thinning within the exposed tree stands and introducing special undergrowth species.

Considering the above clarification as well as the fact that in the locations where the project crosses forest complexes, the Investor applies the principle of minimal land occupation (to limit tree losses as much as possible), which in turn provides no space for the introduction of additional greenery to compensate the losses in density, no recommendations have been made as to protective measures to be taken for the tree stands. Nonetheless, necessary landscaping greenery strips have been indicated (chapter VII.4.3.).

Animals

The construction and operation of the planned S8 expressway – Task I and Task II – will have a negative impact on animals and their migration routes.

At the stages of road construction and operation the project may have the following impact:

Construction stage:

- animals (especially birds and mammals) unable to adapt to the conditions encountered during the construction, the inability to adapt results from human presence and activity as well as the operation of construction equipment;
- mechanical and chemical waste on the areas covered by the investment (e.g. storage of construction materials and equipment);
- soil and flora destruction and thus destruction of the living space for animals;
- occupation of the area to be used for the purpose of investment within the project boundaries and thus reduction of feeding grounds etc. (affecting mainly mammals and birds);
- temporary deterioration of the acoustic climate (vibrations and noise generated by working equipment may periodically disturb the migration of amphibians, reptiles and mammals and scare birds);
- animals killed accidentally at the construction sites and access roads (small mammals, amphibians, reptiles);
- temporary deterioration of the habitat conditions for animals (amphibians, beaver, otter

etc.) e.g. due to potential water contamination during the construction works;

- destruction of the living grounds of amphibians within the boundaries of the road:
  - **Task I** at km: 572+070 (the habitats of the frog habitat – 1 specimen, the edible frog – 10 specimens, the smooth newt – 1 specimen, the moor frog – 2 specimens, the pool frog – 1 specimen), 572+350 (the habitat of the moor frog – 1 specimen), 574+820 (the specimen of the edible frog – 20 specimens);
  - **Task II** at km: 606+930 (the habitat of the edible frog – 50 specimens), 608+930 (the habitat of the common toad – 1 specimen).

Operational stage

- permanent occupation of the area for the purpose of the investment, which means taking up part of the living grounds of animals (breeding and feeding grounds, resting places);
- crossing migration paths (large, medium-sized and small mammals, reptiles, amphibians) may cause:

  a barrier or obstacle to seasonal migrations;

  isolation from breeding and wintering grounds (especially amphibians);
- animal deaths as a result of collisions with vehicles (mammals, amphibians, reptiles);
- anxiety caused by noise generated by cars;
- risk of surface water contamination with chemicals etc. as a result of a breakdown or accident (birds, mammals, amphibians, reptiles). Thus, a safeguarding system is required to prevent the consequences of a potential breakdown.

The existing migratory routes of animals are already crossed by the existing national road No. 8. Nevertheless, animals are able to cross the existing road along its entire length which leads to frequent collisions with vehicles. The implementation of the planned project will permanently separate animal habitats from the road thanks to the construction of a fence. This will eliminate the possibility of vehicles colliding with animals. It is also necessary to provide animals with safe crossings to the other side of the road by constructing appropriate passageways along with the elements directing the animals to these safe passageways (i.e. greenery, fencing).

The following remedial and impact minimising measures should be taken to reduce the negative impact of the investment on animals:

Construction stage:

- the width of the construction area should be assumed in such a way as to occupy as little of the area of animal habitats as possible;
- organising construction sites, storing equipment and materials with such measures applied as to prevent amphibians from entering construction sites, i.e. the erection of plastic fencing around the construction site starting from 1 March to 30 June;
- new breeding grounds are planned to be prepared (water reservoirs) in the locations of destroyed habitats of amphibians as part of the corrective action plan; the reservoirs should be located in the surroundings characterized by similar habitat conditions, approx. 100 m from a variant's axis. It is suggested that the area of one reservoir be approx. 500 m². New reservoirs will be located within the boundaries of the variants, in the locations given below:

  TASK I

  - approx. 575+100, near the proposed culvert at km 575+250; and approx. 572+350, in the area of the suggested culvert at km 572+350.

  Task II

  - approx. 606+900 near the proposed culvert at km 606+905.

  Due to the fact that there was only 1 specimen of the common toad found in the reservoir to be destroyed at km 608+930, there is no need to introduce any remedies or corrective actions for this reservoir. The destruction of the reservoir will not affect the size of the common toad population in this area.

  The suggested location of the reservoirs is to be once again verified at the stage of further design works (Building Permit Design).

Operational stage:

- the right-of-way of the S8 expressway should be fenced on both sides, along its entire length to prevent animals from entering the road;
- to protect the migration corridors, bridges for large and medium-sized animals have to be constructed along with underpasses for small animals; these ecoducts should be equipped with concrete shelves covered with soil;
- anti-glare screens have to be installed at all passageways for large and medium-sized animals; the screens should be properly connected with the fence directing animals to the passageway;
- planting greenery specially designed to direct animals to the passageways;
- securing the road against the risk of amphibians entering the road – fencing designed to direct animals;
- applying proper devices preventing contaminants from infiltrating the water (chapter VIII.5.).

Landscape

The landscape of the area of the planned investment is already dominated by a linear infrastructure element (national road No. 8). Therefore, there will be no considerable change to the existing landscape.

The construction stage of the planned investment will be related to:

- transforming the land surface by levelling works;
- removal and physical transformation of soil, removal of the flora (including roadside trees along the existing national road No. 8);
- further fragmentation of forest complexes and patches of forest;
- setting up construction site facilities, works performed with heavy equipment, storing construction materials etc.
- potential construction related waste to be found in the construction site surroundings.

Operational stage

Due to the earlier anthropogenic transformation of the terrain resulting from the construction of national road No. 8, the new investment will not change the landscape in this area.

Properly designed green belts integrated into the landscape will make the roadside more attractive and will function as a natural shield protecting from wind or other weather conditions. The green belts should be 10-15 m wide.

Operational stage

Due to the earlier anthropogenic transformation of the terrain resulting from the construction of national road No. 8, the new investment will not change the landscape in this area.

Properly designed green belts integrated into the landscape will make the roadsides more attractive. The green belts should be 10-15 m wide and consist mainly of native species adapted to the habitat conditions in the analysed region. Moreover, the green belts have a protective function and serve as new environments. These functions result from the effect of trees on other components of the natural environment (climate, soil, water).

Green belts are not recommended in the sections of the expressway where the excavations/embankments are deeper/higher than 3 m. In such cases the greenery would not fulfil its principal functions and would be ineffective.

The estimated locations where the landscaping greenery is to be planted have been presented on the 1:5,000 scale map in Annex No. 5.

The detailed locations of the landscaping greenery will be presented at further stages of the design works (Building Permit Design).

VIII.3. Ground and soil types

The areas adjacent to the designed S8 expressway are agricultural lands. In the chosen variant, the expressway will incorporate a major section of the existing national road No. 8. The planned investment to be implemented in the variant selected will affect soil both at the stage of construction and operation.

Construction stage

The impact of construction works on the soil environment will be short-lasting and temporary (except for the permanent occupancy of a strip of land to be used for road investment and related engineering structures). Complete destruction of soil at the construction stage will be observed in locations newly occupied for the purpose of road investment, the extent of damage will be more extensive in the junction areas and in the areas occupied for the purpose of road drainage system facilities. The farmland area will be reduced as a result of construction works. The total area to be transformed and permanently occupied is approx. 607 ha (212 ha – Task I and 395 ha – Task II).

Operational stage

During the operation of the S8 expressway the risk of soil contamination has to be taken into account. Soil contamination may be caused by stormwater running off the road, dust produced by vehicles moving on the road and chemical agents or salt used in winter maintenance of roads.

The analysis of soil resistance to traffic related contaminants showed that the soils in the area of both tasks have mostly weak resistance properties.

Considering the identified permanent (occupation of the area for the purpose of road construction) and short-term changes to soil, certain protective measures are recommended to minimize the negative impact of the chosen variant of the S8 expressway on the area at the construction and operational stages.

Construction stage

The impact on soil outside the project boundaries during construction is in most cases reversible. Still, the construction stage requires taking certain measures to minimize the impact of the construction process and the impact of material and machine storage sites, namely:

- hardening the ground of the construction site facilities (e.g. Jumbo slabs);
- proper organization of the construction site facilities including construction material storage sites and car parks for employees;
- removal of the humus layer and using it later in land reclamation activities after road completion.

Sewage and waste generated during the construction process should be removed from the construction site and disposed of in accordance with applicable legal provisions and standards.

Operational stage

Minimising the negative impact of the selected variant on soil will consist mainly in limiting the dispersion of contaminants (mainly heavy metals and petroleum derivatives). Reduction of the soil contamination risk related to pollutant runoff will be ensured by the proposed drainage system carrying stormwater away from the road and the water treatment system. In order to limit the concentration of contaminants in stormwater, it is recommended that the road maintenance rules be observed.

The calculations of air pollution dispersion based on the predicted traffic volumes (for 2012 and 2025) do not indicate that there is a risk of exceeding admissible levels in the areas outside the project boundaries, thus they do not show any risk of contaminating soil adjacent to the road.

To minimize the impact of the chosen variant of the S8 expressway on the ground surface and the soil (mainly soils with weak resistance properties), certain protective measures are planned to be taken, similar to those used for the protection of other environmental components, namely:

- landscaping greenery belts (tall and short species) to function also as a natural shield protecting agricultural lands;
- noise protection (acoustic screens);
- facilities preventing contamination of surface and groundwater;
- conservation and preservation of slopes shaped during construction.

VIII.4. Cultural heritage and archaeological sites

In the vicinity of the chosen variant of the No. 8 expressway route (distance: up to 200 m), in both tasks analysed, there are in total 10 sites under protection of the conservation officer (according to the opinion issued by monument protection officials).

There are 9 archaeological excavation sites in the direct surroundings of the road (No. 19, 20, 26, 33 – Task I and No. 11, 34, 35, 36, 38 – Task II). Both in Task I and in Task II the chosen investment variant crosses the areas of two archaeological sites (Task I – No. 19 and 20, Task II – No. 34 and 38).

The permanent cultural heritage site near Szumowo – military cemetery dating back to the First World War is located approx. 50 m from the analysed Task I of the S8 expressway.

The planned investment will affect the historic monuments and sites and the cultural

landscape both at the stage of construction and in operation.

Construction stage

The construction of the road and the implementation of the planned investment will require the performance of earthworks. As a result, the existing archaeological sites may be exposed and uncontrolled earthworks may cause complete or partial destruction of these sites.

Operational stage

At the stage of road operation the negative impact on the cultural heritage has regard mainly to permanent sites of cultural heritage and is mostly related to pollution, dust and vibrations caused by intensive traffic and speed of vehicles. Vibrations caused by traffic may occur within the zone extending up to 20 ÷ 40 m from the road.

Having analysed the location of the permanent cultural heritage site (cemetery) we may assume that the investment in its operational phase will not have a negative impact on this cultural heritage site.

Therefore, most importantly, proper protective measures are necessary at the stage of construction.

Construction stage

The following actions are required to protect the identified established and temporary cultural sites:

- ✓ complementary archaeological investigations and surveys are necessary before starting the implementation of the investment plan;
- ✓ potential archaeological works should be performed by an archaeologist accepted by the Voivodeship Office of Monument Protection, Regional Office in Łomża. Also, the works require a permit issued by this office;
- ✓ archaeological supervision is required in the designated sections during investment implementation;
- ✓ earthworks contractors should pay special attention to the fact that it is possible to encounter archaeological excavation sites. All archaeological finds have to be reported and the site additionally secured.

VIII.5. Soil and water environment

In terms of surface water and groundwater conservation, in the area of the chosen variant of the planned investment, the following environmental conditions are to be taken into account:

- the area analysed in the report, in the chosen investment variant, lies beyond the range of *MGR No. 215 – the Warsaw subbasin* and it does not cross protection zones of groundwater intakes.
- groundwater table occurring in sand formations at the average depth > 1.0 to 5.0 m below ground in both,
- the planned investment, in its chosen variant, crosses the Szumowo – Łętownia Channel (Task I) and the following rivers: the Kołomyja, the Mężynianka, the Śliwówka, the Ślina (Task II),
- in total 8 mineral resources deposits have been found in the area of the chosen variant of investment (they are located at a certain distance from the investment area though),
- groundwater table of water in an unconfined state has been identified within the area of the chosen investment variant – Task I and Task II – with a total length of 13.06 km,
- weak soils have been identified within Task I and Task II, in the chosen variant, along a section of 2,957 m in total.

The construction of roads, along with the related engineering structures, is associated with potential risk of unfavourable impact on the soil and water environment.

Construction stage:

The contaminants generated at the construction works stage are: substances washed from construction material storage sites, leaks of lubricating oil and fuel from vehicles used for transport and from construction machines etc. Considering the risk of contamination, special caution must be observed during the performance of construction works and the required protective measures must be planned in advance to prevent hazardous substances from penetrating the soil and water environment.

At the construction stage, intensified supply of suspensions into the surface water should be anticipated.

Operational stage:

The main contaminants found in the stormwater running off the roads are: overall suspension, petroleum hydrocarbons, heavy metals and chlorides used in winter maintenance counteracting slippery road surface.

Considering the above, the application of protective measures is required to counteract the negative impact of the project on the soil and water environment – both during construction and in operation.

Construction stage

- ✓ portable toilets must be installed at construction sites as a preventive measure against contamination and to minimize the risk of sanitary and industrial sewage spill;
- ✓ construction site facilities and portable toilets must not be installed in the spring area of the Orz River at km ~ 561+073÷564+000 and within the Ślina valley at km ~ 612+000÷613+000;
- ✓ access (service) roads to the construction site should be planned based on the existing network of communication routes;
- ✓ all precautions should be taken during the performance of construction works to prevent and counteract the penetration of petroleum related substances to the soil;
- ✓ due to the temporary occurrence of intensified supply of suspensions to the surface water it is recommended to reinforce the embankments and ditch slopes by sowing grass (or sodding) as soon as they are completed in order to limit surface erosion and thus reduce the supply of sand and suspensions;

Operational stage

- ✓ the stormwater run-offs from the road should be designed in alignment with the surface level of roadside ditches or as sections of stormwater system (road bends, engineering structures);
- ✓ grass-covered road ditches are recommended as one of the measures to protect the soil and water environment; the grass-covered ditches will fulfil the sediment settlement and retention function;
- ✓ in order to protect the soil and water environment, in places where the depth of the

groundwater table in sand formations is < 5 m below ground level, it is recommended to use geotextile. The sections to be protected with geotextile are presented in the table below, the sections have been selected on the basis of the archived test data and the prepared geotechnical documentation; GEOTECH, October 2007.

Table 1. Road sections to be protected with geotextile.

***Task I* [km]**	***Task II* [km]**
562+500÷564+950 566+500÷567+460 570+650÷570+950 571+700÷572+850 574+200÷574+490	586+420÷587+200 588+750÷589+060 597+350÷597+600 602+720÷604+350 608+700÷609+350 612+100÷613+500
5.1 km	5.02 km

- ✓ the need of properly selected stormwater pre-treatment facilities (sedimentation wells) should be taken into account, such facilities together with devices designed to protect against the consequences of a major fault (a gate closing the outflow of potential contaminants) should be installed before stormwater is drained to the Ślina River;
- ✓ should it be impossible to drain treated stormwater directly to the receiving reservoirs (no watercourses), the application of ecological reservoirs is considered;
- ✓ stormwater sewage from roadside facilities (Passenger Service Point) should be collected by a stormwater sewage system and treated in special devices (sedimentation wells and separators of oil-related substances); Application of purifying tanks is not excluded. In discharging sanitary sewage from a Passenger Service Point one of the following solutions is to be applied:
  - sewage disposal to tight holding tanks located at Passenger Service Points and then to the nearest treatment plant;
  - sewage drained to the road drainage system passing through the pre-treatment system: sedimentation well (sand trap) + separator of oil-related substances or mini biological treatment plant;
  - discharge of sewage to the local sanitary sewage system under conditions specified by the administrator of this network.

VIII.6. Aerosanitary condition

During the performance of building works related to the construction of the S8 expressway in the sections from the Masovian Voivodeship border to Zambrów and from the Wiśniewo ring road to Jeżewo random emission of gas and dust pollution will be observed. The pollution will be generated mostly by working engines of vehicles and construction machines, demolition works and earthworks as well as transporting and unloading construction materials and laying bituminous pavement on the road. The emissions will be temporary and short-term and their effects will be reversible – vanishing upon completion of construction works.

As the Voivodeship Inspectorate of Environmental Protection in Białystok informed, the concentration of nitrogen dioxide in the area of the poviats located near the route of the planned section of the expressway is at an average level. The reported level represents from 23% up to as much as 52.5% of the admissible level for this substance.

In order to determine the impact of the S8 expressway operation on the air condition, calculations of the dispersion of gas pollution emitted from the road have been conducted for nitrogen dioxide, sulphur dioxide, carbon monoxide and aromatic and aliphatic hydrocarbons. The data used in calculations included: designed cross section of the road, predicted traffic volumes on individual sections between junctions for 2012 and 2025, information on land development in the surroundings of the road and the most up-to-date emission indicators reflecting current knowledge on pollution emissions.

The results of these calculations indicate that the reference values will be exceeded (with the existing background taken into account) in the case of nitrogen dioxide only in 2012 and within the maximum distance of 6 m from the carriageway border. The reference values are not expected to be exceeded in 2025. The admissible limits will not be exceeded for any of the remaining pollutants analysed, either in 2012 or in 2025.

The experience of the authors of the Report shows that traffic volumes on road related infrastructure such as: Passenger Service Points are much lower than on the expressway itself. Moreover, the additional emission sources (car parks, petrol stations, garages) are not significant in this regard. Therefore, the impact of such road infrastructure will not contribute considerably to the overall impact of the S8 expressway.

Despite the fact that no considerable negative impact of the S8 expressway on the air condition was identified, to be cautious it is recommended for the works contractor to ensure – at the construction stage – that the technology of demolition and building works cause as little harm to the air as possible, that only efficient equipment in good working order is used, taking care of proper operation and maintenance of such equipment, that the transported construction materials and the ground surface be secured against dust production.

Advanced technical parameters of the road provided in the design will ensure the proper flow and speed of traffic – which are two of the main factors determining the range of road impact during its operation.

The analysed section of the S8 expressway will include landscaping greenery to create a biotechnical barrier along the road which will additionally reduce the dispersion of pollutants emitted by vehicles moving on the road – this regards mostly dust and aerosol pollution retained on plant leaves. This way the greenery will have an additional significant effect on the improvement of the aerosanitary condition in the surroundings of the expressway.

The aerosanitary condition may be improved also thanks to the construction of acoustic screens (noise protection of protected built-up areas), which will function as a biotechnical barrier. At the moment it is impossible to determine the effectiveness of the presented protective facilities in precise numbers. The assessment of their effectiveness is based only on commonly known physical and chemical phenomena.

VIII.7. Acoustic climate of the area

Construction and demolition works necessary to be performed in relation to the construction of the S8 expressway may have a temporary and short-term acoustic impact caused by the work of heavy construction equipment and by passing vehicles transporting materials and raw materials.

Due to the fact that there built-up residential areas and estates in the surroundings of the analysed section of the S8 expressway – mostly one- and two-storey buildings – it was necessary to determine the impact of traffic noise on these protected buildings. Therefore, having taken into account the landscape, the predicted traffic volumes in 2012 and 2025 and the location of residential estates,

the dispersion of traffic noise in the environment was calculated. The calculated ranges of noise impact go beyond the boundaries of the designed road.

The predicted ranges of noise impact in 2012 and 2025 in relation to the applied admissible limits marked by isoline – L_{AeqD} = 60 dB during daytime and – L_{AeqN} = 50 dB at night have been presented in graphic form.

At the current stage of impact assessment activities, no detailed calculations were conducted for the impact range of noise emitted from the expressway related infrastructure such as Passenger Service Points. Still, the above-standard noise impact in the case of such infrastructure will not exceed the environment quality standards with regard to noise protection on the border of the Investor's land ownership i.e. on the border of the road's boundary lines.

For protected (residential) built-up areas located within the range of the isoline marking the admissible noise level at night (year 2025) the possibility of introducing noise protection, namely acoustic screens (artificial panels or earth banks), was analysed. The construction of a total length of 10,000 m of acoustic screens is planned in the following locations on the road:

No.	Chainage [km]	Side	Length [m]	Height [m]
	Task I			
1	566+465÷566+665	right	200	4
2	566+795÷567+285	left	490	5
3	568+230÷568+800	right	570	4
4	569+640÷569+840	right	200	4
5	571+070÷571+270	left	200	4
6	571+610÷571+910	right	300	4
7	572+550÷572+740	right	190	4
8	572+610÷572+800	left	190	4
9	574+030÷574+230	left	200	4
10	574+160÷574+360	right	200	4
11	574+550÷574+830	right	280	4
Total			**3,020 m**	
	Task II			
12	588+400÷588+900	right	500	
13	590+900÷591+290	right	390	4
14	591+520÷591+800	right	280	4
15	593+970÷594+595	left	625	4
16	595+080÷595+540	right	460	4
17	596+845÷597+035	left	190	5
18	602+520÷602+600 602+590÷602+660	left	150	4
19	602+560÷602+960	right	400	4
20	603+215÷603+850	left	635	4
21	604+250÷604+745	right	495	5/4
22	604+490÷604+780	left	290	4
23	606+190÷606+440	right	250	4
24	607+095÷607+450	left	355	4
25	608+390÷608+995	right	605	4
26	610+200÷610+590	right	390	4
27	610+500÷610+900	left	400	4
28	614+980÷615+250	left	270	4
29	615+520÷615+815	left	295	4
Total			**6,980 m**	

Moreover, the green belts whose principal function is to integrate the road into the existing landscape will have an effect on reducing traffic noise emission into the environment by increasing the sound absorption coefficient in the environment and creating a natural barrier shielding from the source of noise.

Graphic Annex No. 5 (*6.3 and 6.6 in the EIR*) shows the impact range of traffic noise in the selected variants in both tasks, including acoustic screens.

VIII.8. Impact on human life and health

Surface water contamination, air pollution emission and elevated noise levels in the environment are the factors that determine the health and life quality of the residents of the areas adjacent to the S8 expressway. The conducted analyses indicate that protective measures should be applied on built-up, residential areas and estates. Noise protection in the form of acoustic screens is proposed. Nitrogen dioxide is the pollutant emitted by moving motor vehicles that has the most far-reaching impact in terms of the distance from the source of emission where admissible level is still exceeded. The calculations made on the basis of the predicted traffic volumes showed no elevated, above-limit concentrations either for nitrogen dioxide or for any other of the analysed pollutants. Thus, no impact is expected on human health and life with respect to pollution. With regard to water and sewage management and protection of natural water resources in the area of the planned investment, there will be no risk to human health during normal operation of the road.

VIII.9. Waste management

The construction and operation of the S8 expressway in the section from the Masovian Voivodeship border to Zambrów and from the Wiśniewo ring road to Jeżewo will produce certain types of waste characteristic of road construction projects, both hazardous and non-hazardous. The precise amount of waste, classified according to the waste catalogue, is not possible to be estimated at this stage of the design.

At the construction stage, waste will be produced as a result of various demolition works required to be performed. Produced waste will mostly belong to group 17 i.e. waste produced in the course of construction, reconstruction, repair and dismantling of building structures and road infrastructure. It is expected that demolition works may produce some waste containing asbestos. Disposal of such waste should be commissioned to a specialized contractor holding a permit to pursue this kind of activity. Also, waste will be produced in relation to the presence of employees working at site (mainly municipal waste classified under group 20 03).

The amounts of some groups of demolition related waste have been estimated on the basis of survey data:

- Structural materials containing asbestos – 32 Mg/year
- Waste related to construction, renovation and dismantling of materials containing PCB – 2 Mg/year
- Transformers and capacitors containing PCB – 1 Mg/year
- Asphalt – 152,635 Mg/year

- Concrete waste and concrete rubble from disassembly and renovation works – 6,995 Mg/year

- Crushed brick – 3,350 Mg/year
- Wood – 2,163 Mg/year
- Glass – 5 Mg/year

During road operation there will be waste produced as a result of pre-treatment of runoff water and winter road maintenance.

- Oil and liquid fuel waste – 45 Mg/year
- Oil/water separator contents – 150 Mg/year.

Another source of waste will be the expressway related infrastructure i.e. Passenger Service Points. Municipal-like waste will be mostly produced there (classified under group 20 01 – selective waste collection and 20 03 – mixed municipal waste, sludge from holding tanks) related to the temporary presence of passengers and service crews. Other types of waste may be: packages, used motor oil, sediments from washing stands and separators, worn out parts, accumulators, tyres and scrap.

Waste management should be in line with applicable legal provisions i.e. the Act on Waste (Journal of Laws No. 62, item 628 of 20 June 2001 as amended), the Ordinance of the Minister of the Environment of 21 March 2006 on waste recovery or neutralization outside installations and appliances (Journal of Laws No. 49, item 356 of 27 March 2006), the Ordinance of the Minister of the Environment of 21 April 2006 on the list of waste types which can be transferred by the holder to natural persons or organizational units, which are not entrepreneurs, and permissible methods of their recovery (Journal of Laws No. 62, item 628 as amended), the Ordinance of the Minister of Economy and Labour on occupational health and safety in the containment and disposal of asbestos-containing products and a training scheme on the safe use of such products (Journal of Laws No. 216, 2005, item 1824).

VIII.10. Major fault risk

The designed S8 expressway may be used as a transport route by vehicles carrying hazardous cargo, which creates a risk of a major fault or breakdown. Despite the fact that such incidents are rare, one should be prepared to deal with them. The incidents that may take place on the expressway are as follows: accidents involving tankers, loss of tightness of the packaging of the transported goods, explosions, fires and car accidents. Places that are especially exposed to the effects of a road disaster are highly hydrated areas where contamination of groundwater or surface water should be expected. Bridges are the places where the risk of contamination is the greatest.

The most important factors that may significantly minimize the risk of a major fault in the environment in relation to road transport are: proper road route layout and elevation above the surrounding area, use of modern types of pavement and grade-separated road junctions included in the design.

The transport of hazardous cargo is regulated under international law in the ADR agreement as well as under Polish law. In order to keep the expressway passable in the event of a major fault or repair works, emergency passages have to be executed allowing the closure of one carriageway and directing the traffic to the other carriageway where two-way traffic will be temporarily introduced. Additionally, there will be entrance roads to allow rescue services to enter the road. Such entrances will be equipped with a locked gate available to be used only by authorized services.

The most important things in the event of a risk occurring in relation to the transport of hazardous cargo by road are: proper organization of rescue operations, rescue teams' ability to respond promptly and the preparation of applicable plans and procedures.

VIII.11. Cross-border impact

The analysis of the expected impact on the environment indicates that the construction and operation of the S8 expressway in both tasks discussed herein will not cause any trans-border impact on the environment.

VIII.12. Reconstructing conflicting devices of the technical infrastructure

The impact of technical infrastructure on the environment in the phase of its reconstruction and failure-free operation will not be considerable – all changes and disruptions observed in the environment will be local and temporary.

The route of the S8 expressway, in the suggested variant, crosses power lines and a high pressure pipeline and collides with the route of water supply network. Environmental impact will be observed during potentially required reconstruction and it will be temporary. No negative impact of power lines on the buildings located nearby is expected in the operation phase. Similarly, no negative impact of the high pressure pipeline on the environment is expected during its failure-free operation.

The principal remedial measure to limit the harmful impact of a fault or failure on the environment or human health is to reduce the probability of such fault. This means designing a system of maximum durability achieved e.g. through proper structural properties and tightness of pipes, high quality materials and devices, appropriate safety and durability parameters of pipeline components and the possibility to close the pipeline immediately in the event of failure.

VIII.13. Scope of post-implementation review and environmental condition monitoring

Post-implementation review and environment monitoring are included in the group of environmental documents applicable to roads and road infrastructure. They are a tool allowing the applied environmental protection measures to be controlled.

Post-implementation review of the discussed tasks is required to compare the implementation of recommendations described in the Environmental Impact Report with the actual impact of the investment and the actions taken to minimize the investment's environmental impact (pursuant to Article 135 (5) of the Environmental Protection Law) as regards:

- <u>traffic noise in the following measurement locations:</u>
  - in places where acoustic screens were proposed in order to check their effectiveness – km 568+450 right side, km 571+200 left side, km 594+200 left side, km 603+500 left side.
  - single homesteads (not protected with acoustic screens) – km 569+200 left side and km 599+190 left side

The locations specified above may be also used as principal measurement points (intersections) to be monitored with regard to noise protection.

- <u>testing the amount and the quality of treated stormwater drained to the Ślina River.</u>

Tests of the amount of contaminants (overall suspensions and petroleum hydrocarbons) in a designated point are to be made twice (e.g. with high water level, after the spring thaw (May) and with low water level e.g. August – September) during 18 months after the expressway is put into operation. The aim of the tests is to verify the effectiveness of the measures applied.

Additionally, the monitoring activities are planned to encompass the passageways for animals (ecoducts) in order to provide data on the actual use of these passageways by animals.

VIII.14. Limited use area

The predictive analysis of risks related to the impact of the designed S8 expressway on individual components of the environment showed that only in the case of traffic noise emission may the admissible levels be exceeded beyond the road boundaries (a strip of land owned by the Investor) and on the border of residential areas and estates (protected areas).

As the applied protective measures, namely acoustic screens, may fail to maintain the required environment quality standard on the border of protected areas, it is necessary to designate a limited use area.

Such decision should be taken after noise measurements are made in selected locations in the framework of the post-implementation review. If the actions taken and the protective measures applied after these measurements fail to ensure that the acoustic standards required for this area are met, a limited use area should be designated.

VIII.15. Analysis of possible social conflicts

Each linear project consisting in the construction of roads and related infrastructure may trigger social conflicts. These may represent conflicts related to the division of real estate, purchase price, security with regard to the road's impact on human life and health and on the environment, technical conditions of road construction and access to land.

If the investment is not implemented, increased traffic volume and heavy cargo in transit on the existing road may lead to protests by residents of the areas adjacent to the existing road. As a consequence, the road may be blocked, which would trigger protests of road carriers facing disruptions or no possibility to pass through.

Upon submission of this Environmental Impact Report the procedure related to the assessment of the project's environmental impact with participation of the community will be started. This will be the stage when requests, comments and objections of the engaged parties will be issued.

IX. ANNEXES

No. 1 General plan.

(1.1. in EIR) General plan with the location of archaeological excavation sites in a 1:25,000 scale (3 sheets).

No. 2 Natural environment.

(2.1. in EIR) Natura 2000 sites and ecological corridors (FPP Consulting) in a 1:90,000 scale (1 sheet);

(2.2. in EIR) Protected natural areas in a 1:50,000 scale (2 sheets);

(2.3. in EIR) Natural habitats, species of fauna and flora and passageways for animals in Task I in a 1:5,000 scale (2 sheets);

(2.4. in EIR) Natural habitats, species of fauna and flora and passageways for animals in Task II in a 1:5,000 scale (5 sheets);

(2.5. in EIR) Photo documentation.

No. 3 Geology and hydrogeology.

(3.1. in EIR) Geological and hydrogeological conditions. Map in a 1: 25,000 scale (2 sheets).

No. 4 Soil type and agricultural maps in a 1:25,000 scale.

(4. in EIR) Soil type and agricultural maps in a 1:25,000 scale (Task I – 1 sheet, Task II – 2 sheets);

No. 5 Noise.

(6.1. in EIR) Noise impact range. Task I Variant 1, map in a 1:5,000 scale (sheet 1÷2);

(6.2. in EIR) Noise impact range. Task I Variant 2, map in a 1:5,000 scale (sheet 2);

(6.3. in EIR) Noise impact range with acoustic screens. Task I Variant 2, map in a 1:5,000 scale (sheet 1÷2);

(6.4. in EIR) Noise impact range with acoustic screens and green belts – Task I Variant 2, map in a 1:5,000 scale (sheet 2);

(6.5. in EIR) Noise impact range. Task II Variant 1, map in a 1:5,000 scale (sheet 1÷5);

(6.6. in EIR) Noise impact range. Task II Variant 2, map in a 1:5,000 scale (sheets 3 and 5);

(6.7. in EIR) Noise impact range with acoustic screens – Task II Variant 2, map in 1:5,000 scale (sheet 1÷5);

(6.8. in EIR) Noise impact range with acoustic screens and green belts – Task II Variant 1, map in a 1:5,000 scale (sheets 3 and 5);

(*6.9. in EIR*) Range of traffic noise from national road No. 8 in the area of Ostrożne – zero variant, map in a 1:5,000 scale (1 sheet)

(*6.10. in EIR*) Range of traffic noise from national road No. 8 in the area of Ostrożne – variant chosen for implementation, map in a 1:5,000 scale (1 sheet)

(*6.11. in EIR*) Range of traffic noise from national road No. 8 in the area of Mężenin – zero variant, map in a 1:5,000 scale (1 sheet)

(*6.12. in EIR*) Range of traffic noise from national road No. 8 in the area of Mężenin – variant chosen for implementation, map in a 1:5,000 scale (1 sheet)