ENVIRONMENTAL IMPACT REPORT CONCERNING THE PROJECT OF MODERNISATION OF RAILWAY LINE NO. 8

STAGE II: SECTION WARSAW OKĘCIE – RADOM – KIELCE WITHIN THE MASOVIAN VOIVODESHIP BORDERS

NON-SPECIALIST SUMMARY

1. FORMAL AND LEGAL FOUNDATIONS

The formal and legal basis of this summary constitutes the order by PKP Polskie Linie Kolejowe S.A. consortium **Scetauroute S.A. Branch in Poland,** Cybernetyki Street, 02-677 Warsaw / Nexel Polska Sp. z o.o., 7 Cybernetyki Street, 02-677 Warsaw, of developing pre-project documentation for the project titled "Modernisation of railway line no. 8, stage II: section Warsaw Okęcie – Radom – Kielce", *Project* **SPOT/1.1.1/162/05,** within the framework of which one executed **Environmental impact report concerning the project of modernisation of railway line no. 8, stage II: section Warsaw Okęcie – Radom – Kielce within the borders of the Masovian Voivodeship** (for the purposes of: decision on environmental considerations, feasibility study, request for funding from ERDF/Cohesion Fund).

2. OBJECTIVE AND SCOPE OF THE STUDY. ADOPTED VARIANT

On 28 July 2005, the Act of 18 May 2005 on *amending the Environmental Protection Act and some other acts* (Journal of Laws No. 113, item 954), regulating the proceedings on environmental impact assessment – provision of the section VI of the Environmental Protection Act came into force and caused the need of repeated commencement of preparing the EIA report.

On 4 July 2006, the Announcement of the Marshal of the Sejm of the Republic of Poland *on announcement of the consolidated Environmental Protection Act* (Journal of Laws No. 129, item 902).

Pursuant to § 3 sec. 1, item 54 of the Ordinance of the Council of Ministers of 9 November 2004 *on determining the kinds of project that may have a considerable impact on the environment and on the detailed conditions related to qualifying the project for drawing up an environmental impact report* (Journal of Laws No. 257, item 2573 as amended), the planned modernisation of railway line no. 8 has been qualified as an investment that can have significant impact on the environment, and thus the environmental impact report may be required.

In order to prepare the environmental impact report, it is necessary to define environmental and spatial results of the modernisation (rebuilding) of railway line no. 8, both at the stage of execution of investment works and at the stage of railway line operation. Also, it is necessary to present environmental impact of the investment within the scope defined in detail in Article 52, section 1 of the Environmental Protection Act. The main purpose of this investment is adjustment of the section in question of railway line no. 8 to the parameters defined in AGG and AGTC contracts interoperability

requirements[1] with simultaneous:

- promotion of more sustainable and less environmentally harmful forms of transport in order to reduce greenhouse gas emission;
- consolidation of the trend to replace road traffic with rail traffic;
- encouragement to use rail transport and combined transport;
- better and safer rail traffic management through the application of new technologies – such as e.g. the European Rail Traffic Management System ERTMS/ECTS and ERTMS/GSM-R.

Validity of the modernisation of railway line no. 8 Warsaw – Kielce results from the necessity to reduce travel time, improve the quality of the rail transport offer, as well as improve the natural environment condition along the railway line and parallel national road no. 7.

3. MATERIALS USED IN THE STUDY

This report has been drawn up by a team of experts from the list of the Masovian Voivode based on the *Feasibility Study of the Modernisation of Railway line no. 8 on the Section Warsaw – Radom – Kielce, Stage II,* Scetauroute, November 2006 and materials, arrangements, opinions, geotechnical research and conducted field inspections.

This study quotes valid acts of Polish and EU law standardising issues related directly or indirectly to environmental protection (prepared Environmental Impact Report of 2006 includes their detailed list). Moreover, reports, documentation, professional and other instructions (both published and not published) as well as numerous topographic and thematic maps (mostly geological, hydrogeological and hydrographical) and monitoring data, mostly with regard to the quality of surface water and groundwater were used.

Interesting data came also from the survey sent to selected forestry managements and hunting circles concerning i.e. distribution of wildlife refuges and the course of local migratory routes of animals, as well as sites of railway accidents with animals, the condition and changes of number of wildlife in the vicinity of the discussed line.

[1] rail interoperability – ability of trans-European high-speed rail system and conventional rail system to safe and non-violated rail traffic on the territory of European Union Member States.

4. DESCRIPTION OF THE PLANNED PROJECT

Railway line no. 8 is a primary line with national significance. It does not constitute trans-European corridors, it is not included in AGC and AGTC agreements, nor does it belong to the TEN network. The section Warsaw Okęcie – Radom – Kielce constitutes the so-called Świętokrzyska Main Line connecting these agglomerations. It is a single-track railway line on the section Warka – Radom (46.5 km); while on other sections (129.1 km), it is a dual-track line.

The current technical condition of the infrastructure and geometrical condition of the railway line Warsaw – Radom – Kielce does not enable speed in excess of 120 km/h.

At Stage I, four basic options of the modernisation (0, 1, 2 and 3) have been analysed according to the Terms of Reference:

Table 4.1.
Modernisation variants concerning the railway line Warsaw Okęcie – Kielce (analysed in the multicriteria assessment)

OPTION	VARIANT	VARIANT CHARACTERISTICS
OPTION 0	**VARIANT 0**	Option **"Not to do anything"**
OPTION 1	**VARIANT 1**	**Railway line revitalisation –** speed 100 km/h on the whole length
OPTION 2	**VARIANT 2a**	Modernisation of the line and its **adjustment on the whole length to the speed of 140 km/h** (assuming that the second track on the section Warka – Radom is not constructed, as well as a new bridge over the Pilica River)

	VARIANT 2b	Railway line modernisation and its adjustment on the section **Warsaw Okęcie – Radom to the speed of 140 km/h, while Radom – Kielce to 100 km/h** (assuming that the second track on the section Warka – Radom is not constructed, as well as a new bridge over the Pilica River)
	VARIANT 2c	Railway line modernisation and its adjustment on the section **Warsaw Okęcie – Radom to the speed of 140 km/h, while Radom – Kielce to 100 km/h** (assuming that the second track on the section Warka – Radom is constructed and the existing bridge over the Pilica River is modernised)
	VARIANT 2d	Railway line modernisation and its adjustment on the section **Warsaw Okęcie – Radom to the speed of 140 km/h, while Radom – Kielce to 100 km/h** (assuming that the second track on the section Warka – Radom is constructed, as well as a new bridge over the Pilica River)
	VARIANT 2e	Modernisation of the line and adjustment on the section **Warszawa Okęcie – Radom – Kielce to the speed of 140 km/h** (assuming that the second track on the section Warka – Radom is constructed, as well as a new bridge over the Pilica River)
OPTION 3	**VARIANT 3a**	Railway line modernisation and its adjustment on the section **Warsaw Okęcie – Radom – Kielce to the speed of 160 km/h** (assuming that the second track on the section Warka – Radom is constructed, as well as a new bridge over the Pilica River)

	VARIANT 3b	Railway line modernisation and its adjustment on the section **Warsaw Okęcie – Radom to the speed of 160 km/h, while Radom – Kielce to 100 km/h** (assuming that the second track on the section Warka – Radom is constructed, as well as a new bridge over the Pilica River)
	VARIANT 3c	Railway line modernisation and its adjustment on the section **Warsaw Okęcie – Radom to the speed of 160 km/h, while Radom – Kielce to 140 km/h** (assuming that the second track on the section Warka – Radom is constructed, as well as a new bridge over the Pilica River)

According to the assumption of Stage I Report, based on conducted technical, financial, socio-economic and environmental protection analyses, the Consultant indicated variant 3b as the preferred scope of modernisation of the railway line in question, considering also amendments in the National Transport Policy concerning line no. 8. After verification, the Contracting Authority chose that variant for further study works as the most beneficial, with the assumption of thorough analysis of the section Radom – Kielce to obtain the possibility to increase the speed above 100 km/h and rebuild the bridge on the Pilica River in the aspect of present considerations.

Adjustment of the railway line to the above-mentioned parameters requires rebuilding of rail structure elements, in particular route geometry correction, rebuilding of the subgrade and track surface, contact line and power supply system, rail traffic management equipment, present engineering structures, buildings related to rail traffic and platforms, as well as construction of viaducts, tunnels, by-pass roads, contact substations, power supply lines, fibre-optical lines and environmental protection equipment.

5. CHARACTERISTICS OF THE NATURAL ENVIRONMENT IN THE VICINITY OF RAILWAY LINE NO. 8

Within the borders of Masovian Voivodeship, railway line no. 8 Warsaw – Kielce runs generally from north to south through the following poviats: Capital City of Warsaw,

Piaseczno (communes: Lesznowola, Piaseczno and Prażmów), Grójec Poviat (communes: Chynów, Warka), Kozienice (Grabów nad Pilicą Commune), Białobrzegi (Stromiec Commune), Radom (communes: Jedlińsk, Jastrzębia, Kowala and Wierzbica), city of Radom and Szydłowiec (communes: Jastrząb and Szydłowiec).

According to the physiographic division of Poland proposed by J. Kondracki, the discussed area is located on the territory of two districts: the North European Plain and the Polish Uplands. Within the framework of the first one, the sub-district of the Middle Polish Plain divided into the Masovian Lowland (mesoregion Warsaw Plain and Kozienice Plain) and macroregion Wzniesienia Południowomazowieckie (mesoregion Radom Plain). On the area of the Polish Uplands, the discussed area is located within the borders of the sub-district Small Poland Upland and the macroregion Kielce Upland (mesoregion Iłża Foothills).

The discussed area is characterised by quite monotonous terrain in the northern part (Middle Polish Plain) and more diversified in the southern part (Kielce Upland). The main factors forming the terrain of the Middle Polish Plan included glacial and fluvioglacial accumulation, and then denudative processes. These plains have no lakes and they are made of till, sand and periglacial covers. Here, terrain formed as a result of denudative, fluvial and wind processes dominates, thus strongly transformed denudative plains, terraces and dunes.

Below Radom, railway line no. 8 crosses the terrain of the Iłża Foothills belonging to the macroregion of the Kielce Upland. Its terrain results from denudative factors forming outcrops of Mesozoic rocks showing various level of erosive resistance. Here, sandstone Lower and Middle Jurassic formations, as well as Upper Jurassic limes surrounded by diverse quaternary alluvium, dominate. They create low monocline slopes extending from northwest to southeast. Sands and clays lie on depressions among bed rock outcrops.

The Masovian section of railway line no. 8 is located within the border of three hydrogeological regions: Southern Masovian, Lublin-Radom and Świętokrzyski. In the Southern Masovian region, three water-bearing rock layers occur in the vicinity of the modernised line: Late Cretaceous-Palaeocene, tertiary and quaternary. In the Lublin-Radom region, there are two water-bearing rock layers: Cretaceous and quaternary, while on the course of the line through the Świętokrzyski region three water-bearing rock layers are present: Jurassic, Triassic and Devonian (also, a quaternary layer is exploited secondarily). The discussed railway line crosses 6 main groundwater

reservoirs (GZWP).

The area included in the study belongs to the Vistula River basin. Its area includes second-grade drainage basins of the following rivers: Jeziorka (with Czarna), Pilica and Radomka. The Pilica is a main watercourse crossed by the discussed line within the borders of the Masovian Voivodeship. It flows in a wide valley from southwest to northeast. Regardless of the river network, the discussed area includes water reservoirs of various origin, numerous wetlands and drainage ditches. The biggest set of fish ponds in the Masovian Voivodeship is located between Piaseczno and Zalesie Górne, at the mouths of the Czarna River to the Jeziorka River.

According to the division of Poland into climatic regions proposed by W. Okołowicz (1979), the area of the Middle Masovian Plains (northern part of the study) is located in the Masovian and Podlasie region. This region is characterised by a relatively low level of rainfall and big temperature fluctuations within the year. Average annual temperature falls into the range of 8.2°C to 7.8°C. Average annual summer temperature is 18°C in July, while winter temperature is -3°C in January. Temperature amplitude is high and equal to 22–23°C. Average annual rainfall totals fall into the range of 415–600 mm, while summer rainfall dominates. In the described region, westerly, south-westerly and north-westerly winds prevail, with the domination of westerly winds (45%).

The area of Wzniesienia Południowomazowieckie (southern part of the study) is located within the scope of the Łódź and Wieluń climatic region. This region is characterised by relatively low rainfall. Average annual totals come to 550–600 mm, while average rainfall totals concerning the winter six months are equal to 200–250 mm and summer six months – 350–450 mm. Average annual air temperature oscillates within the range of 7.5–8.0°C, while the average of winter six months is 0.5–1.0°C and summer six months 14.5°C.

In the strip adjacent to the Masovian section of railway line no. 8, in general three basic soil types can be distinguished: brown soil, fallow soil, river alluvial soils and soils of the initial development phase, In addition, there are also anthropogenic soils related to human operations – worked land, etc. Along railway line no. 8, average land of IVa and IVb valuation class dominate, with a significant ratio of poor and very poor soils – of V and VI class. The ratio of good land is poor and actually limited to soils of IIIa and IIIb class.

Coniferous forest habitats with the domination of pine, birch and oak prevail in woods near the discussed railway line. In the past, under fertile clay and sand-clay soils,

forests growing on dry ground dominated (mixed forests with common oak, small-leaved lime sometimes with spruce and Norway maple), currently replaced mostly with farmlands. River valleys and terraces include shrubbery and riparian forests (mainly osier-poplar and ash wood-alder). High water state is related to alder woods.
Forest share in the general area of Masovian Voivodeship communes, through which railway line no. 8 runs, comes to approx. 18%. Thus, in relation to the Polish average the forestation ratio of approx. 29%, the average forestation ratio of areas along the line is 11% less.

The extent of the described area, its changeable geological and geomorphological structure, great diversification and floral richness make also present fauna distinguished with specific features. The area included in the study is characterised by the presence of rich fauna typical for both forest areas and the transitional buffer zone of fields and forests of Middle Poland.

Among mammals in the discussed area, approx. 30 species have been noted. Apart from common species of predators such as fox, badger and common marten, one should draw attention to beaver and otter living in clean surface water. Among game animals, one should mention numerous roe deer and boar, as well as less numerous deer, fallow deer and elk. Among birds, here live representatives of both endangered species and common species. It is enough to mention, inter alia, black stork, Eurasian crane, black grouse and others. Local waters are a habitat of approx. a dozen fish species. On the whole territory, several species of amphibians and reptiles, including mud turtle, can be seen.

Railway line no. 8 within the borders of the Masovian Voivodeship, basically omitting areas with the strictest protective rigours runs in the vicinity of 1 natural reserve – “Starodrzew Sobieszyński”, 2 landscape parks (Chojnów and Kozienice) and 3 protected landscape areas (Jeziorka River Valley, Pilica and Drzewiczka River Valley, Przysusko-Szydłowieckie Forests). In addition, the described line runs through two Natura 2000 areas. PLB140003 Pilica Valley and PLH140016 Dolna Pilica Valley, as well as it runs in the vicinity of other areas: PLB140013 Kozienice Wildlife Sanctuary and PLH 40013 Kozienice Forest.

6. UTILISATION STRUCTURE OF GROUNDS ALONG THE RAILWAY LINE NO. 8

The discussed railway line connects the economically prevailing Warsaw region with the strong Świętokrzyski region (Skarżysko-Kamienna – Kielce). Along the route,

several towns are located constituting regional and local economic centres – in the Masovian Voivodeship it is mainly Warka and Radom.

In general, it may be assumed that section of railway line no. 8 within the Masovian Voivodeship borders runs through areas with the domination of agricultural land – except Grabów nad Pilicą Commune. Such a utilisation structure is related to the presence of good soils and favourable agroclimatic conditions for fruit-growing.

The analysis of the distribution of plots of land, ownership structure and distribution of settlement units does not indicate negative effect of a barrier constituted by the discussed railway line in relation to them. The division of towns no longer constitutes a big problem, because it has been forming during long period of the line's operation.

7. RAILWAY LINE NO. 8 AGAINST LOCAL PLANS

Within the Masovian Voivodeship borders, 8 out of the 15 communes crossed by the discussed railway line do not have local plans passed for areas adjacent to the tracks. Five communes have valid local plans for a part of areas up to 1 kilometre from the tracks, while two communes have plans for the whole area along the railway line.

Local plans include the area in the vicinity of approx. 32 kilometres of modernised railway line section (this is approx. 25% length of the line within the Masovian Voivodeship borders). Housing is the prevailing form of land development foreseen in local plans. A significant part of areas in the vicinity of the railway line is dedicated also for service, agricultural or forest land.

8. IMPACT OF THE RAILWAY LINE NO. 8 ON GROUNDWATER

Within the Masovian Voivodeship borders, railway line no. 8 runs through areas with different stages of risk for the main level of groundwater. It is located within the reach of six main groundwater reservoirs (GZWP), while only tertiary reservoirs no. 215A and 215 are well-insulated against influences from the surface. Other reservoirs have no insulation or poor insulation.

The type of protection applied on the line should be adjusted to local water and soil conditions, including especially to the lithological formation of surface forms and depth of groundwater presence. Particular attention should be drawn to objects located in places with very high or high level of risk for useful aquifer, including groundwater intakes together with their resource areas and areas within GZWP borders.

In order to protect water and soil against pollution related to line modernisation, one

should ensure that interference with the surface of the ground is the least possible, as well as that construction works and their facilities are properly prepared and executed. Equipment and means of transport should be in good running condition during the construction, while their operation should be consistent with manuals.

On the discussed area, groundwater constitutes the main source of supplying people, agriculture and industry with water. Therefore, the surroundings of water intakes close to the railway line should have subgrade insulated against the infiltration of polluted water to utility levels. One should also regulate water and wastewater management in cubature objects within the scope of modernisation.

With the performance of works related with the planned project according to the applicable provisions and standards, with operational equipment and according to the protection rules presented above, the planned works will not have a considerable impact on water and soil and will not cause significant changes. Similarly, at the stage of normal reliable operation and after previous execution of foreseen protections, impact of railway line no. 8 on groundwater environment should not be significant.

It should be emphasised that initially hydrographical conditions on adjacent areas will not be subject to significant changes in the case of resigning from planned line modernisation. However, due to progressive infrastructure depreciation and as time goes on, one should consider the increased risk to the water environment caused by the railway, i.e. as a result of increasing probability of occurrence of events showing features of a serious failure with participation of trains transporting hazardous substances.

9. IMPACT OF RAILWAY LINE NO. 8 ON SURFACE WATER

Intensity of the railway line's impact on surface water during its modernisation and operation depends, inter alia, on the sensitivity of the water environment concerning pollution and change in water conditions. In the vicinity of the Masovian section of railway line no. 8, sensitive environment areas include firstly valleys of the following rivers: Pilica, Radomka, Jeziorka, Zielona, Oronka and Szabasówka (mostly with meadows on terraces and meadow terraces), as well as a fish pond complex in Żabieniec and meadow area near Podlesie Małe.

In spite of crossing areas with rich hydrographical network, including sensitive areas, railway line no. 8 mostly does not have a regulated drainage system. Only short

sections of subgrade are drained with precast concrete perforated drainage troughs. In general, rainwater and drainage water are drained to surface water and the ground without pre-treatment.

Planned modernisation of railway line no. 8 may result in disturbances of hydrographical conditions and worse quality of surface water in the area of its course. These changes may have sometimes the features of constant transformations and may be caused by rebuilding of subgrade drainage, excavations, piling during construction and rebuilding of viaducts, bridges, culverts, etc. To minimise this impact, construction works related to drainage rebuilding should be preceded by the required area cleaning and water environment protection in the direct vicinity of the railway line.

Surface water pollution during railway line operation may be caused by, inter alia, rainwater and meltwater flows from the railway line's route (viaducts, railway stations), residential sewage dropped from railway carriages directly to the water and soil environment and leaks of hazardous substances resulting from railway accidents.

Non-implementation of the project within the scope of water and wastewater management will mean approval of previous wastewater management conditions and technical condition of the sewage system that have been operated for a long time, damaged in places or even destroyed. As a result, the technical condition and operational conditions of the equipment will worsen, creating a potential threat to water and soil.

Initially, the application of 23 devices protecting surface water against pollution has been proposed on the Masovian section of railway line no. 8. These are mainly sedimentation tanks with additional protection in the form of trapped outlets, water gates, isolation barriers, etc.

The adopted subgrade drainage system, which consists in application of a filtration and drainage layer, causes a reduced intensity of rainwater drain and reduced pollution as well. Water collected and drained from the subgrade in such a way should be characterised by the content of total suspensions within the range of approx. 50 mg/l (less than 100 mg/l) and track amounts of oil derivatives.

Increased retention in drainage (embankment) ditches is significant for the water quality in the vicinity of the railway line. In addition, it has positive impact on the pre-treatment of drained water, while reducing the intensity of drain to a tank at the same time. On the whole section of railway line no. 8 Warsaw – Kielce, construction of approx. 61 km of drainage ditches will be carried out.

10. IMPACT OF RAILWAY LINE NO. 8 ON THE EARTH'S SURFACE: SOILS, LANDSCAPE, FLORA, FAUNA AND PROTECTED AREAS

The planned project will be implemented within the range of existing rail infrastructure and slightly on the area adjacent to trackway and railway facilities, foreseen to be occupied for the purposes of implementation of the investment and operations of its facility. Railway investments, related to modernisation of the existing condition on the previously used area with currently applied technologies of contractor works and with an unused belt of land around the tracks and facilities, belong to undertakings of negligible impact on the natural and functional resources of the land.

At the construction stage, the investment's impact on the earth's surface, including soils, is basically related to technical interference with bedrock during conducted works connected with implementation of facilities, devices and installations. At the stage of operation, the investment's impact consists mainly in emission of particulate pollution including products of abrasion and corrosion of metal parts and elements from the trackway, as well as emission of pollution from facilities, devices and installations functionally related to the rail transport service.

Special impact on soils, other surface components of the earth and underground environment on the site and vicinity of the investment is related to the occurrence of serious industrial failure as a situation of incidental pollution. However, this exceeds the scope of standard conditions of implementation and operation of the investment. It is the subject of an analysis of risk of occurring forms of degrading impact at further stages of preparing the planned project documentation.

The following factors have basic significance in the reduction of negative impact of the modernisation and operation of railway line no. 8 on the earth's surface: minimisation of the occupancy of new areas (including the area for the construction site facility and machinery park), duration of works, reasonable waste management at the stage of the line's rebuilding and operation, application of the relevant building drainage and anti-erosion protection, as well as following the works progress recultivation of degraded land as a result of conducted activity related to the construction and maintenance of equipment and installations.

Within the Masovian Voivodeship borders, railway line no. 8 has been operating in the environment for several years, when this route crossed, inter alia, bigger forest complexes (e.g. the region of Chojnów Forests and Stromiecka Forest). Considering the lapse of time, currently it is hard to observe fragmentation of biotopes of the

mentioned forest complexes. This issue will not constitute any problem either in the case of the conducted modernisation works. Forest area occupancy related to correction of the route's geometry will be minimal and concern only several-metre movements.

A more significant impact of the planned investment on the landscape and fauna will be related to the addition of the second track on the section Warka – Radom, when logging of the forest belt approx. 15 m wide adjacent to the current line will be necessary.

Within the Masovian Voivodeship borders, forests are crossed on the length of approx. 24.5 km, which is approx. 18% of the discussed section. In addition, the line adjoins unilaterally forest complexes on the length of approx. 8.0 km, which is approx. 6% this section.

In the general part of the environment's characteristic, it was mentioned that beaver habitats prevail in forests on the Masovian section of railway line no. 8. A potential fire risk relates to this fact. It is higher in big, pure complexes of coniferous stands and in the case of more intense human penetration facilitated by the vicinity of the railway line. Areas at strong fire risk include forests in the vicinity of Warsaw and Warka.

Today, line no. 8 does not constitute a significant barrier in animal migrations. It concerns both migrations within the district borders – for food, as well as seasonal migrations to look for partners. The small line load and low speeds of trains do not cause significant losses of animals. The small barrier for game animals and boars may be constituted by line sections on high embankments and in deep excavations.
Within the Masovian Voivodeship borders, railway line no. 8 runs several times through the main Southern-Central Corridor, which is a part of the important migratory route connecting Eastern and Western Europe. For the first time, this line runs through the above-mentioned corridor within the borders of the Pilica Valley (designated as the Natura 2000 area PLB140003 Pilica Valley), constituting the corridor's northern branch together with the *Stromieckie Forests*. For the second time, cross-cut occurs between Szydłowiec and Skarżysko Kościelne.

The mentioned corridor constitutes a documented migratory route of big animals in the east – west direction. Culverts, viaducts and bridges on the line perform within a limited scope the function of crossing place for animals, mainly average-sized and small mammals (rodents, foxes, badgers) and amphibians.
In order to reduce unfavourable impact of the line on the mentioned migratory routes, the following preventive measures have been proposed: wildlife acoustic and reflective

scares, safety fences, adaptation of specified bridges and culverts to perform the function of crossing places for animals and construction of a new upper animal crossing. Below you may find the proposed types and amounts of means minimising the impact of railway line no. 8 within the Masovian Voivodeship borders on the crossed ecological corridors.

Table 10.1.

Proposed protection of ecological corridors on railway line no. 8 within the Masovian Voivodeship borders

RAILWAY LINE NO. 8	Wildlife acoustic scares	Wildlife reflective scares	Safety fences for animals	Adaptation of existing crossing places for animals	Construction of new crossing place for animals	Rebuilding of culverts for small animals
Amount of protections	10.5 km	8.6 km	2.0 km	5 items	1 item	27 items

11. IMPACT OF RAILWAY LINE NO. 8 ON THE QUALITY OF ATMOSPHERIC AIR

Apart from the Warka and Radom region, within the Masovian Voivodeship borders, the discussed railway line runs outside areas with increased concentration of environmental pollution. Railway area pollution is indicated in balances of air pollution in the country as an element of communication pollution, but – as opposed to car transport – it constitutes a small percentage.

Railway line no. 8 Warsaw – Kielce is electrified on its whole length: the share of diesel multiple units is limited only to station areas (switchers), official trains and trolleys. An increased share of trains and machines with diesel units occurs at the stage of modernisation works.

In the case of the discussed line, we may discuss three main pollution types: scattered emission related to secondary dusting from the trackway and adjacent areas, low point emission related to seasonal heating of cubature objects, as well as the share in emission from power sources (trains are important receivers of electrical energy).

Based on source information such as environmental reports from voivodeships, it can

be stated that the acceptable concentration of air pollution is not exceeded within PKP (ownership) demarcation lines. Based on model calculations of pollutant distribution for the specified section of railway line no. 8, excess of air quality standards is not forecast at the stage of modernisation and rebuilding of the trackway outside the railway area borders.

12. WASTE MANAGEMENT

At the modernisation stage of railway line no. 8, waste will be produced during works related to land preparation, closing down and rebuilding of existing facilities, as well as construction of designed facilities, devices and installations, green area management and operation, and then closing down the construction site facility and machinery park. At the stage of railway line operation, waste from the maintenance of facilities, devices and installations, as well as developed land in the investment belt will be produced.

During land preparation and execution of planned works, waste from the construction site, repair and disassembly of building objects and infrastructure, including waste qualified as recyclable, will be produced in the highest mass and cubature amounts. Waste other than hazardous will mostly include waste of aggregates and soil mass, metal and concrete. Hazardous waste will include waste wooden railway line ties consisting in chemical preservatives, as well as aggregates, soil masses and other polluted waste or including hazardous substances.

Table 12.1.
Estimated amounts of waste produced at the stage of project implementation to be reused on other lines

No.	**Code**	**Waste type**	**unit**	quantity
	02 01 03	Waste biomass (from cleaning embankments)	Mg	150
	15 01 06	Mixed packaging waste	Mg	0.9

	17 01 07	Mixed waste from concrete, brick rubble, waste ceramic materials and equipment elements other than mentioned in 17 01 06 (including concrete ties*)	thousand Mg	40 (including 31*)
	17 02 03	Plastics waste	Mg	1.5
	17 02 04	Waste from wood, glass and polymers, including wooden railway line ties	thousand Mg	30*
	17 04 01	Waste and scrap from non-ferrous metals*	Mg	750
	17 04 05	Steel waste and scrap (including rails*)	thousand Mg	24
	17 05 04	Soil, including stones other than those mentioned in 17 05 03	thousand Mg	7,200
	17 06 04	Insulation materials other than mentioned in 17 06 01 and 17 06 03	Mg	3,15
	20 03 01	Non-sorted (mixed) municipal waste	Mg	3.75

* for recycling on other lines

In the case of an efficient waste management system at the stage of contractor works, including devices and equipment of the construction and machinery park with a waste management facility according to valid regulations, as well as waste removal from places of their production on a running basis, waste management impact on particular works sections will be short-term, limited to the period of carrying out works on specific sections and investment facilities.

Direct environmental impact of waste refers mainly to its disposal on the earth's surface, area of land occupied by waste in the location and vicinity of the investment or disordered management of its assortments, or its harmful impact as a result of probable move of hazardous and harmful substances released to the environment.

During modernisation works, one should selectively collect all hazardous waste in an environmentally-friendly way, according to the properties and possibilities of its disabling. Such waste, including polluted materials or that including hazardous substances, should be successively transferred to authorised companies to neutralise it, in the amounts appropriate for organised transport or defined with an acceptable collection period.

Activities resulting from implementation of the planned project (modernisation of the Masovian section of railway line no. 8) with correct technical and organisational solutions, complying with waste management and work safety rules in the manner described in issued decisions, will not generate (in standard conditions, as far as the generated waste is concerned) any risks to human life and health and the environment.

13. ASSESSMENT OF MODERNISATION OF RAILWAY LINE NO. 8 WITHIN THE SCOPE OF PROTECTION AGAINST ELECTROMAGNETIC RADIATION

In general, the Masovian section of railway line no. 8 does not include any environmental risks caused by electromagnetic radiation emission, related both to the stage of carrying out works and to the stage of operating devices and installations of electrical power systems, signalisation, communication and data transmission.

The issue of radiotelephone communication included within the scope of telecommunications sector is a separate problem. It uses electromagnetic radiation as a carrier of transferred information. From the point of view of the requirements imposed by the Environmental Protection Law within the scope of protection against electromagnetic radiation, one should provide that communication equipment used by contractors (fixed, remote radiotelephones, even mobile phones) be applied in such a way that does not exceed permissible values of electromagnetic field emission.

14. IMPACT OF RAILWAY LINE NO. 8 ON THE VIBROACOUSTIC CLIMATE

During modernisation works conducted on the mainline section of railway line no. 8 and on rebuilt station sections, temporary acoustic disruptions resulting from operations of heavy duty construction equipment and drives of vehicles transporting materials and resources.

Considering the generally favourable location of the planned project in relation to residential development, it may be assumed that noise emission at the stage of line

modernisation will not be onerous for the environment over a longer time and does not require application of minimising measures. As a basic recommendation, supervision of equipment operating time and proper organisation of the construction site should be assumed.

Analyses conducted on a general scale indicate that in all variants there will occur increased noise exposure in areas along the railway line. As a result of the assessment of expected noise risk on the considered section of railway line no. 8, regions of this risk and scope of essential anti-noise protection have been estimated.

After confrontation of the results of the noise exposure assessment with an estimation of development and number of citizens, regions of potential acoustic conflicts related to operation of modernised railway line have been indicated.

The following proposals aim at minimisation of the impact of the planned project on the vibroacoustic climate in the vicinity of the Masovian section of line no. 8:

- noise barrier approx. 6.3 km long on both sides of the line,
- anti-vibration solutions 4.3 km long, where application of traditional anti-noise solutions is limited, after allowing for use at the railway.
- increased insulation of windows (approx. 613 items), as a passive solution in the case of exceeding permissible noise levels, if the are no formal arrangements concerning application of anti-vibroacoustic solutions.

15. LEGALLY PROTECTED MONUMENTS

Railway line no. 8 within the Masovian Voivodeship borders was founded in the second half of the twentieth century. Since its foundation, it has been modernised many times, and as a result, old facilities (buildings and technical equipment) were replaced by new ones. However, some facilities have been maintained in an unchanged form from the first period of line operation. Their historical values make them protected monuments.

When analysing the impact of the planned project on monuments, it should be stated that modernisation of the existing railway line will be much less risk for them than construction of a new route. Planned modernisation works should not have significant negative impact on monuments, provided that proper contractor standards of planned works are maintained.

Increased changes of the trackway course (from 20 to 30 metres) will concern only several arches, in whose vicinity no documented monuments, including archaeological

sites and zones, are present.

Registered archaeological sites are protected by the conservation officer. In the process of preparation and implementation of the investment in their vicinity, the Investor will be obliged to conduct archaeological research within the scope agreed on with the Voivodeship Monument Conservation Officer and to obtain its consent for this research before receiving the decision on construction permit.

16. ENVIRONMENTAL MONITORING

Regular tracking and analysis of environmental conditions at indicated points and within the relevant scope are called monitoring. Basic features of monitoring in the vicinity of the rail infrastructure should include: record, control and forecast of trends of environmental change, providing information essential to rationalisation of management of technical infrastructure and environmental resources, collection of knowledge on the environmental condition, transformation trends, mutual connections and relations, as well as changes of its component properties, including using them in current and planned business activity.

The entity managing the first-rate railway line is obliged to conduct periodical measurements of levels of substances or energy introduced as a result of its operation to the environment. This results from the provision of Article 175 of the Environmental Protection Law Act and implementing regulation dated 23 January 2003 *on requirements for conducting measurements of the levels of substances or energy in the environment by the road, railway, tramway line, airport or port authority* (Journal of Laws No. 35, item 308).

According to this regulation, in order to control the quality of the environment during operation of arterial tracks and primary railway lines, it is necessary to carry out periodical noise level measurements. Regardless of legal provisions, due to the protection of surface water and groundwater during the operation of the railway line, it is necessary to control the technical condition of devices for the drainage and pre-treatment of rainwater flowing from the trackway and station area.

17. AREAS OF RESTRICTED USE

The Environmental Protection Law Act constitutes the legal basis of establishing areas of restricted use. In the case of line facilities (motorways, express roads, national roads and main lines), being the source of abnormal noise, there may occur areas where,

despite the application of proposed environmental protection measures (e.g. noise barriers, anti-vibration batts, landscape screening), abnormal vibroacoustic interactions will be measured.

On the basis of the elaborated report and model calculations for the construction and operational stages, it may be quite confidently stated that it will not be necessary to establish areas of restricted as far as this project is concerned. The final assessment of the actual impact will be possible only after the post-implementation monitoring system is implemented and representative results of tests carried out on the modernised line are obtained.

18. COMPARISON OF CONSIDERED OPTIONS

In order to justify the selection of a modernisation option concerning railway line no. 8 on the section Warsaw Okęcie – Radom – Kielce, the Consultant conducted a multicriteria assessment in Phase I. For the purposes of the analysis, option 2 and 3 is presented in variation approach, i.e. considering firstly differentiation of speed to 100, 140 and 160 km/h on sections of the researched line, and secondly construction (or its lack) of the second track on the section Warka – Radom and a bridge over the Pilica River.

Considering analysed criteria of assessing variations of railway line modernisation, among all four scenarios of project purpose validity, variants **2c, 2b, 2d** and **3b** have been proposed for further analyses. The “3b” variant has been selected for further study works as the most favourable, also with consideration of amendments in the National Transport Policy concerning railway line no. 8. However, the Contractor has been obliged to thoroughly analyse the section Radom – Kielce to obtain the possibility of increasing speed to more than 100 km/h, as well as to thoroughly analyse construction or rebuilding of a bridge over the Pilica River in the aspect of present considerations.

19. PROPOSED MEASURES MINIMISING THE ENVIRONMENTAL IMPACT OF MODERNISATION OF RAILWAY LINE NO. 8

Below you may find proposed measures minimising (alleviating) the environmental impact of the project. They constitute a synthesis of previously discussed solutions and proposals consistent with valid Polish legislation and procedures, referring to legal

solutions applied in the European Union.

Minimising means constitute both legal procedures applied in an appropriate time, regulating, inter alia, issues of consultation, post-completion monitoring research, as well as organisational measures, and first of all technical protection (noise barriers, sedimentation tanks, noise scares or plantings).

The above-mentioned procedures may form the final financial outcome of the project and its success. E.g. delay in the introduction of changes in local plans, commencement of expropriation processes, social consultations or arrangement concerning detailed location of crossing places for animals, will extend the assumed implementation time, and thus total modernisation costs.

Therefore, one of the main conclusions should include drawing special attention to the time coordination of the whole project, with consideration of the specificity of issues concerning area development and environmental protection. The above-mentioned measures should consider the line's division into sections foreseen at the stage of implementation, as well as engaging of some issues requiring preliminary work.

19.1. Means minimising the environmental impact of the line

19.1.1. Public consultations

The project's success depends mostly on social approval. Proper preparation of public consultation at the level of communes has particular relevance, especially within the scope of changes in local plans, land acquisition or detailed solutions, such as elimination of passages and indicating approach roads.

Early commencement of consultation increases the opportunity of actual involvement of local society in the process of the investment's location, thus reducing the risk of rejection and serious protests during the introduction of changes to local plans.

Carrying out consultation is the Voivode's obligation due to current legislation. However, it does not mean that at the project's stage no arrangements and agreements within own (designer's) scope should be conducted.

19.1.2. Minimisation of the project's impact on water and soil:

- Application in line and station drainage systems of devices protection

groundwater and surface water in the form of: drainage troughs reinforced with concrete elements, so-called *gara troughs or other materials* (e.g. *non-woven geotextile fabric*), grassy drainage troughs, sediment tanks and drains with trapped outlets, water gates and isolation barriers

- Successive introduction of new trains by carriers (including passenger carriages with closed sanitary systems), repair and maintenance of operated trains on a running basis (including elimination of leakages in hydraulic systems)
- Regulation of the water and sewage systems in cubature objects entering into the scope of modernization by means of connection to local sewer systems, use of tight septic tanks, and construction of separate storm drainage and sanitary sewage systems
- Introduction of new de-icing means (less harmful to plants, water and soil)
- Application of non-durable (biodegradable) herbicides
- Proper manner of carrying out earthworks, eliminating covering water courses and their silting, erosion and damaging banks
- Proper supervision and operation of equipment at the operational stage
- Minimisation of the occupancy of new areas, including particularly forest and agricultural land
- Land recultivation after completion of the investment

19.1.3. Minimisation of impact on flora and fauna

- Construction of new upper crossing places for animals (along the designated migratory corridor)
- Adjustment of 5 selected engineering structures to perform the function of animal passages to keep the permeability of migratory corridors
- Minimisation of necessary logging and cutting bushes (after their previous stock-taking)
- Introduction of land restoration and supplementary plantings (32 structures)
- Application of non-durable (biodegradable) herbicides
- Installation of wildlife acoustic and reflective scares on selected line sections to scare animals away

19.1.4. Minimisation of impact on landscape and protected areas

- Minimisation of the occupancy of protected areas (including the one for the

second track)
- Land rehabilitation in the vicinity of rebuilt engineering structures (bridges, viaducts, etc.)
- Land recultivation after removed passages and cubature objects
- Cleaning areas in the vicinity of the railway line (including stations)

19.1.5 Minimisation of impact on Natura 2000 areas

- Land rehabilitation in the vicinity of the rebuilt bridge over the Pilica River
- Putting water and wastewater management in order on the Pilica bridge
- Maintenance of the permeability of ecological corridors

19.1.6. Minimisation of impact on monuments

- Carrying out all modernisation works in the vicinity of monumental building structures (first of all railway architectural monuments) with consideration of the conservation officer’s requirements

19.1.7. Minimisation of impact on atmospheric air

- Reduction in low emission in relation to change from carbon heating to electric and oil heating in selected facilities (control rooms, gateman structures, etc.)
- Introduction of new trains and repairs of currently operated trains, as well as the application of relevant protection of transported materials against dusting (closed carriages, covering sheets, etc.)

19.1.8. Minimisation of impact within the scope of waste management

- Development and implementation of a waste management programme, including dangerous waste
- Introduction of the principle of preventing waste production
- Selective waste collection, enabling recycling
- Division of earth masses into: humus, non-polluted masses, rubble and other
- Repeated application of e.g. roadbeds, rails, ballast

19.1.9. Minimisation of impact on the vibroacoustic climate

- Minimising noise at the stage of construction works (proper organisation of work, using fully operative equipment),
- Operation of fully operative trains
- Application of protective equipment in the form of noise barriers, anti-vibroacoustic solutions (where traditional solutions cannot be applied), woodwork with a very high level of acoustic insulation (as a passive protective method in the case of no formal arrangements concerning the application of anti-vibroacoustic solutions).
- Observance of provisions in local plans, designating development lines in the vicinity of railway areas
- Implementation of post-completion monitoring and possible verification of applied protection based on its results

Table 19.1

Proposed means to minimise the environmental impact of railway line no. 8 within the Masovian Voivodeship borders

New upper crossing place for animals (items)	Facilities requiring modernisation to perform Passage functions (items)	Culverts requiring modernisation	Wildlife acoustic scares (line km)	Wildlife reflective scares (line km)	Fences For animal protection (line km)	Plantings And plant renaturalisation (item)	Sedimentation tanks (item)	Windows (item)	Noise barriers (km)	Anti-vibration batts (km)
1	5	27	10.5	8.6	2.0	32	23	613	6.4	4.3