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1. GENERAL DESCRIPTION OF VENTURE UNDER ANALYSIS

The planned venture is the construction of a motorway between Łódź and Warsaw: from the Stryków I junction at km 365+261.42 to the boundary between the Łódź and Mazovia provinces at km 411+465.80. The motorway will operate on a toll basis.

The section referred to above is a component of the A-2 motorway running from the Polish border through Świecko – Poznań – Łódź – Warsaw – Biała Podlaska – Kukuryki and on to the Polish border.

The planned project, an investment in the A-2 motorway within the confines of the Łódź province [*województwo*] in the section from km 365+261.42 to km 411+465.80, cuts through the following districts [*gmina*]: Stryków, Dmosin, Łyszkowice, Nieborów, Bolimów. Land falling within the Głowno district also lies in the immediate vicinity of the motorway.

The beginning of the motorway section in question is at km 365+261.42 to the east of the planned Stryków I junction, where the A-2 motorway will intersect with the A-1 motorway. Section within the Stryków district, in the county [*powiat*] of Zgierz, km 365+261.42 – 366+668, length ca. 1.4 km, in the section from Stryków to the village of Nowostawy Górne. The motorway is then in the district of Dmosin, in Brzeziny county, km 366+668 – 379+546, length 12.88 km, between the villages of Nowostawy Dolne and Rozdzielnia. The district of Głowno borders on the motorway route in Zgierz county at km 397+600, to the south-east of the village of Wola Lubiankowska. Section within Łyszkowice district, in Łowicz county, km 379+546 – 394+524, length 14.98 km, between the villages of Kalenice Górne and Polesie. Section within Nieborów district, in Łowicz county, km 394+524 – 402+358, between the villages of Dzierzgówek and Piaski. Section within Bolimów district in Skierniewice county, km 402+358 – 411+465.80 between the villages of Wólka Łasiecka and Wola Szydłowiecka. End – km 411+465.80 – boundary between Łódź and Mazovia provinces, in the village of Wola Szydłowiecka.

The land through which the section of the A-2 motorway in question passes, starting from the south-eastern suburbs of Stryków, is mainly agricultural, comprising arable terrain and grasslands, away from areas of rural farm buildings. At ca. km 366+600 – 366+700, it intersects with the channel of the River Mrożyca, among fields. At km 373+200 the route approaches the south-eastern edge of the farm buildings of the village of Dmosin, and crosses the course of the River Mroga and the occasional farm buildings between the villages of Kałużew and Wiesiołów. At ca. km 377+400 it crosses a small stream, the Brzuśnia, and runs through fields to the eastern border of the farm buildings of the village of Rozdzielnia. Between km 379+500 – 381+300, the route of the motorway crosses the southern part of the wooded summit of the Wzgórz Domaniewickich [Domaniewicki Hills]. In this area, the motorway route passes through the southern edge of the documented Kalenice natural aggregate deposit, documented in cat. C₂. This deposit is not being mined. Recoverable geological reserves (according to State Geological Institute data) are ca. 17,494,000 tonnes. Around km 380+700 to 380+800 and from 381+100 to 381+300, on the right-hand side, beyond the lines that mark the boundary of the motorway, mining of raw materials is going on, in the form of natural aggregates from the Kalenice II and Kalenice IV deposits. According to information from the Łyszkowice District Local Development Programme, passed by a decision of the District Council, Decision NR XII/59/2007 of the Łyszkowice District Council of 26 September 2007, the planned method of reclamation of these mining areas is through tree planting.

Continuing among scattered farm buildings in the south-eastern part of the villages of Kalenice Górne and Czatolin, the motorway route crosses the course of the River Baranówka at km 384+200 and approaches the village and district capital

of Łyszkowice, which it passes to the north, running through some rather wet agricultural land and grassland lying between Łyszkowice and the village of Wrzeczeko. At km 386+900, the route crosses the boggy valley of the River Bobrówka and, via scattered buildings of the hamlet of Pod Dańkiem, runs through arable land towards the southern edge of the village of Kuczków, which merges unbroken into the village of Łagów, featuring some compact buildings along both sides of a street. The route continues to the north-east, passing through an area without woodland that is used for agriculture, to the village of Seligów. Before that village, at km 390+200, it crosses the River Uchanka, at about 120 m SE of a set of fish ponds. Continuing to the north-east, the route passes through arable land to the built-up area of the village of Bobiecko, with a street flanked on both sides by houses, which it goes through at km 391+200. Onwards to the NE the route passes through some wet grasslands intersected by numerous drainage ditches towards the northern edge of the built-up zone of the village of Polesie, but before reaching it, crossing the Ruczaj brook at km 393+470. Immediately after passing through the string of houses in the villages of Stachlew, Polesie and Parma, at km 394+300 the route crosses the flat and boggy valley of the River Zwierzyniec and the string of buildings beyond it that belong to the village of Dzierzgówek. On to the north-east, the route passes through areas with small copses, mainly of pine, stretching to the north of the village of Bełchów, and at km 395+678 it crosses the standard-gauge electrified railway line linking Łowicz and Skierniewice. At km 395+900 – 396+000, the route of the motorway passes through the scattered farm buildings of the village of Filipówka and, descending to the axis of the valley, passes through grasslands, across the River Łupia-Skierniewka at km 396+100, and then through the south-eastern edge of a string of buildings belonging to the village of Bobrowniki, which is a densely built-up street with houses on both sides. After about 1.5 km through arable farmland, at km 398+100 the motorway route enters the woodlands of the Bolimów Landscape Park, having crossed national highway No. 70, linking Łowicz and Huta Zawadzka, at km 398+350. Running increasingly eastward through the Park woodlands, at km 399+800 the route intersects with the 220 kV high-tension overhead power line from Mory to Janów. From km 400+050, the motorway route runs through the northern fringe of the Bolimów Landscape Park woodlands, and immediately beyond its northern boundary, runs between the edge of the woods and the lands belonging to the villages of Nowa Wieś and Piaski, at the southern edge of the buildings of these villages. At km 402+150 the motorway route re-enters the Park's woods, and at km 404+000 is in the agricultural land belong to the village of Wólka Łasiecka, cutting through its string of buildings at km 404+900. Moving on to the east through an area of fallow agricultural land lying to the east of the village, the motorway route crosses the provincial road from Sochaczew to Skierniewice at km 406+074. Having crossed this road, the motorway route enters the broad, flat valley of the River Rawka (which is a Natura 2000 nature reserve), the bed of which it crosses at km 407+000, passing 150 m to the north of the boundary of the Ziemiary reservoir. From km 407+300, the motorway route leaves the Rawka valley, rising to the adjacent higher ground and entering an area of scattered farm buildings of the village of Joachimów – Mogiły. The route continues towards the north-east along the north-eastern edge of the Bolimów Landscape Park woodlands. At km 410+400 the motorway enters farmland belonging to the village of Wola Szydłowiecka, where, in an area of scattered farm buildings at the southern outskirts of the village, the documented section ends.

The area for the proposed investment is generally located in a zone with little urbanisation, in the centre of an extensive area of farmland, and to a lesser extent woodland, and at some distance from any compact urban building. In its eastern section, though, the route cuts through the northern fringe of the Bolimów Landscape Park, or runs along its northern boundary.

The woods in the section from km 398+100 – 411+465.80 are situated inside the Bolimów Landscape Park. For a section of ca. 2.0 km in length, the motorway

runs through the Bolimów Landscape Park, while in the remaining section, i.e. km 400+050 – 411+465.80, it will, when built, constitute the northern boundary of the Park.

1.1. Geological structure and hydrogeological conditions

The motorway section in question runs through a region with quite a varied geological structure, especially in terms of Quaternary formations, the average depth of which is a few dozen metres.

The water-bearing stages that occur in the vicinity of the motorway feature high utility values.

The hydrogeological conditions in the vicinity of the planned motorway are variable, in line with the variety of the geological structure.

Of greatest significance in utility terms is the second, continuous water-bearing level, which occurs in the depth range 9.7 – 29.5 m below ground level, most probably throughout the area in question – it has been found to occur in all boreholes drilled in this region. Its thickness varies from 11 to over 40 m. It is fed by an influx from the south-west and by water from the shallower water-bearing level.

In view of the continuity of the water-bearing stratum, its considerable extent and good hydrogeological parameters, this level has been assigned to the Main Underground Reservoirs No. 403 “Brzeziny-Lipce Reymontowskie Inter-Moraine Basin”. The hydrogeological conditions are favourable for the location of underground water intakes for water mains. From the water quality aspect, the underground water has been classed as Ib or Ic for purity, in other words as pure water with no significant local contamination.

The planned route cuts through the area of this reservoir in two sections.

- The section from start of route to km 366+650 has been classed as an area requiring a high level of protection.
- The section 376+600 – 384+000 has been classed as an area requiring a high level of protection because of the relatively easy migration of potential contaminants from the land surface.

The Quaternary water-bearing levels are fed by infiltration of atmospheric precipitation. The regional underground water flow runs to the north, into the valley of the Bzura. Locally water from the first water-bearing level flows into rivers, brooks and drainage ditches.

It transpires from analysis of the results of monitoring of the soil environment that designated soil contaminant content levels are generally low, and there is no contamination of the soil; at the same time there is a lack of any significant difference in depth terms in the contaminant distribution, so there are no favoured zones of soil environment contamination. Nor are any significant differences observed in the spatial distribution of contaminants along the motorway section in question.

The underground water quality in Quaternary formations is variable. The first water-bearing level is contaminated in many places (particularly in areas where villages are more heavily built-up). The deeper Quaternary water-bearing level generally features good quality.

1.2. Soils

The soils in the area analysed are for the most part black earths that have arisen on a substrate of clays and silts. Small fragments of black earth occur in the

Łowicz region. Normal and lixiviated brown soils also occur in the northern part of the province; these are made up of boulder clays assigned to soil quality classes II-IV. In the central part of the province, podzolic, tawny (pseudo-leached) and brown lixiviated soils predominate, which are made up of loose sands, low-clay sands and clay sands. Pseudo-podzolic and brown lixiviated soils made up of light and strong clay sands of average fertility occur in the Skierniewice and Zgierz counties. Locally, in the north-western part of Skierniewice county, normal brown soils made up of boulder clays and clay sands occur. Throughout the province, alluvial soils – river fen soils – occur in the valleys of rivers and streams. These soils have arisen from dust, clay and silt formations. In depressions in the terrain they have formed hydromorphological type soils represented by the half-bog and gley soil types, and peats.

The soils that occur in the region where the route is planned to run are chiefly medium-quality soils, weak and very weak. In the Stryków district, class V and IVb soils are most commonly found. In the Dmosin district, class IVa and b and class V agricultural land dominates. In the Łyszkowice district, the surface is mainly made up of class V and class IVa and b soils. The Nieborów district is characterised by a lack of better class soils (III and IV). Class V and VI soils prevail here. In the Bolimów district, class V and VI soils occupy the greatest area.

1.3. Surface water

Surface water in the immediate vicinity of the planned section of the A-2 motorway is primarily represented by a network of natural surface brooks and artificial drainage ditches. These belong to the right-bank area of the second-order Bzura drainage basin and the first-order Vistula drainage basin..

The main water courses draining the surroundings of the planned motorway are the rivers Bzura, Mroga, Mrożyca, Skierniewka and Rawka.

1.4. Air and climate

Studies of air pollution around the planned A-2 motorway were carried out by the Provincial Environmental Protection Inspectorate in Łódź. The measurement results were drawn up in the form of a report entitled “Report on environmental monitoring around planned motorways and high-speed highways in the Łódź province in 2005”. Sulphur dioxide and nitrogen dioxide measurements were taken at points alongside the motorway in the Zgierz, Brzeziny, Łowicz and Skierniewice districts.

On the basis of the data obtained at the measurement points located along the motorway, the mean annual SO₂ concentration away from built-up areas was found to be in the 6-10 µg/m³ range in rural areas, whereas closer to urban areas it was 10-12 µg/m³. These concentrations are, respectively, 30% and 60% of the mean annual admissible level.

1.5. Acoustic climate

The acoustic climate in the environment is affected by such noise sources as road, rail and air transport, industrial enterprises, service stations, high-tension power lines and so on. Traffic noise is most certainly one of the main factors with an impact on the shaping of the acoustic climate in the environment. In areas outside towns, this is mainly noise originating from vehicle movements taking place along roads. Other road and rail traffic noise sources are much more local in nature.

The planned A-2 motorway will, in the section between the Stryków junction and the border between the Łódź and Mazovia provinces, be located between the existing national-level highways No. 8, and No. 14 and No. 2. A lot of traffic currently

makes use of these roads. The planned motorway will be aimed at taking the load off these roads – it will take over a large part of the vehicular traffic on the Łódź-Warsaw section.

The acoustic climate in the vicinity of the existing national-level highways is mainly shaped by these roads, which is a direct consequence of the heavy traffic load passing along them. In years to come this traffic will increase, and thus the scope of the noise from these roads will also increase and the acoustic climate will deteriorate. To protect urban built-up areas located close to these roads, suitable acoustic screening would need to be provided, but a better solution would be to build a road that takes over some of the traffic and is located in areas where there is less in the way of housing. Acoustic maps compiled in 2007 on the basis of long-term measurements for sections of the national-level highways support these conclusions. Sample fragments of acoustic maps for the analysed sections of existing highways are shown in fig. 1.1 and 1.2.

Analysis of these maps supports the assertion that the existing national-level highways No. 2 and No. 8 constitute a source of nuisance for all areas situated in their vicinity for which admissible noise levels were established (areas marked in yellow on the first of the maps).

Fig. 1.1 Map showing where admissible night-time noise levels [L_N] are exceeded in the Łowicz urban area by national highway No. 2.
Key:
pale green: no instances of admissible values being exceeded
dark green: 0-10 dB
red: 10-20 dB
grey: > 20 dB
cream: areas where admissible values were not determined

Fig. 1.2 Map showing where admissible night-time noise levels [L_N] are exceeded in the Tomaszów Mazowiecki urban area by national highway No. 8.
Key as for Fig. 1.1

1.6. Natural environment, protected areas

A description and evaluation of the landscape were carried out on the basis of a visual record of the territory, and on the basis of analysis of photographic documentation and orthophotographic maps.

The terrain where the motorway is to be sited features only minor variety in the landscape. Landscapes are largely monotonous, with flat areas lacking major variety (river valleys, woods). Four main types of landscape have been identified in the area in question. The main criterion for dividing the landscape into types was the extent or quality of the changes occurring in the landscape in relation to the degree of distortion of natural relations in the environment and changes introduced as a result of human activities. The following landscape types were distinguished:

- near-natural landscape: this class includes the woodland type and meadows and glades surrounded by woods, and river valleys,
- natural and cultivated landscape – this class includes meadows that are becoming overgrown, wooded agricultural landscape – small clumps of trees among meadows and fields, and agricultural landscape – meadows, fields, drainage ditches, field copses, isolated farm buildings, kitchen gardens, orchards,
- cultivated landscape – associated with colonisation,

- degraded cultivated landscape – this class includes the landscape of highway zones and the landscape surrounding power lines.

The planned project predominantly runs through areas that are similar to the natural landscape or are of the natural and cultivated landscape type. Superficially the greatest area is occupied by a harmonious cultivated landscape, which means arable soils, meadows, and to a lesser extent woods, groves and orchards. These are mainly wooded areas, areas of meadows and fields with small clumps of trees and isolated buildings, and areas of wasteland with groups of natural tree cover.

The information given below lists the valuable features that have been identified on the route of the planned motorway:

1. Natural feature (km 366+500) – Wych elm *Ulmus laevis* 356 cm in girth, listed on 25.09.2002 by Municipal Council Decision No. XLIII/333/2002. It grows about 520 m to the north of the motorway boundary line and will not be destroyed when the investment is implemented.
2. km 404+900 – two wych elms *Ulmus laevis*, 305 and 330 cm in girth, growing about 300 m from the motorway boundary line.
3. The Lower Mrożyca Valley Natural and Landscape Grouping, near Nowostawy Dolne.
4. The Łódź Hills Landscape Park (PKWŁ) – (km 368+300 – 370+000). For about 1.5 km of its length the motorway adjoins the fringe of the PKWŁ. This area does not stand out as having major natural merits.
5. The Mroga and Mrożyca protected landscape zone (km 365+950 – 367+130) – in the section in question, this zone takes in the valley of the River Mroga and the terrain located to the west of the valley.
6. The valley of the Uchanka together with fish ponds on the river. This valley constitutes an ecological corridor for many animals. The area has been confirmed as a habitat of the fire-bellied toad. Its habitats are located about 200 m from the planned motorway and will not be destroyed. Cranes have been observed feeding in the meadows that surround the fish-breeding ponds (390+200 km).
7. The system of meadows in the valley of the Ruczaj and Zwierzyniec brook. This area has become known for its natural aspects because of its extent and the degree to which meadows of varying wetness have been retained. The communities that have sprung up here are typical and, together with small patches of high peat bog and rushes, they make up a mosaic of natural habitats of a significant biological heterogeneity, and fulfil an important biocenotic function. Nesting pairs of peewits have been found in these meadows, and displaying snipe. These meadows are also a feeding place for the white stork. At 393+500 km (near the Ruczaj brook) a white stork's nest has been confirmed (pair of storks with young). In the River Zwierzyniec valley the crossed viper [*Vipera berus*] occurs.
8. River Skierniewka valley. A large mosaic of habitats and a natural channel make this, along with the Rawka, Mroga and Mrożyca, the most valuable river valley in the motorway belt.
9. Bolimów-Radziejów and Central Rawka Valley protected landscape area – the project passes through this area from km 396+400 to km 398+100.
10. The Bolimów Landscape Park – the project collides with the park in a section of some 1.9 km, i.e. from km 398+100 to km 400+050, then it passes along the northern fringe of the Park to the end of the section under analysis at km 411+465.80.
11. The Mroga valley (in the area of km 373+400): In the vicinity of the town of Grodzisk on the banks of the River Mroga, on the line of the planned motorway and on the surrounding land is an old manor house, with parkland around it. In 1984 the park was entered in the register of heritage sites under number 717/A,

and since that time has been protected. Some impressive trees of a size requiring them to be preserved grow in the park and the adjacent land.

12. Protected species:

- marsh gentian – five habitats, the nearest of which is about 220 m from the motorway boundary line, and none of which will be destroyed during construction.
- superb pink – six habitats, the nearest of which is about 50 m from the motorway boundary line; may be destroyed during construction if the construction site extends beyond the boundary lines. The location described is one of 10 found in the Bolimów Landscape Park.
- water crowfoot – two habitats, the nearest of which is about 10-15 m from the motorway boundary line (near a historic World War I cemetery); may be destroyed during construction if the construction site extends beyond the boundary lines.
- hedge hyssop – this habitat is located in the area where the project is expected to be implemented (reconstructed national highway No. 70).
- *Ostericum palustre* – three habitats, the nearest of which is about 50 m from the motorway boundary line, and will not be destroyed during construction provided that construction work remains within the boundary lines. Maintenance of this habitat is also dependent on subsequent agricultural use of the meadows where it occurs.
- water figwort – habitat located about 250 m from the boundary line; will not be destroyed during construction stage.
- marsh helleborine – two habitats, the nearest of which is about 450 m from the motorway boundary line; will not be destroyed during construction stage.
- peewit – a pair of peewits have been seen on the meadows to the north of the motorway (404+400 km), at a distance of ca. 200-250 m from the planned investment site.

13. Bolimów-Radziejów and Central Rawka Valley protected landscape area.

1.7. Natura 2000 “Dolina Rawki” [Rawka Valley] area

The planned Rawka Valley Special Protection Area (PLH100015) is the only part of the Natura 2000 ecological network that comes into collision with the A-2 motorway in the Stryków-Łódź/Mazovia border section. The Natura 2000 area runs north-south, while the motorway runs west-east.

This area is intersected for about 500 m at route km 406+750 – 407+300, and for a further 400 m the motorway route runs along the boundary of the area. The Rawka valley covers an area running from Żydomice to Bolimów. A 42 km section of the area (in a longitudinal direction) lies within the Bolimów Landscape Park. The river and its valley constitute a natural axis cutting through the Park area with a longitudinal trend.

Photo 1.1 Agricultural landscape in the Bolimów Landscape Park – km 401+900

Photo 1.2 The Rawka valley where the A-2 motorway cuts across it

Photo 1.3 House – Łągów No. 43

Photo 1.4 House – Łągów No. 48

Fig. 1.3. How the planned A-2 motorway passes through the Natura 2000 Rawka Valley area

The Rawka is one of a small number of rivers in lowland Poland which follows a natural, meandering course and has banks which are overgrown with wetland and meadow vegetation. The numerous old river beds are places where water and marsh plants, rushes and reed beds grow. The Rawka's bed has a mean width of around 10 m, and a depth of 1.5 m. Along the valley, swampy, silty, boggy and peaty soils occur. In view of the Rawka's location in the central part of the country, between Łódź and Warsaw, it plays the part of an important ecological corridor.

The fragment of the valley that will receive the immediate impact of the motorway does not feature any particularly outstanding natural value. Its minimal natural values suffer by comparison with the whole of the protected area. The following factors are responsible for this:

- Considerable human pressure arising from closeness of human dwelling places,
- Construction work on the A-2 motorway carried out in the 1970s. One result of this work is that there is still an embankment 1 km long on the right bank of the river, while on the left one bridge span was erected. During this work there was considerable interference with the species that then existed and their habitats, causing deep and irreversible changes.
- On the right bank of the river, 100 metres from the motorway strip, the Joachimów-Ziemiary dam and reservoir were built. This component did the most damage to the habitats and species make-up of the Rawka valley in its immediate vicinity. This is a shallow reservoir (average depth 2 m), with no vegetation at all on its banks – the vegetation is systematically stripped. There is also an unsurfaced road running round the edge of the reservoir on an embankment. This development has caused birds that live in the valley to avoid this region of it – they have no place to nest and hide from predators. In addition, frequent bloomings of blue-green algae and deep freezing in winter mean that the fauna of this reservoir is poorly developed.

All these factors taken together have meant that in this area (which has been the subject of an inventory) there are small numbers of protected species of plants and animals and their habitats to be found. Obviously the Rawka itself is something quite separate: its waters are home to protected fish and the brook lamprey.

The following bird species have been listed on the inventory for the region under analysis:

- peewit, km 406+800 – km 407+400 – on farmland and marshes at a distance of ca. 300 m from the investment under analysis,
- white stork's nest – km 406+700 – at a distance of ca. 120 m from the boundary lines,
- red-backed shrike km 406+800 – km 407+700 – living in reeds and low shrubs on both sides of the motorway and within the motorway strip.
- kingfisher – along the Rawka (km 406+900) – on tree branches overhanging the water. Lack of steep bluffs in the immediate vicinity where this species could nest.

1.8. Description of existing heritage sites in the vicinity or within the range of impact of the planned project which come under the regulations for heritage conservation and care

In the strip of land 1000 m wide (500 m each side of the motorway), within the reach of the planned section of motorway 29 items have been identified which are heritage sites, and 59 archaeological monuments.

In the vicinity of the planned motorway, 2 cemeteries have been identified (Wólka Łasiecka, Wólka Szydłowiecka). Other structures of cultural interest, however, mainly comprise rural buildings (houses and farm buildings).

On the basis of information received from the Provincial Heritage Protection Office in Łódź and the branch office in Skierniewice, a list has been drawn up of the heritage sites lying within the scope of the planned project. During this process, some of the buildings were found to have been substantially modified by their owners, leading to a loss of their heritage character.

With the exception of the Arkadia – Nieborów – Łasieczniki Aleja Lipowa [avenue of limes] (which is entered in the register), all the heritage sites identified have been included in the heritage listings.

Among these heritage sites, two are within the boundary lines for the planned motorway: houses No. 43 and 48 in Łągów. Demolition of these buildings is planned.

2. DESCRIPTION OF VENTURE OPTIONS UNDER ANALYSIS

2.1. Option based on venture not being undertaken

Analysis of the option in which the project does not get off the ground relates to the situation in which the section of motorway in question is not constructed.

The area lying between Stryków and the provincial border with Mazovia is currently linked by a network of existing roads, most important of which in the region where the motorway is planned are national highways No. 2, No. 14 and No. 8 (in the eastern part of the section in question). The area under analysis also takes in national highway No. 70 (covered by the project – re-routing of a section of road ca. 4.4 km in length).

Building the motorway in the section from Stryków (a section of the A-2 motorway that has been built and is in operation currently extends as far as this town) will result in a diminution in the flow of vehicles chiefly on national highways No. 2 and No. 14. Traffic forecasts (taking into account the network of planned roads) show changes to the traffic loading on the road situated in the immediate vicinity, national highway [NH] No. 14 (Głowno – Stryków section) and on the road servicing the east-west direction (e.g. NH No. 2), as well as on a road that is not in the immediate vicinity of the planned motorway section, e.g. national highway No. 8.

Failure to build this section of road could, however, be seen as a source of:

- an increase in congestion on the existing road network. As may be seen from the results of general measurement of traffic carried out on the national highways network, the increase in traffic during the five-year period from 2000 to 2005 was an average of 18% on Poland's roads, the figure for Łódź province being 13%;
- not building the section of road in question would, in the context of a functioning motorway to the west of Stryków, additionally concentrate traffic movements on the routes mentioned, and especially on highway No. 14 in the Stryków area;
- a deterioration in the technical state of existing roads,
- a rise in the nuisance caused by roads for local residents in places located along these roads,
- the roads that exist at present do not have the necessary equipment to protect the environment.

Noise

Analysing the results of forecasts made during work to draw up a report on the environmental impact for sections of existing national highways No. 14, No. 2 and No. 8, we may state with certainty that construction of the A-2 motorway will lead to

an improvement in the state of the acoustic climate in the vicinity of these roads, on sections that lie within Łódź province. The motorway will take a significant proportion of the traffic away from them. This will have the immediate effect of a fall in the noise level in adjacent areas. From analysis of distances of noise level iso-lines for admissible values, we can say that the fall in traffic intensity when the planned motorway is put into use will cause a significant reduction in their extent, and in 2025 this difference may be 40-51% (NH No. 14), around 32% (NH No. 2) and around 20-24% (NH No. 8). It should, however, be pointed out that construction of the motorway will worsen the acoustic climate in residential areas situated near to it. Residential housing may lie in a noise impact zone where the level is above admissible values, and this will necessitate the use of anti-noise shielding, e.g. in the form of acoustic screens.

Air

Building of the A-2 motorway in the section under analysis (obviously including its continuation to Warsaw) will take over and free up traffic which is currently handled by other main roads (mainly national-level highways). As a result of construction of the A-2, harmful substances concentrations on national highways will fall significantly. Should the investment fail to be implemented, however, the rise in traffic levels will cause an increase in exhaust gas emissions, and this will have a negative impact in densely-populated areas lying along existing roads. Beneficial changes may particularly be seen in the case of national highway No. 8.

Natural environment

With regard to the natural environment, failure to build this section of motorway may be viewed from the local aspect (area where motorway will run) and in the broader context.

From the local aspect, construction of the motorway will occupy an area of about 667 ha which has hitherto for the most part been used for agricultural purposes. In the option where construction is not undertaken, this land will remain in its previous use, at least as we understand things at present. From this aspect one can concede that implementation of the motorway project will cause a diminution in the biologically active area, plus the need to remove a few quite large trees which have locally important landscape functions. Also removed will be small stretches of protected plant species, which will not constitute a significant negative impact given their fairly widespread occurrence in the region.

In short sections, the motorway will pass through woodlands, causing them to be divided, and leading to what is known as the edge effect, which may bring about a weakening of the condition of tree stands and the development of undesirable phenomena (blowdowns, spread of invasive species of vegetation). In the event of woods being dissected by the motorway, changes in microclimate also need to be borne in mind, in the shape of increased ventilation inside the woods and access of light, which may cause a fall in humidity and a rise in temperature. Mosses and lichens will be among the first organisms to react to these conditions.

There may be a similar reaction with the fauna. Changes to animal location in a woodland environment are generally observed in a strip several tens of metres wide (at least 30 m), and wider in the case of birds. Some bird species (particularly wetland birds) may lose their feeding grounds and leave the motorway area for this reason. Vehicle collisions with birds and small mammals may in turn bring in predator species that are interested in easy meat in the form of carrion.

For a distance of about 700 m, the motorway will cut through the Natura 2000 Rawka Valley area. The project will also run right next to woods that are within the borders of the Bolimów Landscape Park, and thus have a negative impact on wooded terrain in terms of air pollution.

These are the negative impacts that may be expected to occur in the area around the motorway.

The measures aimed at minimising the impact that will need to be taken, which are listed in section 4, will reduce the undesirable effects (preserving migration corridors, protecting woodlands), but will not entirely eliminate them.

On the other hand, if the motorway is not built, a barrier effect will be maintained on the existing road network, and with the forecast traffic increase, this effect will become more severe.

2.2. Implementation options

Pursuant to Art. 52, par. 1 d of the Act that governs environmental protection for projects based on construction of a highway for which a decision has been issued on its siting, there are no requirements to present siting options that are under analysis.

The siting of the A-2 motorway was established by the Łódź Provincial Governor in the following decisions issued in 2005:

- no. 11/2005 (RR.I-7045/2/7/DK/05) of 19 July 2005, on the siting of the A-2 toll motorway in the Stryków I – Łyszkowice section (from km 365+261.42 to km 386+168.60),
- no. 7/2005 (RR.I-7045/2/9/KS/04/05) of 8 June 2005, on the siting of the A-2 toll motorway in the Łyszkowice – Nieborów section (from km 386+168.6 to km 398+362.3),
- no. 6/2005 (RR.I-7045/2/8/MS/04/05) of 8 June 2005, on the siting of the A-2 toll motorway from the Nieborów junction to the border of Łódź and Mazovia provinces (from km 398+362.3 to km 411+465.8).

Given this situation, the environmental impact report did not analyse other options for the siting of the motorway.

3. SPECIFICATION OF ANTICIPATED ENVIRONMENTAL IMPACT

3.1. Impact on land surface and soils

Work associated with construction of the route will cause:

- removal of the top layer of fertile soil;
- disruption of the ground surface linked to earth works carried out during highway construction;
- possible short-term and transitory falls in the water table because of the need to carry out essential drainage where soils which will not bear weight have to be replaced;
- generation of waste and small amounts of waste water.

The impact of construction work on the soil environment will be brief and transitory (apart from the permanent occupation of a strip of land by the motorway and engineered structures). The direct impact during highway construction on the land surface and soils will be local. Total destruction of soils during the construction phase will occur in places where the road is laid, over a wider extent around junctions and in areas that are occupied by road drainage installations. The area of agricultural land will be insignificantly reduced by the construction work. While earth works are going on there will be damage to the natural environment in areas of excavation and spoil dumping, within the highway strip and in its vicinity, caused by the need to make the road bed, for example. An area of ca. 690 ha will be transformed and irreversibly occupied.

In the section in question, because of the slight variations in level in the terrain and the running of the motorway on small embankments (locally in the region of particular features they may be higher), no need is envisaged for any significant movement of masses of earth or any deep excavations, except for sections where soil with a poor load-bearing capacity will need to be replaced.

Soil contamination next to roads is chiefly a consequence of deposition on the ground of particles containing substances that have got into the air from exhaust pipes of vehicles travelling along the road. Besides exhaust emissions, vehicle traffic is also linked to environmental contamination by carbon black arising from abrasion of vehicle tyres. The road surfaces themselves, which are built of a variety of materials, are also subject to abrasion.

The consequences of highway contaminants' impact on the soil will not be felt until the road has been in use for several years. The greatest and most hazardous impact is that of surface heavy metal deposits, especially compounds of lead, zinc, copper and cadmium. As time passes, there is also a gradual acidification of soils. Thanks to the general introduction of lead-free petrol and catalytic converters, however, lead pollution of soils will be marginal.

Another threat to soils near highways is salt pollution as a result of winter treatment work.

Because of the increasingly good technical condition of vehicles and the use of lead-free petrol, the amount of contaminants getting into the top layer of soil is showing a tendency to fall. The proposed systems for drainage and removal of water from the road surface will have the effect of limiting the negative impact of the road on the land surface and soils.

3.2. Impact on surface and underground water

Construction of the motorway section under analysis constitutes a potential source of negative impact for the aqueous environment, water ratios and surface water contamination. It may cause local and transient disturbances to surface run-off in the immediate area and a deterioration in surface water quality.

The potential for a change in water ratios comes about through work linked to the implementation of technical infrastructure facilities and equipment, construction of engineered facilities and regulation of water ratios around the route (control of streams, changing their course, construction of culverts, bridges, etc.).

Most susceptible to changes in water ratios are small streams located near the route and areas of drained land.

All work linked to highway construction also presents a threat to water quality, which may be caused by:

- silting up as a result of soil erosion during road construction (erosion damage most frequently occurs on embankment and excavation slopes and in and around ditches);
- the removal without treatment of domestic and process waste water from construction site facilities;
- the flushing away of hazardous compounds from materials used in construction work (e.g. blast furnace ashes or bituminous substances);
- the introduction into surface water of significant quantities of suspensions from construction sites (cement, lime meal, etc.);
- petroleum products from construction machinery and means of transport getting into water.

The impact of construction work on the soil and water environment will be short-term and transient (apart from the permanent occupation of a strip of land by the motorway).

The main threat that the motorway poses for underground water, both during its construction and when it is in operation, is accidents with spillage of liquid or solid hazardous substances onto the surface, which might then get into underground water by filtration with precipitation. The risk of this happening is much greater during construction, when the surface is not in any way protected against contaminants soaking into the ground. During normal operation of the motorway, the most significant hazards are associated with run-offs of contaminated water from the road surface. Such water may chiefly be contaminated with agents used to treat the road in winter, and to a lesser extent with heavy metals and petroleum derivatives. Another threat is posed by road accidents, especially ones that involve vehicles carrying hazardous loads, which may also run off the road into ditches and systems for draining atmospheric precipitation from the surface.

Waste water led away into water or the ground must not contain waste or fluid contaminants, or give rise to any changes to the natural biocenosis that is characteristic of this water, or changes to its turbidity, colour or odour, and must not cause precipitates or foam to form in it.

The provisions of the law, i.e. the Order *concerning the conditions that need to be met when waste water is drained into water or onto land, and concerning substances that are particularly hazardous for the aqueous environment* (Dz.U., No. 137, item 984), set requirements for rain and flood water only for:

- total suspended matter 100 g/m³
- petroleum-derived hydrocarbons 15 g/m³

The contaminant concentration in rainfall run-offs depends on numerous factors, including the intensity of vehicular traffic, the technical state of the vehicles, land management, climatic conditions and the breadth of the drained crown of the road.

From analysis of the results obtained we should emphasise that forecast contaminant concentrations in effluents for 2025 are lower than for 2010 – this is as a result of the assumption that in 2025 the target of 2 × 3 traffic lanes has been achieved for the motorway. This assumption means that the watertight surface from which waste water is drained is significantly greater, which makes for a greater volume of precipitation in which contaminants are diluted.

3.2.1. Impact on acoustic climate

While construction work is going on, harmful acoustic phenomena occur in the zone where work is proceeding and its surroundings. These impacts may cause a deterioration in the state of the acoustic climate, as the heavy machinery carrying out work associated with construction will be a source of sound at high levels. The performance of work means a concentration of many such noise sources in a relatively small area. Movements of large-tonnage vehicles carrying loads and materials will have a negative impact on the acoustic climate around the construction. Heavy construction gear may be a source of sound at a level of around 90 dB. Vehicles transporting machinery and equipment and construction materials emit noise at a level in excess of 80 dB. The noise emitted during the performance of work will be a periodic and reversible phenomenon. It will feature a wide range of variation. All buildings located along the planned project that are not far from the edge of the road bed that is being built will be in the zone of impact of momentary sound level values.

The greatest negative impact on man where noise is concerned during the implementation phase is expected to be linked to construction of the motorway and the ancillary infrastructure (bridges, re-routing roads and relaying junctions and link roads). As part of the planned project, it will be necessary to provide

communications between buildings located on both sides of the motorway and land which is used for agriculture. It is planned to build a dozen or more over-bridges and two junctions, and to upgrade or re-route roads of various categories. The reconstruction of such roads and the building of bridges and junctions will take place on several sites at a minimum distance of a few metres from residential housing. The noise impact will undoubtedly be felt by residents of housing located near to areas where work is to proceed. It is important that such work be carried out only during the day, and over as short a time as possible.

The planned project will pass mainly through land on which there is scattered agricultural and service/residential building, with occasional single-family residential dwellings. When the motorway has been built, a deterioration in the acoustic climate around these buildings may be expected. It should be stressed, though, that as a result of some traffic being taken over by the motorway, there will be a significant improvement to the state of the acoustic climate in areas adjoining national highways No. 14, No. 2 and No. 8, in sections running parallel to the projected motorway, where the sound level currently reaches high values. To determine the state of the acoustic climate following construction and commissioning of the A-2 motorway (section from Stryków I to Łódź/Mazovia province border), the environmental impact report includes forecasts of the equivalent sound level taking into account its location. These forecasts have been made for the following time horizons:

- 2010 – option following commissioning of the A-2 motorway,
- 2025 – option 15 years after commissioning of the A-2 motorway.

In the analyses undertaken, the following admissible equivalent sound level values for areas located adjacent to the planned A-2 motorway have been adopted:

- for daytime (6:00 – 22:00): 60 dB,
- for night time (22:00 – 6:00): 50 dB,

and:

- for daytime (6:00 – 22:00): 55 dB,
- for night time (22:00 – 6:00): 50 dB,
- for areas with single-family housing located adjacent to the Łyszkowice junction.

Analysis of the extent of the sound iso-lines revealed that for the area adjacent to the motorway at the Łyszkowice junction, the 55 dB iso-line, which is the admissible value for areas of single-family housing, extends as far as the 50 dB iso-line at night, and for this reason the 50 dB iso-line for night time was used in the analysis of the range of noise and when proposing screening.

Single-family housing zones are specified in the Annex.

3.3. Impact on the atmosphere

During project implementation, pollutant emissions into the air will take place both through vehicle movements and as a result of heavy gear operating. The quantity of pollutants emitted will depend on the processes used, among other factors. Construction will require the operation of gear such as milling machines, rippers, loaders, construction material transportation vehicles, static and dynamic rollers and many other types of equipment. Depending on how far work has progressed, the operating time and the numbers of machines and equipment will vary, so there will also be variations in their impact on air quality based on emissions of gaseous pollutants (chiefly NO_x and SO₂), dust and heavy metals in dust. These impacts will be reversible and short- or medium-term (depending on how long it takes to carry out the work). The immediate impact, especially that of polluting dust, will be felt by buildings located near the road and vegetation, both natural and in crop form.

Air pollution may be divided into primary pollutants, which occur in the air in the form in which they were released into the atmosphere, and secondary pollutants, which are a product of physical changes and chemical reactions taking place between components of the atmosphere and substances released into it. The products of these reactions are sometimes more harmful than primary pollutants.

Air pollutants are highly mobile and may spread over wide areas and get into other components of the natural environment. They are prone to propagation with an intensity that depends among other factors on meteorological and terrain conditions. The road in question runs for the most part across flat terrain, through areas used for agriculture, and this helps to ventilate the terrain well.

Analyses carried out for the purposes of the environmental impact report have revealed that the main problem during operation of the A-2 motorway will be potential breaches of the reference level for oxides of nitrogen. The forecast revealed that higher-than-admissible values for this pollutant may occur throughout the planned section of the A-2 motorway (from Stryków I to the Łódź/Mazovia province border), in both 2010 and 2025.

The greatest excess nitrogen dioxide value is expected in the section from the start of the project to km 375+800 of the A-2 motorway in 2010. The maximum range of excess values for this substance will be around 61 m from the roadway axis.

In 2025, the sulphur dioxide concentration in this section may come close to the admissible level for this substance from human health protection considerations ($30 \mu\text{g}/\text{m}^3$).

The analyses further revealed the potential for admissible sulphur dioxide levels from plant protection considerations to be exceeded in the section from km 365+300 to km 375+800 in 2010, and in 2025 in the section from km 375+800 to km 385+000. These excesses are not, however, all that significant, and reach a maximum of 9 m from the roadway axis, so they will not extend outside the highway strip.

3.4. Impact in animated environment

The impact of the planned project on plants will be for the most part restricted to destruction of common field and meadow communities in the strip of land occupied by the road and the construction strip. It will be necessary to fell existing stands of trees in fields. One section that is particularly exposed to this type of negative impact is in places where the project under analysis cuts through woodland.

At the construction stage there may be drying out or flooding of the soil, and this, as a result of habitat changes, will cause certain plant species to die out, to be replaced by species that are better adapted to the changed environmental conditions. This process may result in a change to entire plant communities. Work carried out in peaty and boggy areas and undrained meadows will destroy the structure of communities, and also significantly restrict animals' vital activities. Long-term drainage may cause complete destruction of plant communities and associated animal species.

In places where the motorway runs along river valleys, riparian flora will be destroyed by the felling of trees and bushes and other vegetation occurring on the banks of rivers (the Rawka, Mrożyca and Rokitnica). Destruction of the above vegetation may have an indirect impact on increased pollution of watercourses that are crossed, as these species not only stabilise river banks, but also play the part of a biological filter. With regard to the Mrożyca valley, one hazard that arises out of the construction and subsequent operation of the road is the blocking of the ecological corridor and destruction of valuable natural habitats.

Within the limits of the potential impact of the A-2 motorway (Stryków - Łódź province border), numerous patches of alder-ash wetland have been found. These patches are spreading along many watercourses that will be crossed by the motorway: the Mrożyca, the Mroga, the Brzuśnia, the Bobrówka and the Rawka, and also in the vicinity of Nieborów (Bolimów Landscape Park). This is a protected type of natural habitat, and along with the meadows in the Bolimów Landscape Park is one of the most valuable environmental components found near the planned motorway. All these patches that have been identified possess a similar, high natural value. They feature a good to average development of all layers of trees. The predominant constituent of these tree stands is the common alder, with just a small admixture of European ash. In the undergrowth, besides offshoots of common alder, there is extensive bird-cherry, black elder and the protected alder buckthorn, and less commonly water elder. In the burgeoning undergrowth there is an extensive spread of wood stitchwort, giant fescue and wood dock.

The alder-ash wetland areas described above are no different in their structure, species make-up and behaviour to other woodland complexes occurring in Central Poland, and they are commonly found in Central Poland.

When it is operating, the motorway will be a major ecological barrier dividing the ecosystems it intersects. The negative impact of this process will be especially marked in areas of an unspoiled character. It will be least marked in areas that have been heavily transformed by the activities of man.

The fencing of the motorway along its entire length will make it impossible for animals to get about, resulting in isolation of individual populations.

The natural environment will also be negatively affected by highway contaminants (exhaust gases, dusts, fuel, oil and lubricant residues and salt), artificial lighting from road lights and vehicle headlamps, and also unceasing noise and vibration. These impacts will cause disruption to the breeding behaviour of birds and amphibians and limitation of the use of habitats that adjoin the motorway. Contamination of the zone alongside the motorway may have an impact on the health of animals that are reliant on vegetation occurring in this zone. Environmental contamination usually affects a strip of land a few dozen metres in width alongside a motorway. Contamination that has built up in the soil affects the state of plants that occur in this terrain. The agents employed to clean and preserve the road surface and the salt that is used in winter have a particularly negative impact on the natural environment. Salt contamination of the motorway zone lowers the permeability of the soil in this area, which will have a negative impact on plant growth. This change in soil conditions will also cause halophilic plants to spread.

Analyses and modelling carried out for the purposes of the environmental impact report have shown that noise has the greatest impact on adjoining areas.

When evaluating the impact of noise on species (and in particular on birds), for want of any research of this kind in Poland, we based ourselves on studies conducted in Holland. The Dutch studies showed that for most of the characteristic species living in open terrain, noise begins to have a negative impact at a level of 50 dB, while for woodland species this threshold is 40 dB. From this level upwards, a rise in noise intensity causes a reduction in bird populations living in the area near to the road.

In order to establish whether areas that are bird habitats listed during local inspections fall within the zone of significant negative impact of the planned project, noise modelling was carried out. In line with the assumptions adopted, the range of the 50 dB iso-line in daytime delineates the zone of peak impact on the population of

the species under analysis. The 60 dB iso-line delineates the strip of land (up to the motorway) in which bird population numbers perceptibly fall by 50% (abandoning nests, avoiding this area). The table below sets out the bird species identified in the motorway area, together with an evaluation of the impact on them and the consequences for the population. The analyses omitted the white stork, since this species is to a considerable extent habituated to anthropogenic impacts (one of which is noise).

Table 3.1. Impact of the motorway on listed bird species

Approximate location of occurrence	Distance from motorway carriageway	Species that occur	Range of 60 or 50 dB iso-line in daytime for 2010-2025	Anticipated impact	Comments
373+400	400 m	Black woodpecker	195-225 m	None	Outside range
373+700	100m – 400m	Kingfisher	195-225 m	Minor destruction of feeding grounds linked to felling of wetland in Mroga valley and possible regulation of river over short section	No major impact. A wide span above the river is proposed, which will allow the kingfisher to fly freely along the river, and contact with feeding grounds will be maintained.
379+500 – 380+900	Along both sides of motorway	Woodlark	450m – 500m (50 dB iso-line)	No utilisation of land in the strip directly adjacent to the motorway. Potential collisions between birds and vehicles	Most of the woods will remain outside the range of impact. Population will be maintained
390+200 – 390+300	100m – 200m	Crane	195-225 m	Loss of small part of feeding grounds, with their most important part (meadows around fish ponds) not disturbed and not located in the noise hazard zone	
392+100 – 393+400	200 m	Common snipe	180-200 m	No noise impact. Small part of habitat taken over by project	Meadows used by birds cover a large section and are of considerable width
		Peewit			
001+100 (NH No. 70)	100 m	Buzzard	–	Potential collision with vehicles. Birds will perch on trees by the side of the road	
404+000 – 404+700	200m – 300m	Peewit	180-200 m	No impact Minor occupation of part of habitat	
406+900	100m – 200m	Kingfisher	180-200 m	Minor destruction of habitat	No impact. High, wide span will allow the birds to pass freely under the structure

From analysis of the impact of motorway construction on the birds living in the adjacent area we may state that construction will cause permanent occupation of part of the feeding grounds of the peewit and the crane and woodlark. In the initial stage of operation of the motorway, these species (and others too) will also avoid frequent approaches to within ca. 150-250 m from the edge of the motorway carriageway. In later years we may expect the species in question to get used to the motorway to some extent. The buzzard will probably adapt most rapidly, as buzzards will be happy to make use of the poles placed there for the screening mesh as perches. From these perches they will be able to spot prey in the areas adjacent to the motorway, as well as carrion lying on the carriageway as a result of collisions of small and medium-sized animals and birds with vehicles. This type of behaviour could cause accidents. This type of threat is most likely on the section of NH No. 70 that is being re-routed (buzzards will perch on nearby trees), since the lack of fencing by this road will mean that small animals will die under the wheels of vehicles. The speeds reached on this road will not, however, be as high as on the motorway, so that the chances for the buzzards to get away will be much higher.

The loss of field and meadow feeding and breeding grounds for birds will not have a negative impact on their population. There will be extensive areas of land along the line of the project under analysis with a similar use structure.

A further two species typical of copses and shrubs and roadsides that are protected under the birds directive have also been listed on the route of the motorway – the red-backed shrike and the ortolan bunting. For these two species, project implementation will cause destruction of a part of their habitat through the cutting down of trees and bushes. In view of the very considerable proposed planting of greenery that the birds will be able to use in the area of the motorway and its adjacent infrastructure (service stations, junctions), however, no negative impact on these species is anticipated.

Linear projects, when functioning, are among the undertakings which have the strongest impact on the environment. In the case of motorways, this impact is at its greatest because roads of this category are fenced off along their entire length (except at slip roads and junctions). One consequence of this is total isolation of animal populations, causing a complete lack of migration. Providing animals with the opportunity for migration is very important for many reasons. The barrier the road erects has a negative impact on many aspects of animal life.

The existence of a barrier in the form of a high-speed road may lead to a fall in animal numbers through reduced reproduction caused by a lack of (or difficulties obtaining) access to places for reproduction or to a partner. Difficulty of access to feeding grounds may also bring about a deterioration in the vitality of a population.

3.5. Impact on landscape

The terrain where the motorway is located does not feature any great variety of landscape. From around km 380 on the motorway, the landscape is predominantly monotonous, with flat land broken only by minor variation (river valleys, stretches of woodland). Four main types of landscape have been identified in the terrain covered by this report. The main criterion adopted for dividing landscapes into types is the degree or quality of changes occurring in the landscape, in relation to the degree of distortion of natural relations in the environment and changes introduced as a result of man's activities. The following landscape types are distinguished:

- near-natural landscape, which includes woodland landscapes and landscapes of woodland clearings and glades, and river valleys,

- natural/cultivated landscape, which includes landscapes of overgrown meadows, agricultural/wooded landscapes, with small areas of woodland among meadows and fields, and agricultural landscapes – meadows, fields, drainage ditches, copses in fields, isolated farm buildings, gardens by houses and orchards,
- cultivated landscape, linked to settlement,
- degraded cultivated landscape, which includes landscapes of areas where highways run.

The planned project mainly passes through terrain that ranks as near-natural or natural/cultivated. This terrain is mainly wooded, or meadows and fields with small clumps of trees and occasional farm buildings, and waste land with groups of natural trees stands.

Photo 3.1 Unutilised meadows near the Rawka

Implementation phase – the impact on landscape qualities during the implementation phase will be short-lived and will be linked to:

- construction of the new road on land hitherto used for other purposes,
- removal of fragments of the forest cover and trees and bushes that form part of the surrounding landscape,
- temporary occupation of adjacent territory by access roads and construction buildings,
- enhanced vehicular traffic and movements of heavy construction equipment.

Photo 3.2/3.3 Examples of the road construction phase in an open landscape

Photo 3.4 Visibility in woods is limited to narrow and short views along roads

Photo 3.5 New scenic openings appear in woods

Operation phase – the impact on landscape and recreational qualities during the operational phase will be long-term and direct.

The motorway under analysis has been earmarked for a new highway corridor, and its functioning will therefore constitute an entirely new spatial element in the surroundings. The greatest exposure will be in the area of planned facilities linked to motorway services: service stations, maintenance loops, end and intermediate toll booths.

The way the road fits into the landscape will depend on the type and nature of the landscape and on the technical design of the motorway (positioning of motorway grade lines relative to existing terrain), and also on the way the immediate surroundings of the planned road are managed, both at present and as planned.

The impact of the planned road on the landscape has been considered in area terms, in other words, with regard to how it will be perceived from some distance off, in the context of a specific type of landscape, and also in local terms, i.e. how the road will be perceived from next to it, in the context of local landscape interiors.

An evaluation of the impact of construction of the planned project (including the planned noise suppression shielding) on the landscape has been carried out on the principle of analysis of construction of facilities already performed in land managed in a similar way.

It is recognised that spatial elements that can be fitted into the surroundings have a negligible impact on the landscape.

A description of the impact of the planned road on the landscape is given below.

A near-natural landscape like a woodland landscape, because of the bushes and young trees that occur in the undergrowth, has fairly limited scenic extent. Landscape interiors are formed by woodland clearings and glades and also by forest roads.

Because of the restricted field of observation in woodland areas, the planned road (here meaning the section of highway No. 70 that is scheduled to be re-routed) will be relatively little visible (apart from where a bit of it crosses a flyover) from within the woods and from the terrain located beyond the woods. In this respect it will have a negligible impact on the landscape.

The felling of trees to build the road will introduce a local but lasting change to the near-natural landscape. The routing of the road through woods opens up the inside of the woods. This may lead to trees being blown down, especially tall pines that are not adapted to deal with wind. The landscape along the planned road will be transformed into an anthropogenic landscape.

An agricultural/wooded landscape features numerous landscape interiors based on fragments of woods and copses amid fields. These terrains feature a rapid rate of natural succession.

Photo 3.6 Visibility in agricultural/wooded landscape is based on landscape interior walls

Photo 3.7 Landscape of overgrown meadows

Photo 3.8 Broad and extensive views in an agricultural landscape

Photo 3.9 Above-road crossings allow one to observe a landscape from a new perspective

Because of the numerous barriers to views, the planned road will be of low visibility in this landscape.

In the event of the planned road cutting through a landscape interior, two smaller interiors will be created. This will have no impact on the nature of the landscape.

A landscape of overgrown meadows features narrow, distant views based on lines of trees on the horizon.

A road run through such a landscape is visible through a screen of young trees. After a few years the road is swallowed up by the landscape.

An agricultural landscape is open in nature, and things that catch the eye are field copses and greenery around buildings.

A road that runs at the terrain level fits well into an agricultural landscape. The most visible element of the road in such an instance will be bridges and approaches to them. How bridges fit into a landscape depends to a large extent on their colour scheme. The same is true of stretches of road run on embankments. In such places the motorway will be something that cuts across the axes of views.

Because of the open nature of an agricultural landscape, the motorway will make its presence felt in it in sections where it is run along high embankments.

A landscape of suburban and rural settlement is made up of single- or two-storey buildings.

The greenery accompanying such buildings absorbs them to a large extent in the surroundings and at the same time separates them off visually from adjacent areas. Open views most commonly occur along the axes of existing roads and in non-built-up intervals between buildings.

In built-up areas, the most important thing is to protect people from the negative impact of the road on human health and life. The shielding that is planned for the motorway will separate the motorway off visually from the housing, either through sound-proofing screens or earth banks, or else the road will be fully concealed in cuttings.

Because of the restricted access to the motorway, its fencing and the high volume of traffic, its operation will split up settled areas. Communication between areas divided by the road will be by overpasses over the planned motorway, or else via underpasses along the planned highway. Most local roads running perpendicular to the planned route will be visually closed off.

It is possible to make compensation for landscape losses in a cultivated landscape if attractive organised green areas appear along the planned project. This may, for example, take the form of strips of greenery.

Photo 3.10 Example of how a road running on an embankment about 6 m high can be fitted in. Bushes and trees grow at its base

Photo 3.11 Example of a road that has been blended into a cultivated landscape (single-family housing on the right-hand side, behind screens hidden in greenery, is the road)

A degraded cultivated landscape occurs in areas where heavy investment has taken place through the development of urbanisation. In such a landscape, natural terrain conditions have been entirely transformed by man.

In the area around the planned motorway, landscapes of this type include existing highways with the usual accompanying buildings for commercial, service, manufacturing and warehousing use and housing blocks, along with high-tension power lines.

Road construction in such a landscape will accelerate the transformation towards further urbanisation.

3.6. Planned demolitions and waste management

Motorway construction will engender a need to remove existing buildings that stand within the limits of the highway strip as established by location decisions.

Under the preliminary project, buildings are set to be removed in 48 settlements (residential buildings together with farm edifices and structures: barns and farm buildings). These buildings are made of wood or building materials (brick, fly-ash blocks and concrete blocks). The roofs are made from ceramic or cement roofing tiles, roofing paper or asbestos cement.

3.7. Impact on Natura 2000 “Dolina Rawki” [Rawka Valley] area

In view of the considerable anthropogenic transformation of the areas lying in the strip potentially to be affected by the A-2 motorway, and the small number and area of valuable natural habitats, the proposed siting of the motorway must receive a positive evaluation. The planned venture will run through the northern end section of the area. The motorway will cut through the Rawka valley in a section ca. 550 m in length (km 406+750 to km 407+300), and will then run along the border of the area for a 400 m section (km 407+300 to km 407+700). The small piece of the valley where the A-2 motorway will run does not feature any exceptional natural value, being an area that has been transformed and is under heavy anthropogenic pressure. The most valuable element in this area is the River Rawka.

Furthermore, there is a small number of valuable natural habitats here, and they cover a small area. In this light we may state that the location selected is the best one as far as protection of nature is concerned. Valorisation and stock-taking of the natural environment has revealed that no protected or rare vascular plants occur in the above fragment of the valley. Nor are there any natural habitats that are the subject of protection in the area.

The siting of the motorway is the main factor that weakens the impact of the venture on the Rawka valley eco-system – this place is not well supplied with rare and protected plant species. From the data presented in the Standard Data Form for this area we may state that the motorway will occupy less than 1% of the surface of the “Rawka Valley” area.

In the construction stage, temporary occupation of land along the planned over-bridge will be necessary for the purposes of the temporary technical road. This road and the areas directly occupied by the bridge will be used for movements of heavy gear. The soil structure will be damaged, as will be the vegetation growing on the land between the boundary lines. An inventory carried out in the Rawka valley on the route of the motorway shows that habitats exposed to destruction or transformation are grasslands and woodlands in which the dominant species is the grey alder. The small areas overgrown with trees, and the absence of any characteristic structure or dominant species mean that this habitat cannot be classed as either wetlands or alder swamp. The nearest protected habitat where the motorway under analysis is concerned is about 200 m to the north, and is a fresh meadow that is extensively used. In view of the distance and the anticipated lack of any changes to water ratios, no potential for a negative impact on this habitat is envisaged.

Fig. 3.1 The A-2 motorway where it crosses the Rawka Valley Natura 2000 area

KEY:

LAND USE [column 1]

Buildings
Arable land
Waste land
Grassland
Woodland
Rushes and peat bog
Bodies of water

PROTECTED AREAS AND ITEMS [column 2]

Nature reserve
Natura 2000 area
Landscape park
Boundary of landscape park
Protected landscape area

Natural habitats – NATURA 2000

- [3] Old river beds and natural eutrophic water bodies with communities of *z. Nympheion, Potamion* **3150**
[4] Lowland and upland fresh meadows, extensively used (*Arrhenatherion elatioris*) **6510**

[blue line] Rivers

PLANT AND ANIMAL SPECIES OCCURRING [column 3]

Water crowfoots (*Batrachium sp.*)
Blackcurrant (*Ribes nigrum*)
Red-backed shrike (*Lanius collurio*)
Peewit (*Vanellus vanellus*)
White stork (*Ciconia ciconia*)
Kingfisher (*Alcedo atthis*)

[Legends on picture:]

Bolimowski Park Krajobrazowy = Bolimów Landscape Park
Rezerwat Rawka = Rawka Reserve
Dolina Rawki = Rawka Valley
Obszar Chronionego Krajobrazu Bolimowsko-Radziejowski z Doliną Środkowej Rawki = Bolimów-Radziejów Protected Landscape Area with Middle Rawka Valley

The building of the bridge over the river will mean that several alders growing on its banks will need to be felled. It will also be necessary to cut down trees and bushes growing on the land intended for the bridge.

The course of the river will not be changed and its bed will not be regulated or enlarged.

One potential threat linked to the implementation phase is the possibility of pollution of the river's waters while work is going on, or destruction of its banks by work going on upon them. Occasional muddying of the river may have a harmful impact on fish and lampreys, for the protection of which this Natura 2000 area was set up, among other reasons.

For 150 metres of the land that is within the Natura 2000 area, an embankment is to be built. The rest of the valley (ca. 450 metres) will be crossed by the project on an over-bridge, as already mentioned. At both ends of the bridge service roads will appear to enable the adjacent land to be accessed and to provide a link between areas with buildings.

Protected bird and animal species have not undergone stock-taking in the immediate neighbourhood of the planned project. The Rawka valley is, however, a migration corridor for various species – birds, mammals and amphibians. At the project implementation stage, transformations to the land, tree and bush clearance and the performance of work and the presence of people and machinery will scare away fauna. While the over-bridge is being built, the frequency and effectiveness of migration will fall, especially during the day, while work is going on. The situation will be better at night, when people and equipment will be away from the valley.

All the impacts described above will cease when work is completed. The land will be reclaimed and vegetation will recolonise it.

One protected species that is under threat if the project is implemented is the blackcurrant, which is under partial protection. There is a site where this plant occurs in the road strip at km 406+990. There will be an impact if work spreads beyond the boundary lines.

At km 406+750, at a distance of ca. 100 m from the motorway boundary lines, there is a white stork's nest. Storks are not birds that would be minded to abandon their nests because of noise or the presence of man. As long as no-one deliberately molests the birds, no negative impact on this species is envisaged.

At the operation stage, acoustic impacts will affect adjacent land, along with air pollutant emissions and soil contamination. One significant threat for the Rawka

valley may be caused by a chance release of pollutants into the river, as a result of surface run-offs from the carriageway.

Noise emission may cause animals moving along the river bed to be frightened away. The impact of vehicle lights (dazzle effect) will also have a negative impact. The A-2 motorway will have the effect of interrupting or restricting the functioning of natural links as a result of increasing traffic intensity.

Since the over-bridge will be raised to a height of 4.5-7 metres, the migration corridor for animals beneath the structure will remain open. All species of animals, including birds and amphibians, will be able to move freely beneath the bridge.

Building of the bridge has an additional benefit in view of the forecast potential for admissible nitrogen dioxide concentrations away from the road itself to be exceeded. The elevation of the emitter (vehicles) will make for far better ventilation and mixing (and thus dispersion) conditions compared to how things would be if the project were to be run along a small embankment or on the flat.

3.8. Impact on Bolimów Landscape Park

The construction of the motorway within the Bolimów Landscape Park will have the following negative consequences:

- Part of the biologically active land will be occupied;
- Several dozen hectares of woodland will be felled (wetlands, broad-leaved woods and forests),
- The wall of trees will be pushed back with the road running through, and it will become exposed to a negative impact, chiefly through air pollution,
- Because of the large traffic intensity and unbroken fencing, the motorway will give rise to a barrier effect, which will prevent animals from making contact between habitats located on opposite sides of the motorway,
- It will have a significant impact on the landscape,
- The Nieborów junction situated at the park boundary will cause increased penetration of the Park by tourists,
- Alien species not naturally occurring in the Park will migrate into the park along the motorway.

Positive consequences of implementation of project:

- The attractiveness of the Park will increase because of better communications with large conurbations (Warsaw, Łódź), and greater numbers of tourists may be expected. This is a positive consideration in view of the potential to present the merits of the Park and to provide ecological education. Meanwhile this factor will have negative consequences for the environment itself because of the increased risk of fire, larger amounts of litter and so on. That is why this point appears on both the plus and minus sides for project implementation.
- Re-routing of NH No. 70 – running it round the edge of the Park, will help to take the flow of vehicles away from the woodland area.
-

3.9. Impact on protected cultural achievements

An inventory of heritage sites has shown that there are three sites to be found on heritage lists within the motorway boundary lines. These are:

- km 373+650 – wooden manor house of the XX century in the village of Grodzisk (Dmosin district),
- Two listed houses in Łagów:
 - o km 388+420 – house no. 43,
 - o km 388+430 – house no. 48.

The park with its listed trees that surrounds the manor was made a listed building in the 1990s. The building itself is also under protection along with the park. When a decision was being taken about the location of the motorway, it turned out that the proposed project clashed with the park and house. In view of its considerable national interest, the Minister for Culture took Decision DOZ-AD-[83]/500/124/05 of 18.05.2005, which completely revoked the final decision of the Provincial Heritage Preservation Office in Łódź of 01.06.1984 listing the manor house and park in Grodzisk, Dmosin district, under no. 717/A. At present the park is not subject to protection, but the actual manor house building is still on the list. Implementation of the project will involve destroying the park and also a need to take down the house.

The two listed buildings identified in Łagów will also be destroyed as a result of motorway construction.

A number of buildings and roadside shrines that are listed and that lie on existing roads in Seligów (km 390+800) and Łagów (388+300 – 388+600) will be exposed to a negative impact as a result of project implementation. Work linked to the construction of an over-bridge and a local road which will run across it above the motorway will be carried on just a few metres away from some of the listed buildings. This may cause these buildings to get dirty (dusty), or may cause them damage as construction materials are transported.

At km 404+480, right next to the motorway boundary lines, near the village of Wólka Łasicka, is a cemetery for World War I German soldiers. At present it is very hard to identify this monument (which is listed). The cemetery is not fenced, and thick shrubbery and young trees have grown all over it. It is very hard to isolate the graves. A memorial should be located in this cemetery (according to the cemetery map). When the inventory was drawn up, this item could not be located.

Fig. 3.2 Location of listed World War I cemetery in relation to the A-2 motorway

Fig. 3.3 Linking new course of NH No. 70 into existing road near listed avenue

Key:
Fill-in tree plantings carried out in recent years
Remnants (stumps) where listed trees have been felled
Listed trees of significant size which are in the zone of the planned project
Planned strip of road
Elements of planned road
Axis of planned road

The main work associated with motorway construction will be carried out at a distance of ca. 20-30 metres from the cemetery. There will be a service road right next to the listed site. What threatens the cemetery is its neglect. While construction work is going on it may be destroyed or transformed through a lack of awareness of what is to be found here. As has already been commented, at present the cemetery area looks like another of the many copses located round about.

The most valuable listed site with which the project under analysis in this report collides is the item listed under number 1150/296/74, namely the Arkadia – Nieborów – Łasieczniki Avenue of Limes. The planned A-2 motorway passes within ca. 2.5 km of this avenue. No impact of the motorway itself on the avenue is possible. But while the motorway is being built, national highway No. 70 is to be re-routed for a 4.4 km section; a section which currently passes through the Bolimów

Landscape Park woodlands. The re-routed road will link up with the existing NH No. 70. At this point there is a collision between the planned project and the listed avenue of trees (fig. 3.3). The road under analysis will join the existing road in two places. This is caused by the need to make a safe crossroads. The link road on the left side (in the Arkadia direction) will give rise to a need to remove some of the fill-in plantation put there a few years ago. Work in this section will be carried out at a distance of ca. 5-7 metres from a listed tree. The Nieborów direction link will be built near to 4 listed trees of considerable size (over 300 cm in circumference). In this case it will be necessary to fell trees planted as fill-in.

The listed trees (apart from being listed in its own right, the avenue is made up of preserved natural items) in the section under analysis are on the other side of a drainage ditch that was recently restored. Project implementation will not give rise to any need to fell listed trees. The threat that the construction phase represents is the potential for mechanical damage to the trunk or root of a tree. As the road is to run on the flat, there will be no need for any change in water ratios at this stage.

During the operation stage, negative impacts will be associated with the following factors:

- winter road treatment – combating slippery road surfaces by scattering salt on the carriageway, which, with melt water and by being sprayed off the surface, will get into the soil and have a negative impact on plant life (including listed trees),
- air pollution – forecasts have not revealed any potential for admissible pollutant levels away from the road strip to be exceeded, but because of the considerable inaccuracy of the forecast and the possibility of unfavourable atmospheric conditions (inversion and stagnation of air masses), local places where these values will be higher away from the road cannot be excluded,
- road accidents – vehicle colliding with tree.

4. DESCRIPTION OF ANTICIPATED ACTIONS AIMED AT PREVENTION OR LIMITATION OF OR NATURAL COMPENSATION FOR NEGATIVE ENVIRONMENTAL IMPACTS AND EVALUATION OF THE EFFICACY OF THE PROPOSED METHODS AND MEANS

4.1. Impact on land surface and soils

- One potential threat during road use is soil contamination caused by substances originating from the road: with the air or with water running off the carriageway.
- The impact of the planned road on soils will be minor – this is borne out by the results of tests carried out on other, existing roads with a similar or greater flow of traffic. We can forecast that the planned road will not significantly impact on the concentration of contaminant substances in the soil.
- Minimising the negative impact of the road on the land surface and soils is chiefly linked to limiting the spread of contaminants, mainly heavy metals and petroleum-derived hydrocarbons. The threat to soils linked to contaminant run-offs will be reduced by the proposed systems for drainage and purification of rainwater from the road surface, comprising sediment traps/sand traps and retaining and filtering tanks.
- To reduce the chlorides concentration in road effluents, it is recommended that the use of de-icing agents containing chlorides be restricted by adhering to the regulations for winter treatment of roads.

- The roadside plantations proposed in this report will have a favourable impact on soil protection. The greenery will reduce the impact of the road on soils by limiting dust formation back up from the substrate, will restrict the spread of contaminants and will prevent erosion processes.

4.1.1. Impact on surface and underground water

- Surface and underground water may be polluted by splashed water and rain and flood run-offs from the carriageway, and by environmentally hazardous spillages of substances in the event of a serious accident.
- Analyses have shown that the admissible total suspension level may be exceeded.
- The anticipated petroleum-derived hydrocarbon concentration in rain water effluents running off the carriageway of the planned A-2 motorway will not exceed the norms.
- The planned route crosses various types of brook and drainage ditch over virtually its entire length. These brooks will take rain and flood water running off the motorway.
- In the section of the A-2 motorway under analysis, one section, from km 389+600 to km 393+800, has been identified which runs through an area which is highly susceptible to contamination of underground water; the reason for this is the presence of a poorly isolated main water-bearing level,
- To minimise the negative impact on water in the section in question, the installation of a sealed rain and flood water drainage system is recommended,
- A sealed rain water drainage system may be produced using sealed roadside ditches (with their sides and bottom sealed), grassed ditches sealed with a geomembrane or bentonite mat or sealed rain water drains.
- Over the rest of the motorway section there is no need to take extra precautions in connection with rain water drainage. If possible, however, removal of rain water using grassed ditches is recommended. The purification capacities of the ditch will then be utilised.
- In the light of the potential that has been identified for total suspension levels to be exceeded, it will be necessary to pre-purify drain water prior to discharging it into tanks with settling traps; at the outlet from each settling/sand trap it is recommended that valves be fitted to enable the flow to be cut off in the event that environmentally hazardous substances are spilled.
- Water running off slopes will flow into open grassed ditches, and as nominally clean water will not require purification.
- In the section of motorway under analysis, a series of retention and filtration tanks has been proposed. The purpose of the tanks is partial removal of rain and flood water pre-purified in settling/sand traps to the soil and to ameliorate run-off surges prior to sending the water to the receiving tank.
- The approximate location of the planned retention and filtration tanks is shown in the table given below:

Table 4.1 Approximate location of planned retention and filtration tanks

Left side		Right side	
km point on motorway			
366+290	394+560	403+400	366+290
366+880	395+010	404+320	368+380
367+510	395+530	404+670	373+110
368+190	396+520	404+980	374+040
368+800	397+370	405+250	386+710
369+580	397+700	405+750	387+690
370+130	399+200	406+330	388+380
389+400	399+490	407+710	391+700
390+140	399+550	408+230	394+020
391+700	399+900	408+670	395+990
392+400	400+980	409+510	397+750
393+400	401+100	410+500	411+020
393+560	401+850	411+020	–
393+960	402+080	411+290	–
–	–	411+350	–

- It is proposed that the sides of the containers be left without any hardening (or that they be reinforced in a natural way), and they should have a gentle gradient to enable the area around a container to be colonised by vegetation.
- The exact location and parameters will be set at the construction project development stage. An alteration in the containers' location by ± 150 m will be admissible.
- The opportunity to drop some containers will be admissible in the event that detailed hydrological calculations show there to be no rational need to have them, since the forecast volumes of water drainage will not disrupt the water flow rate in the receiver to which the water is directed.
- According to the design documentation, the proposed location of the retention and filtration tanks is at a short distance from the edge of receivers (water courses). This location, plus the need for them to be fenced off, will make for a significant limitation of the effectiveness of crossing points for large and medium-sized animals at the following points – km: 390+183, 392+440, 408+635, 399+270, 399+867, 403+475, 411+315.
- In the above instances, in order to preserve the appropriate width and angles of approach to crossings, one of the following solutions must be adopted:
 - o move the tank in relation to the crossing (bridge) away to a distance of at least 75 m (then the tank can be fenced),
 - o if the solution posited in point 1 cannot be implemented (e.g. because of where the boundary lines run), the idea of a tank at that location should be dropped (assuming hydrological calculations allow),
 - o if the existence of a tank cannot be avoided for hydrological reasons, the tank must be left unfenced (although its edge must not be at a distance of less than 20 m from the edge of the facility) – in this case a very gentle side gradient must be used and the sides must be densely planted with vegetation. In this case the fencing will be run between the tank and the edge of the motorway, and will merge into the anti-dazzle screens of the facility.
- At the sites of service stations, maintenance loops and end and intermediate toll booths, the following way of handling waste water is proposed:
 - o waste water contaminated with petroleum derivatives gathered from site around fuel stations, service stations and technical checkpoints is to be pre-purified in separators,

- o waste water from parking places for vehicles carrying hazardous materials is to be drained off to a sealed tank. In this tank, should the need arise, neutralisation of waste water will be possible,
- o domestic waste water will be drained away via the sewage system to a biological waste water purification unit,
- o other waste water with low levels of contamination will undergo pre-purification in settler/sand traps.
- The highway manager will be obliged to obtain water authorisation permits to construct and reconstruct water handling equipment, and to discharge waste water into water courses or into the ground.
- The efficacy of the proposed solutions is to be verified by a post-implementation analysis.

4.1.2. Impact on acoustic climate

- The motorway will take some of the traffic that currently moves along national highways No. 2, No. 14 and No. 8. Analyses have shown that project implementation will have a beneficial impact on the acoustic climate in the built-up zone that lies along these roads.
- Forecasts made for areas located along the proposed motorway indicate that in 2025 there will be about 227 residential buildings within the scope of a negative noise impact. Because of this, acoustic screening equipment will need to be used, which will limit the negative impact from motorway operation on the residential accommodation. With this in mind, the erection of absorbing acoustic screens and earth banks has been proposed. The parameters of the proposed screens are given in the table below:

Table 4.2 Main parameters and approximate location of recommended acoustic screens

No.	Screen number	Screen length* [m]	Screen height [m]	Type of screen	Approx. km point where screen begins*	Screen location, in direction of rising km
1	Acoustic screen no. 1a	180	6.0	Absorbing*	372+750	left side
2	Acoustic screen no. 1	590	6.0	Absorbing*	372+930	left side
3	Acoustic screen no. 2	560	4.5	Absorbing*	373+510	left side
4	Acoustic screen no. 3	821	4.5	Absorbing*	374+380	left side
5	Acoustic screen no. 4	1430	4.5	Absorbing*	375+205	left side
6	Acoustic screen no. 5	390	4.5	Absorbing*	378+255	left side
7	Acoustic screen no. 6	750	4.5	Absorbing*	378+670	left side
8	Acoustic screen no. 7	860	6.0	Absorbing*	381+590	left side
9	Acoustic screen no. 8	705	4.5	Absorbing*	382+700	left side
10	Acoustic screen no. 9	1590	4.5	Absorbing*	383+430	left side
11	Acoustic screen no. 10	245	4.5	Absorbing*	385+050	left side
12	Acoustic screen no. 11	455	4.5	Absorbing*	385+410	left side
13	Acoustic screen no. 12	77	6.0	Absorbing*	385+860	left side
14	Acoustic screen no. 13	330	6.0	Absorbing*	385+975	left side
15	Acoustic screen no. 14	1045	4.5	Absorbing*	386+305	left side
16	Acoustic screen no. 15	347	4.5	Absorbing*	387+940	left side
17	Acoustic screen no. 16	260	6.0	Absorbing*	388+290	left side
18	Acoustic screen no. 17	60	6.0	Absorbing*	388+565	left side
19	Acoustic screen no. 18	260	4.5	Absorbing*	388+620	left side
20	Acoustic screen no. 19	380	6.0	Absorbing*	391+020	left side
21	Acoustic screen no. 20	270	6.0	Absorbing*	391+420	left side
22	Acoustic screen no. 21a	145	4.5	Absorbing*	393+935	left side
23	Acoustic screen no. 21	1100	4.5	Absorbing*	394+010 (for A-2)	left side
24	Acoustic screen no. 22	700	4.5	Absorbing*	395+700	left side
25	Acoustic screen no. 23	460	6.0	Absorbing*	396+405	left side
26	Acoustic screen no. 24	130	4.5	Absorbing*	396+865	left side
27	Acoustic screen no. 25	550	4.5	Absorbing*	398+255	left side
28	Acoustic screen no. 26	1140	4.5	Absorbing*	399+895	left side
29	Acoustic screen no. 26a	200	4.5	Absorbing*	401+025	left side

A-2 motorway construction in section from Stryków I junction (without junction) at km 365+261.42 to the boundary between the Łódź and Mazovia provinces at km 411+465.80

30	Acoustic screen no. 27	500	4.5	Absorbing*	401+230	left side
31	Acoustic screen no. 28	970	4.5	Absorbing*	403+740	left side
32	Acoustic screen no. 29	550	4.5	Absorbing*	404+735	left side
33	Acoustic screen no. 30	520	5.0	Absorbing*	406+090	left side
34	Acoustic screen no. 31	470	4.5	Absorbing*	407+555	left side
35	Acoustic screen no. 31a	45	4.5	Absorbing*	408+050	left side
36	Acoustic screen no. 31b	160	4.5	Absorbing*	408+080	left side
37	Acoustic screen no. 32	515	4.5	Absorbing*	410+385	left side
38	Acoustic screen no. 32a	175	4.5	Absorbing*	410+725	left side
39	Acoustic screen no. 33a	180	4.5	Absorbing*	372+750	right side
40	Acoustic screen no. 33	1145	4.5	Absorbing*	372+930	right side
41	Acoustic screen no. 34	430	4.5	Absorbing*	374+100	right side
42	Acoustic screen no. 35	700	4.5	Absorbing*	377+560	right side
43	Acoustic screen no. 36	650	4.5	Absorbing*	378+780	right side
44	Acoustic screen no. 37	650	4.5	Absorbing*	381+730	right side
45	Acoustic screen no. 38	660	4.5	Absorbing*	382+760	right side
46	Acoustic screen no. 39	750	4.5	Absorbing*	383+445	right side
47	Acoustic screen no. 40	530	4.5	Absorbing*	384+490	right side
48	Acoustic screen no. 41	250	4.5	Absorbing*	385+955 (for A-2)	right side
49	Acoustic screen no. 41a	165	4.5	Absorbing*	385+955 (for A-2)	right side
50	Acoustic screen no. 42	725	4.5	Absorbing*	385+955 (for A-2)	right side
51	Acoustic screen no. 43	95	4.5	Absorbing*	385+955 (for A-2)	right side
52	Acoustic screen no. 43a	90	4.5	Absorbing*	385+955 (for A-2)	right side
53	Acoustic screen no. 44	330	6.0	Absorbing*	385+975	right side
54	Acoustic screen no. 45	1050	4.5	Absorbing*	386+305	right side
55	Acoustic screen no. 46	350	4.5	Absorbing*	387+940	right side
56	Acoustic screen no. 47	260	6.0	Absorbing*	388+290	right side
57	Acoustic screen no. 48	145	6.0	Absorbing*	388+565	right side
58	Acoustic screen no. 49	260	4.5	Absorbing*	388+620	right side
59	Acoustic screen no. 50	570	4.5	Absorbing*	390+040	right side
60	Acoustic screen no. 51	540	6.0	Absorbing*	390+850	right side
61	Acoustic screen no. 52	50	6.0	Absorbing*	391+410	right side
62	Acoustic screen	250	4.5	Absorbing*	393+820	right side

	no. 53a					
63	Acoustic screen no. 53	2420	4.5	Absorbing*	393+995 (for A-2)	right side
64	Acoustic screen no. 54	460	6.0	Absorbing*	396+405	right side
65	Acoustic screen no. 55	125	4.5	Absorbing*	396+865	right side
66	Acoustic screen no. 56	171	4.5	Absorbing*	004+140	right side
67	Acoustic screen no. 57	375	4.0	Absorbing*	399+040	right side
68	Acoustic screen no. 58	400	4.5	Absorbing*	400+810	right side
69	Acoustic screen no. 59	200	4.5	Absorbing*	401+230	right side
70	Acoustic screen no. 59a	530	4.5	Absorbing*	401+430	right side
71	Acoustic screen no. 60	975	4.5	Absorbing*	403+740	right side
72	Acoustic screen no. 61	720	6.0	Absorbing*	404+740	right side
73	Acoustic screen no. 62	840	4.5	Absorbing*	406+200	right side
74	Acoustic screen no. 63	380	4.5	Absorbing*	407+655	right side
75	Acoustic screen no. 64	455	4.5	Absorbing*	408+060	right side
76	Acoustic screen no. 66	280	4.5	Absorbing*	410+725	right side
77	Acoustic screen no. 66a	105	4.5	Absorbing*	410+965 (for A-2)	right side
78	Acoustic screen no. 67	370	4.5	Absorbing*	411+090	right side

* In the section of it that is located on a flyover, it is recommended that the acoustic screen be transparent. A change in the nature of the screen design (to transparent) is also admissible on condition that a suitable acoustic climate is maintained.

The figures given below show examples of the effectiveness of the proposed acoustic screens.

Fig. 4.1 Acoustic climate in vicinity of planned A-2 motorway at km 373 at night, in the year 2025

[top half:] Prior to application of screens
 [bottom half:] After application of screens
 [colour key:] Equivalent sound level in dB(A)

Fig. 4.2 Acoustic climate in vicinity of planned A-2 motorway at km 386 (Łyszkowice junction) at night, in the year 2025

[key as for fig. 4.1]

- It is recommended that the height of the acoustic screens be no less than as given in the above table. Details of the material type, design, length and height should be filled in at the technical project stage. The screens should be manufactured at the stage of project implementation.
- An alteration in screen length by $\pm 10\%$ and an alteration in their location by ± 50 m is admissible. These alterations are not admissible in the event that their introduction means the proposed screens are ineffective.

- Acoustic screens situated by local roads from which access to private land needs to be ensured should be equipped with gate entrances.
- Access to service roads must be provided in the proposed screens running beside the motorway to enable the motorway to be properly serviced. Breaks in the proposed screens are admissible, but their effectiveness must be maintained, which means that in some instances entrance gates will need to be made.
- All acoustic screens have been designed for the most unfavourable noise impact forecast up to 2025 after motorway construction.
- Noise analysis has shown that in some instances there are scattered farm buildings not too far from the motorway which are subject to protection. Because of the small distance from the noise source (motorway), to ensure effective protection screens have to be proposed which run for a substantial distance. In such instances purchasing of the building rather than construction of a screen should be considered. Consent from the building's owner is needed for an action of this type.
- In the event that several edifices cannot be kept to below admissible levels for noise (when screens have been installed) because of their closeness to the motorway, it is proposed that such buildings be purchased before project implementation.
- A listing of buildings earmarked for purchase is given in the table below:

Table 4.3 List of residential buildings for which construction of an acoustic screen may not be economically viable, and buildings for which there is not the technical capability to protect them from noise levels exceeding regulation limits

No.	Acoustic screen no.	Location of residential buildings relative to motorway (km on A-2) and their distance from the edge of the carriageway	Length of acoustic screen [m]	Height of acoustic screen [m]	Proposed solution
1	–	366+300-366+450 (440-505 m) (left side)	–	–	At the post-implementation analysis stage, a check should be made on whether the residential buildings (which, at the report stage, are on the boundary of the night-time admissible noise level) fall within the range of noise at a level that exceeds the admissible limit, and if necessary a decision should be taken on how to protect them.
2	–	369+650 (305 m) (left side)	–	–	At the post-implementation analysis stage, a check should be made on whether the residential building (which, at the report stage, is on the boundary of the night-time admissible noise level) fall within the range of noise at a level that exceeds the admissible limit, and if necessary a decision should be taken on how to protect it.
3	35 (right side)	377+850 (90 m)	700	4.5	The proposed acoustic screen will protect one residential building, and consideration should be given as to whether it would be economically preferable to purchase the property.
4	37 (right side)	382+000 (150 m)	650	4.5	The proposed acoustic screen will protect one residential building, and consideration should be given as to whether it would be economically preferable to purchase the

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					property.
5	9 (left side)	383+750 (75 m) 383+760 (75 m)	1590	4.5	At the post-implementation analysis stage, a check should be made on whether the residential buildings (which, at the report stage, are on the boundary of the night-time admissible noise level) fall within the range of noise at a level that exceeds the admissible limit, and if necessary a decision should be taken on how to protect them.
6	40 (right side)	384+800 (90 m)	530	4.5	At the post-implementation analysis stage, a check should be made on whether the residential building (which, at the report stage, is on the boundary of the night-time admissible noise level) fall within the range of noise at a level that exceeds the admissible limit, and if necessary a decision should be taken on how to protect it.
7	44, 45 (right side)	386+090 (45 m)	330, 1050	6.0, 4.5	At the post-implementation analysis stage, a check should be made on whether the residential building (which, at the report stage, is on the boundary of the night-time admissible noise level) fall within the range of noise at a level that exceeds the admissible limit, and if necessary a decision should be taken on how to protect it.
8	13, 14 (left side)	386+150 (40 m)	330, 1045	6.0, 4.5	At the post-implementation analysis stage, a check should be made on whether the residential building (which, at the report stage, is on the boundary of the night-time admissible noise level) fall within the range of noise at a level that exceeds the admissible limit, and if necessary a decision should be taken on how to protect it.
9	46, 47 (right side)	388+440 (35 m)	350, 260	4.5, 6.0	At the post-implementation analysis stage, a check should be made on whether the residential building (which, at the report stage, is on the boundary of the night-time admissible noise level) fall within the range of noise at a level that exceeds the admissible limit, and if necessary a decision should be taken on how to protect it or whether to purchase it.
10	15, 16 (left side)	388+440 (30 m)	347, 260	4.5, 6.0	The proposed acoustic screen will protect several residential buildings, but it will be necessary to purchase the property located nearest to the motorway because it is not feasible to protect it.
11	51, 52 (right side)	391+130 (45 m)	540, 50	6.0, 6.0	At the post-implementation analysis stage, a check should be made on whether the residential building (which, at the report stage, is on the boundary of the night-time admissible noise level) fall within the range of noise at a level that exceeds the admissible limit, and if necessary a decision should be

A-2 motorway construction in section from Stryków I junction (without junction) at km 365+261.42 to the boundary between the Łódź and Mazovia provinces at km 411+465.80

					taken on how to protect it.
12	19 (left side)	391+350 (40 m)	380	6.0	At the post-implementation analysis stage, a check should be made on whether the residential building (which, at the report stage, is on the boundary of the night-time admissible noise level) fall within the range of noise at a level that exceeds the admissible limit, and if necessary a decision should be taken on how to protect it.
13	53 (right side)	395+700 (35 m) 395+800 (35 m) 395+850 (50 m) 395+900 (50 m)	2420	4.5	At the post-implementation analysis stage, a check should be made on whether the residential buildings (which, at the report stage, are on the boundary of the night-time admissible noise level) fall within the range of noise at a level that exceeds the admissible limit, and if necessary a decision should be taken on how to protect them.
14	54 (right side)	396+610 (25 m)	460	6.0	The proposed acoustic screen will protect several residential buildings, but it will be necessary to purchase the property located nearest to the motorway because it is not feasible to protect it.
15	26 (left side)	400+550 (25 m)	1140	4.5	The proposed acoustic screen will protect several residential buildings, but it will be necessary to purchase the property located nearest to the motorway because it is not feasible to protect it.
16	58, 59, 59a (right side)	401+320 (60 m)	400, 200, 530	4.5, 4.5, 4.5	The proposed acoustic screen will protect one residential building, and consideration should be given as to whether it would be economically preferable to purchase the property.
17	26a, 27 (left side)	401+300 (45 m)	200, 500	4.5, 4.5	At the post-implementation analysis stage, a check should be made on whether the residential building (which, at the report stage, is on the boundary of the night-time admissible noise level) fall within the range of noise at a level that exceeds the admissible limit, and if necessary a decision should be taken on how to protect it.
18	61 (right side)	404+890 (40 m)	720	6.0	At the post-implementation analysis stage, a check should be made on whether the residential building (which, at the report stage, is on the boundary of the night-time admissible noise level) fall within the range of noise at a level that exceeds the admissible limit, and if necessary a decision should be taken on how to protect it.
19	30 (left side)	406+390 (70 m)	520	5.0	At the post-implementation analysis stage, a check should be made on whether the residential buildings (which, at the report stage, are on the boundary of the night-time admissible noise level) fall within the range of noise at a level that

					exceeds the admissible limit, and if necessary a decision should be taken on how to protect them.
20	32, 32a (left side)	410+650 (150 m)	515, 175	4.5, 4.5	The proposed acoustic screen will protect one residential building, and consideration should be given as to whether it would be economically preferable to purchase the property.

- Forecasts have shown that the proposed solutions (screens, purchasing) will protect residential buildings from noise impacts at levels above admissible levels.
- The efficacy of the proposed screens in protecting against noise should be verified at the post-implementation analysis stage.

4.1.3. Impact of vibration

- The following steps need to be taken to avoid damage to buildings in the project implementation stage:
 - o before commencing road works, stock needs to be taken of the technical state of all buildings lying within the anticipated zone of dynamic impacts; this stock-taking should include a list and photographic documentation of all pre-existing damage to buildings that was there before the work began,
 - o before commencing construction work, it should be established which types of vibrating roller will be used – some equipment of this type causes less of an impact, and at places where work will be carried out near to buildings, use of rollers with the smallest negative impact range is advisable,
 - o where the anticipated range of dynamic impacts takes in buildings that are away from the motorway strip, action to protect these buildings should be planned, in the event that measures to protect these buildings are not envisaged in the construction project.
- At the stage of preparation for project implementation, comprehensive diagnostic studies and analyses are needed that specifically include a thorough evaluation of the technical state of buildings directly adjacent to the motorway and ancillary facilities. Technical state evaluation will enable the state of the buildings to be evaluated during and after completion of motorway construction. It will thus be possible to establish the real impact. In justified instances, essential protective work on buildings may turn out to be required.
- Impact monitoring during the construction stage by vibration measurement is recommended. Such monitoring particularly relates to the phase in which vibrating rollers are used.
- At the construction stage, vibrations may occur during the setting of piles for the planned over-bridges and flyovers. To eliminate the impact of vibrations, use of a process that does not cause vibration is recommended for piling work carried out near buildings.

4.1.4. Impact on the atmosphere

- On the basis of analyses and forecasts, there has been found to be potential for admissible levels of substances analysed – nitrogen dioxide and sulphur dioxide – to be exceeded. However, it is only in the case of nitrogen dioxide that excessive concentrations may extend beyond the motorway strip.
- In view of the significant uncertainty in the analyses performed, it will be necessary to take NO₂ and SO₂ measurements along the section analysed as part of the post-implementation analysis.

- Strips of greenery have been proposed along the full length of the stretch of motorway under analysis; these will restrict the spread of contaminants onto land near to the project.
- Construction of the motorway will take over some of the traffic intensity from existing parallel sections of national highways, as a result of which contaminant emissions will fall, improving atmospheric air quality along the roads in question.

4.1.5. Impact on animated nature

- The stretch of motorway under analysis collides in two areas with branches of migration corridors for fauna that are of national significance (supplementary national corridors), which are currently of crucial significance for seasonal migrations and movements of elk and lynx. There is also a collision in three areas with migration corridors of regional significance and in 3 areas with corridors of local significance.
- To minimise the deleterious barrier effect that the motorway will bring about, crossings for animals must be envisaged in the project. The proposed actions to minimise the impact of the planned section of the A-2 motorway on fauna living in the wild have been planned to give an effective reduction in the effects of the ecological barrier created.
- In order to minimise the impact of the motorway on the population of hoofed and predatory mammals, 10 crossing points for large animals have been planned, including 4 over-bridges ("green bridges") above the motorway and 6 underpasses, in the form of bridges and flyovers along the course of the motorway. The underpasses are for the most part (5) of a combination nature – bridges over rivers. In view of their size and location, the crossings will be utilised by all occurring species of large and medium-sized animals, and also by small mammals (stoats and weasels, rodents, insectivorous animals), as well as to some extent by amphibians, snakes and invertebrates.
- To minimise the consequences of the motorway's impact on the medium-sized hoofed mammal population (and also to some extent on amphibian and small mammal populations), 12 crossings for animals have been planned, 11 of which are underpasses, in the form of bridges and flyovers along the course of the motorway. The crossings are for the most part (10) of a combination nature – bridges over rivers or smaller streams.
- A total of 44 crossings for small animals are planned, 25 of these being of a combination nature – they combine the function of a crossing for animals and a passage for small water courses (chiefly field and drainage ditches).
- A total of 6 crossings for amphibians are planned, 4 of which comprise four passages and 2 comprise two. Where they are grouped together, the passages should be located at a maximum mutual distance of 50 m.

4.1.6. Impact on landscape

- To begin with, the planned project runs through terrain featuring rises and falls of no more than a few tens of metres. For the most part the project will run on the flat or on an embankment. There will also be the occasional deep cutting. The surrounding terrain is open and there are occasional copses of trees or the remnants of woodland. Towards the end of the section the project runs through woods that are part of the Bolimów Landscape Park. In open country, the motorway will be visible from a long way off (with the exception of the cuttings), so it would be advisable to plant greenery to alleviate the negative impact on the landscape. The plantations should be planned so as to blend in with the plantations proposed for the vicinity of crossings for animals.
- The proposed plantations will be both tall (trees) and medium-sized (bushes).

4.1.7. Impact on Natura 2000 areas and other protected areas

- The project under analysis collides over a stretch of about 550 m with the Natura 2000 “Dolina Rawki” [Rawka Valley] area (PLH100015),
- To limit the negative impact of the planned motorway on the Rawka valley and the territory of the Bolimów Landscape Park, the following minimising actions were established in consultation with the Park’s management:
 - o The flyover bridge crossing the Rawka valley should be extended so as to cross the whole valley from km 406+750 to km 407+300, which enjoys protection under the Natura 2000 aegis. A longer flyover will almost entirely do away with any transformation of the valley linked to implementation of the project.
 - o The planned service roads in the valley area should be naturally surfaced (e.g. using gravel).
 - o It is recommended that, to reduce the negative impact of the high flyover on the landscape, the outside pillars should be planted around with bushes. The plantations should be carried out in line with the technical conditions for facilities of this type.
 - o Components of the flyover should not be painted bright colours.
 - o Use of lighting on the Rawka valley flyover is not admissible.
 - o Anti-dazzle screens should be fitted, and these will also restrict noise. Wooden screens at least 2 m tall are preferred.
 - o Throughout its span over the Rawka valley, the motorway must have a watertight system to drain away rainfall and flood water.
 - o Before introducing any water into the receiver (the Rawka), pre-purification in suitable installations will be required.
 - o Use of a settling tank integrated with a separator is recommended. Because of the need to locate this installation within the valley, use of a tank that can be fully or partly sunk into the ground is recommended. The pre-purification installation must be fitted with an outlet shut-off valve or a siphoned outlet. The land around the tank should also be planted with vegetation.
 - o Work within the valley should be carried out with due care. Pollution of the waters of the Rawka must not be allowed.
 - o The top layer of soil should be utilised for land reclamation when construction work is over.
 - o It has been suggested that the Park’s management should conduct a programme of natural inspection of the construction work on the section of the project passing through the Park, with particular attention to the crossing over the Rawka valley.
 - o It has been suggested that the management of the Bolimów Landscape Park be responsible for supervising monitoring of the effectiveness of the crossings for animals within the Park and the Natura 2000 Rawka Valley area.
 - o To minimise the negative impact of the motorway on the woodland complexes within the Bolimów Landscape Park, an ecotone zone needs to be set up at the motorway-forest interface. It is suggested that native species that occur in the area of the planned project be used for this, e.g. common oak, bird cherry, blackthorn, mountain ash, black elder, euonymus, common birch, alder buckthorn and common broom.
 - o All tree and bush felling linked to motorway construction should be carried out away from the hatching season for birds.
 - o The Park’s management took a positive attitude to the proposed locations and parameters of the animal crossing points. Material provided confirmed that the crossings had been proposed with a view to the natural conditions and animal migration routes. The are reasons to assert that the crossings

(those proposed are of a great variety of types) will function properly and minimise the barrier effect that the motorway will constitute.

4.1.8. Impact on heritage sites and archaeological monuments

- The inventory of heritage sites revealed there to be three listed sites within the motorway boundary lines, and these sites will be destroyed through project implementation:
 - o km 373+650 – XX century wooden manor house in Grodzisk (Dmosin district),
 - o km 388+420 – house No. 43 in Łagów,
 - o km 388+430 – house No. 48 in Łagów.
- The wooden manor house will be moved to a newly-created open-air ethnographic museum in Nagawki,
- It is suggested that the two other heritage dwellings also be moved free of charge to the museum. These buildings may be reconstructed on the museum site, or used as material to make repairs to other heritage dwellings that are located on the museum site.
- Should it not be possible to come to any agreement regarding moving the buildings, photographic documentation should be created, along with a description of the state of the buildings, and an approach should then be made to the Provincial Heritage Conservation Officer for consent to take down (destroy) the buildings in question.
- Construction work and the transportation of materials needed for project implementation should be carried out in such a way as not to harm or defile the roadside shrines that are on record, which are located by existing roads in Seligów (km 390+800) and Łagów (388+300). In the event that any hazard arises for these items, they should be shielded or else moved, at the Contractor's expense, to some other place as indicated by the Provincial Heritage Conservation Officer.
- Work carried on in the vicinity of the heritage sites located in Seligów and Łagów must be carried on in such a way as not to cause damage to these sites.
- The WW1 German soldiers' cemetery that borders on the planned motorway at km 404+480 is very seriously damaged and overgrown. It is not of major cultural significance at the present time. It is, however, a place where soldiers have been laid to rest, and it would be best not to allow this territory to be defiled. The suggestion is, therefore, to fence this cemetery off while construction work is going on nearby. Were there any threat of contamination of or damage to this site (despite the fencing), the potential for erection of a temporary (while construction work goes on) protective screen should be considered.
- Merging in the re-routed national highway No. 70 will involve a need to clear several dozen trees planted a few years ago as part of supplementary plantations filling in the line of an avenue along the Arkadia-Nieborów road which is heritage listed. The Contractor must obtain consent from the Provincial Heritage Conservation Officer to fell trees in this listed avenue.
- Implementation of the re-routing of NH No. 70 will not give rise to a need to fell listed trees of heritage dimensions.
- Work carried on near these listed trees must be pursued with great caution so as not to cause damage to branches, bark or roots. It is suggested that the existing drainage system (grassy ditches) be left unchanged, as this will enable work near the tree roots which might have a deleterious effect on the trees' health to be avoided.
- It is recommended that a plantation programme be drafted that fits in with the structure of the avenue, which would then be submitted for approval to the Heritage Conservation Officer.

- In areas where archaeological monuments that qualify for salvage studies stand, archaeological excavations have either been completed or are still under way (as at the end of 2007 and early 2008).
- It is not possible to say whether all traces of the past have been investigated during this work. There is the possibility that new sites will be uncovered while construction work is going on. Consequently there must be constant archaeological supervision of the construction area. Should any new archaeological findings be identified during this supervision, the need will arise for salvage excavations to be carried out.

4.2. Impact on human health linked to road safety

- At present, all transit traffic takes place along existing national highways. Unrestricted access, non-standard parameters and the presence of pedestrians and cyclists means that accidents happen very frequently. When the A-2 motorway has been built, the existing road network will see a fall in traffic load which will have a positive impact on road safety. It will also bring about a fall in air pollution and an improvement in the acoustic climate in areas contiguous to these roads.

5. RECOMMENDATIONS IN RESPECT OF POST-IMPLEMENTATION ANALYSIS AND MONITORING

The performance of a post-implementation analysis after the project has been commissioned is aimed at verifying the assumptions made in the impact assessment and establishing the efficacy of the proposed protective installations.

For the fragment of the A-2 motorway under analysis, performance of a post-implementation analysis in the sphere of noise and of contamination of rain and flood water delivered to receivers following prior pre-purification is recommended, along with an evaluation of the state of air pollution at the boundary of the highway strip.

Under the protection plan for the Bolimów Landscape Park and in line with the results of a meeting to look at how the project's impact on the Park can be minimised, monitoring should include a 3-year period of analysis of the effectiveness of the crossings for animals that are located within the Park. The monitoring itself will be supervised by the management of the Bolimów Landscape Park.

6. CONCLUSIONS

From the analyses carried out for the purposes of this report, we may state that the A-2 motorway is a necessary project. Traffic forecasts show that it will take a significant proportion of the traffic that currently travels along national highways No. 2, No. 14 and No. 8. A fall in traffic will bring about an improvement in acoustic climate and road safety and will cause a diminution in air pollution and a decrease in the risk of a serious accident occurring in areas in the vicinity of these roads.

Project implementation will mean that ca. 677 ha of land will have to become permanently occupied – this is for the most part farmland and waste land and fragments of woodland. The project will not have a significant impact on areas, species or habitats of the Natura 2000 network. It will not disturb the cohesion of the area with which it collides – the Rawka valley. The project in question will pass through the Natura 2000 area entirely on a flyover. Analyses have shown that the most significant impact will be the deterioration in the acoustic climate, the air pollution in adjacent areas and the intersection with animal migration routes.

Following consideration of the protective measures put forward in this report:

A-2 motorway construction in section from Stryków I junction (without junction) at km 365+261.42 to the boundary between the Łódź and Mazovia provinces at km 411+465.80

- acoustic protection systems (screens, earth banks, cuttings),
- crossings for animals,
- the rain water drainage and pre-purification system,
- plantations of greenery,

it is possible to state that the planned A-2 motorway in the section from the Stryków I junction (no junction) at km 365+261.42 to the boundary between the Łódź and Mazovia provinces at km 411+465.80 will not have any significant impact on the environment.

The project will not have a significant impact on priority species or habitats and will not have any significant impact on Natura 2000 areas.