**Project No. 50630/503/501**

# SECTION MARKED III (BETWEEN CHAINAGE 161.0 AND 174.5 KM) IN CSONGRÁD COUNTY OF M5 MOTORWAY

# ENVIRONMENTAL IMPACT ASSESSMENT IN DETAIL

**UVATERV RT.**

**BUDAPEST, February 1999**

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| Project: | M5 Motorway Csongrád County section<br>(126.4 – 174.5 km) | |
| Designed phase: | ENVIRONMENTAL IMPACT ASSESSMENT IN DETAIL<br>Section III 161.0 – 174.5 km | |
| Designed branch: | ENVIRONMENTAL PROTECTION | CSONGRÁD COUNTY |
| | | Project No.: 50630/503/501 |
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# INTRODUCTION

The section of M5 Motorway under examination is part of the route marked E75 of the European public road network. It provides a north-south connection both between the capital city and the southern areas of the country and, in international relation, between the northern, Northwest-European and the Southeast-European countries. M5 Motorway is also part of the so-called "Helsinki Corridor No. IV".

In the process of development of the Hungarian expressway network the section Budapest – Újhártyán was constructed in Phase 0, while section Újhartyán – Kiskunfélegyháza thereof was built as Phase I thereof. Phase III would include the implementation of the section leading up to the State border in two steps (Sections II/B and III), joining the motorway Novi Sad – Beograd.

The M5 Motorway is constructed as a toll motorway (except for the section bypassing Kecskemét). The extension of the motorway up to the State border is to be the next step of the road network development. The following sections of the M5 Motorway will be constructed, like the previous phase, in the framework of concession funding, under Government Decree No. 2119/1997 (V.14.)

In order to prevent unfavourable environmental effects Section 67 of Act LIII of 1995 on the General Rules of the Protection of the Environment prescribes to carry out "an environmental impact assessment prior to the commencement of activities exercising a considerable effect on the environment". The activities exercising a considerable effect on the environment are defined in the list of activities subject to impact assessment, in Schedule No. 1 to Government Decree No. 152/1995 (XII.12.) on the Scope of Activities Subject to Environmental Impact Assessment and on the Detailed Rules of the Relevant Regulatory Procedure", regulating the implementation of the Act. Element 62 of the list prescribes the compulsory execution of the impact assessment procedure for the motorways and motor roads.

Taking all these into consideration, UVATERV Rt. prepares, in the course of preparatory works, the environmental impact assessment of M5 Motorway's section in Csongrád County on the basis of the mandate of the Office of Motorway Development of the Road Management and Coordination Directorate, with the involvement of subcontractors.

The impact study prepared for the environmental impact assessment procedure examines the section in Csongrád County – according to the expectable financing schedule – broken down in two road sections. The two road section under examination are the following:

- section marked II/B between chainages 126.4 (county border) and 161.0 km and
- section marked III between chainages 161.0 and 174.5 km (State border).

**The present work includes the environmental impact study of section marked III of M5 Motorway in Csongrád County.**

Remark of the editor: The expert documents constituting the basis of the present study comprised the entire section in Csongrád County in one study, these documents were – when applicable – separated according to the two sections under examination. Numbering, table breakdown, incidental construing difficulties occurring from time to time are consequences of this breakdown considered subsequently necessary.

# 1. PRELIMINARIES
# PRESENTATION OF THE PLANNED MOTORWAY

## 1.1. PLANNING PROCESS

Planning of M5 Motorway started at the beginning of the 1970s. After preparation of the plans of the section between Budapest – Kecskemét UVATERV elaborated the study plans of the section between Kecskemét and the State border in the second half of the 1970s. After approval thereof the planning for licensing of the sections being critical from the aspect of area assurance (bypassing Kecskemét and Szeged) started. The plans were accomplished in the course of 1981-1982 and the zone necessitated by the motorway was approved in the General Zoning plans as well.

However, from the beginning of the 1980s the planning works slowed down due to the decrease of the investment resources, thus the detailed drawings of the bypass sections as well as the plan for licensing of the section between Kecskemét - Szeged were not elaborated. At the same time the public pressure, the demand for property purchase, house building increased in the zone affected by the motorway. Consequently, in 1988 the area assuring plan of the section between Kecskemét – Szeged was elaborated, afterwards the planning of the section up to the State border was continued. In the framework thereof, in Phase I the so-called "Plan of Reconciliation with the Population" was prepared.

The Plan of Reconciliation with the Population applied each administrative unit, with separate environmental description in each case. In possession of the plans meetings with the inhabitants were organized in each affected settlement, at which the inhabitants of the settlement could get acquainted with the planned track of the motorway. Remarks made at the meetings were taken into consideration in further phases of the planning. Plans for licensing were finally elaborated in 1991, dividing the section up to the State border into four sections:

- Section I between chainages 73.0 – 101.5 km
- Section II between chainages 101.5 – 126.3 km
- Section III between chainages 126.3 – 156.5 km
- Section IV between chainages 156.3 – 174.8 km.

In the plans for licensing there are also detailed environmental chapters that may be regarded as the preliminaries of the present work. These plans were reconciled with the authorities and approved by the authorities later on. During the previous planning process the environmental authority participated in all reconciliation discussions, legal and regulatory procedures.

However, during the past period, by the coming into force of the Environmental Act the licensing conditions changed. As mentioned in the Introduction, motorways were ranked to the activities subject to environmental impact assessment. In such circumstances it is required that in the framework of the present document the environmental impact study of sections III and IV of the new motorway should be elaborated as per breakdown of the plan for licensing, which is the basic document of the environmental licensing procedure.

Since the preparation of the plans for licensing in 1991 the sectioning of the motorway changed. Currently the sections and their boundaries are the following:

Section 0: between chainages 18.0 – 44.3 km

| | | |
|---|---|---|
| Section I | between chainages 44.3 – 113.5 km | |
| | including: | |
| | Section I/A | between chainages 44.3 – 73.5 km |
| | Section I/B | between chainages 73.5 – 90.5 km |
| | Section I/C | between chainages 90.5 – 113.5 km |
| Section II | between chainages 113.5 – 161.0 km | |
| | including: | |
| | Section II/A | between chainages 113.5 – 126.4 km |
| | Section II/B | between chainages 126.4 – 161.0 km |
| Section III | between chainages 191.0 – 174.5 km | |

Out of these, sections 0 and I were already constructed and, as far as we know, there are valid licences for section II/A. The present impact study refers to section III according to the new sectioning. Simultaneously with this document the environmental impact study is being elaborated as well.

## 1.2. PRESENTATION OF THE TRACK

The section examined in the framework of the present document starts at chainage 161.0 km, after Szeged-Node North. The section under examinations ends at chainage 174.5 km, the State border of Hungary. The former section marked II/B in Csongrád County is comprised in the other impact study to be elaborated simultaneously with the present document. The track is shown in Figure 1 in a concise manner at a scale M = 1: 100,000.

The section under examination touches the administrative areas of 3 settlements on the whole:

- Szeged – Kiskundorozsma between chainages 161.0 – 164.4 km
- Domaszék between chainages 164.4 – 169.1 km and
- Röszke between chainages 169.1 – 174.5 km.

The motorway leads from the present main road No.5 and the railway line to Subotica to the west. It avoids the city of Szeged to the west, Domaszék to the east and Röszke again to the west.

Figure 1

Concise map of the planned track
M = 1 : 100,000

The motorway is of a plain region character, its track is resolved with large-radius arcs, its layout and altitude shaping is quiet and generous. Since its location was practically not or almost not influenced by the relief relations, the emphasis in its tracking was put on the creation of regional connections, avoiding or possible sparing of the detached farms, agricultural and industrial facilities.

In the section at Dorozsma the designated track leads practically only through pasturelands and ploughlands. Between roads marked 5404 and 5408 the planned motorway crosses the Algyő main channel, then leads further between Outer-Matyér channel and the main channel. Between road marked 5408 and Matyér-Subasa main channel the motorway leads on the eastern side of the hobby-gardens and small gardens in Dorozsma, at a distance of approx. 70-80 m. In the area of Domaszék and Röszke the motorway leads again through a dense farm region.

Planned nodes:

- Szeged- Node West (Domaszék) at chainage 165 + 506 km (main road No.55)
- Szeged- Node South (Röszke) at chainage 172 + 510 km (road No.5512)

Planned road passages and engineering structures:

- underpass under road marked 5408 and bicycle path at chainage 162 + 244 km
- underpass under dirt road at chainage 164 + 055 km
- underpass under correction of main road No. 55in Szeged- Node West at chainage 165 + 506 km
- underpass under dirt road at chainage 167 + 317 km
- underpass under dirt road at chainage 169 + 106 km
- underpass under dirt road at chainage 169 + 930 km
- underpass under dirt road at chainage 171 + 022 km
- underpass under road marked 5512 at chainage 172 + 510 km

Rest areas:

- Rest area at Röszke around chainage 173 km bilateral simple rest area to be developed perspectivically into a complex rest area

## 1.3. HORIZONTAL AND ALTITUDE CHARACTERISTICS OF THE TRACKING

The technical specifications of M5 Motorway and the relevant road corrections comply with the requirements of Standard No. ME-07-3713-94 on “Planning of public roads”. The motorway belongs to the planning category K.I.a.A (motorway in outskirts and plain region):

- Planned speed: 120 km/h
- Visibility for stop: 270 m

| In case of $V_t$=120 km/h | Permitted | Applied |
|---|---|---|
| • smallest circular-arc radius | 750 m | 6,000 m |
| • smallest parameter | 300 m | 1,761.81 m |
| • highest ascent | 4 % | 0.6 % |
| • smallest convex camber | 15,000 m | 50,000 m |
| • smallest concave camber | 6,000 m | 300,000 m |

At other roads the following characteristics were taken into consideration:

- Corrections of second class main roads (roads Nos. 50 and 55) were ranked to the planning category K.II.a.A and developed according to planned speed $V_t$=100 km/h.
- Corrections of by-roads (marked 5408, 5431, 5512) were ranked to planning category K.II.b.A and developed according to planned speed $V_t$=80 km/h.

The cross-sectional characteristics were developed with 2 traffic lanes, emergency lane and separating lane for each direction, as follows:

- Width of crown 26.5 m
- Width of traffic lane 3.75 m
- Width of emergency lane 3.0 m
- Width of separating lane 3.6 m
- Width of roadside 0.95 m
- Lateral decline of pavement 2.5 %

In case of slip road or slow road:

- Width of crown 30.0 m
- Width of slip road or slow road: 3.75 m
- Width of roadside 1.95 m

## 1.4. EARTHWORKS

The planned motorway section leads on an embankment all the way. Prior to the performance of the earthworks soil, humus must be removed in a thickness of min. 20 cm and deposited alongside the motorway in spoil-areas of max. 1.5 m height.

Appropriate earth material for embankment construction must be assured from mining sites (they can be found in the neighbourhood of the planned track in sufficient number already at present, therefore at exploitation the already existing mines are to be preferred). Between chainages 158.46 – 159.06 km soil exchange is necessary, since at this site currently a liquid dung depot is to be found. Naturally that will be relocated, however the area must be relieved from the existing soil contamination according to the requirements, e.g. by transporting the same to a dump suitable for receiving polluted soil.

The compaction degree desired in the whole mass of the embankments is 85%. In the embankments' upper thickness of 0.5 m and in some places of the removal to be considered as gullies in the upper 25 cm a min. compaction of 90% is required. The masses of the separating lane and the roadside have to be compacted to a compaction degree of 95%.

The bank slope of the motorway embankment is 1:2.5; the bank of the node branches and other roads is 1:1.5. On the surface of the earthworks the designed CBR is 5%. It can be ensured by laying a sandy gravel protection layer of 20 cm thickness. The planned protection layer is to prevent damages caused by frost and thaw as well.

At sites where the maximum groundwater level approaches the ground level, the application of technological textiles and geo-grid is recommended. The endangered areas are the following:

- between chainages 161.00 – 169.70 km
- between chainages 162.20 – 164.70 km
- between chainages 167.10 – 167.30 km
- between chainages 168.30 – 169.60 km
- between chainages 169.95 – 170.025 km
- between chainages 171.50 – 172.00 km.

Between chainages 162.3 and 164.0 km for the sake of noise protection a noise screening wall or as an alternative a protection dam may be constructed. Its bank has to be of a proportion of 1:1.5.

The separating lane, the roadside and the bank surfaces are to be covered by 10 cm thick soil and grassed. The noise protection embankment has to be covered by soil of a thickness suitable for intense vegetation plantation.

## 1.5. PRESENT AND EXPECTABLE TRAFFIC

In 1996 the Design Traffic per Hour (MOF) of the roads affected foreseeably by the motorway construction was the following:

- On road No. 50 between Szeged and the State border 450
- On road No. 55 between Domaszék and Szeged 1,208

(The aggregated traffic data per hour and day are comprised in the Traffic Table No. 1, breakdown in detail are indicated in Traffic Tables Nos. 2-6 for the entire section in Csongrád County, thus enabling the comparison of the traffic relations and the running-down of the traffic on the road network. Information for section marked III is highlighted by grey background).

As a consequence of natural traffic development, these values will considerably increase by 2015. For example in case of a toll of HUF 10/km the following traffics may be expected, without the construction of the examined section up to the State border:

- On road No. 50 between Szeged – State border 1,997
- On road No. 55 between Domaszék – Szeged 1,659

(see further in Traffic Tables Nos. 1-6)

Traffic Table No.1 **Aggregated traffic data in the present status and in 2015 in toll-free version and with toll**

| | | 1996 | | | In 2015 without motorway (zero version) | | | | | | In 2015 with motorway | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | HUF 10 / km toll | | | HUF 20 / km toll | | | HUF 10 / km toll | | | HUF 20 / km toll | | |
| Road No. | Section | MOF | Average Daily Traffic | | MOF | Average Daily Traffic | | MOF | Average Daily Traffic | | MOF | Average Daily Traffic | | MOF | Average Daily Traffic | |
| | | (Unit / hour) | (veh./ day) | (Unit / day) | (Unit / hour) | (veh./ day) | (Unit / day) | (Unit / hour) | (veh./ day) | (Unit / day) | (Unit / hour) | (veh./ day) | (Unit / day) | (Unit / hour) | (veh./ day) | (Unit / day) |
| 50 | M5 Motorway - Kistelek | 1,560 | 9,278 | 13,102 | 1,944 | 14,294 | 16,329 | 1,827 | 13,737 | 15,347 | 697 | 4,178 | 5,852 | 1,177 | 7,557 | 9,887 |
| 50 | Kistelek | 1,187 | 8.638 | 9,974 | 2,108 | 16,543 | 17,708 | 1,981 | 15,917 | 16,644 | 756 | 4,656 | 6.347 | 1,276 | 8,439 | 10,722 |
| 50 | Kistelek – Balástya | 1,095 | 7,251 | 9,197 | 2,006 | 15,021 | 16,849 | 1,925 | 14,701 | 16,168 | 1,207 | 8,394 | 10,136 | 1,637 | 11,453 | 13,753 |
| 50 | Balástya – Szatymaz | 1,399 | 9,589 | 1,174 | 2,085 | 15,510 | 17,510 | 1,990 | 15,114 | 16,719 | 1,346 | 9,344 | 11,305 | 1,716 | 12,005 | 14,414 |
| 50 | Szatymaz – M43 Node | | | | 2,085 | 15,510 | 17,510 | 1,990 | 15,114 | 16,719 | 1,350 | 9,380 | 11,341 | 1,716 | 12,005 | 14,414 |
| 50 | M43 Node – Szeged | 1,542 | 10,858 | 12,953 | 2,085 | 15,510 | 17,510 | 1,990 | 15,114 | 16,719 | 1,561 | 11,218 | 13,115 | 1,702 | 12,776 | 14,296 |
| 50 | Szeged – State border | 450 | 3,280 | 3,780 | 1,997 | 15,214 | 16,776 | 1,997 | 15,214 | 16,776 | 856 | 6,824 | 7,187 | 911 | 7,197 | 7,655 |
| M5 | Kiskunfélegyháza – Kistelek | | | | | | | | | | 2,335 | 17,905 | 19,618 | 1,299 | 10,766 | 10,911 |
| M5 | Kistelek – Balástya | | | | | | | | | | 2,360 | 18,129 | 19,825 | 1,297 | 10,766 | 10,898 |
| M5 | Balástya – Szeged-North | | | | | | | | | | 2,272 | 17,529 | 19,087 | 1,260 | 10,454 | 10,580 |
| M5 | Szeged-North – Szeged-West | | | | | | | | | | 1,557 | 11,516 | 13,080 | 1,065 | 7,925 | 8,942 |
| M5 | Szeged-West – State border | | | | | | | | | | 1,142 | 8,393 | 9,592 | 1,086 | 8,020 | 9,124 |
| M43 | M5 Motorway - Main road No.50 | | | | | | | | | | 2,161 | 16,461 | 18,153 | 995 | 7,700 | 8,358 |
| 5411 | Kiskunmajsa – M5 Motorway | | | | | | | | | | 123 | 907 | 1,036 | 92 | 616 | 773 |
| 5411 | M5 Motorway – Kistelek | 109 | 698 | 913 | 128 | 841 | 1,079 | 192 | 1,298 | 1,614 | 168 | 1,266 | 1,414 | 98 | 656 | 827 |
| 5422 | Forráskút – M5 Motorway | | | | | | | | | | 243 | 1,857 | 2,042 | 247 | 1,184 | 2,073 |
| 5422 | M5 Motorway – Balástya | 232 | 1,921 | 1,949 | 165 | 1,310 | 1,388 | 174 | 1,377 | 1,462 | 200 | 1,609 | 1,679 | 220 | 1,663 | 1,851 |
| 55 | Domaszék – M5 Motorway | | | | | | | | | | 1,692 | 12,873 | 14,216 | 1,696 | 12,882 | 14,247 |
| 55 | M5 Motorway - Szeged | 1,208 | 9,190 | 10,145 | 1,659 | 12,549 | 13,933 | 1,671 | 12,626 | 14,037 | 1,096 | 8,233 | 9,205 | 1,444 | 10,853 | 12,132 |

Remark: Lines marked with grey colour comprise traffic data for the section under examination

Traffic Table No. 2 **Distribution of the cross-sectional road traffic in 1996**

| Daytime (6-22) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Bus | | Lorry | | | | | | |
| Road No. | Section | Car (veh./day) | Single (veh./day) | Articulated (veh./day) | Light (veh./day) | Heavy (veh./day) | Trailer (veh./day) | Motorcycle (veh./day) | Bicycle (veh./day) | Small speed vehicle (veh./day) | Total (veh./day) |
| 50 | M5 Motorway. – Kistelek | 6,024 | 276 | 0 | 662 | 655 | 692 | 16 | 3 | 0 | 9,278 |
| 50 | Kistelek | 6,485 | 154 | 4 | 247 | 323 | 485 | 60 | 0 | 0 | 8,638 |
| 50 | Kistelek – Balástya | 5,322 | 137 | 5 | 211 | 297 | 515 | 25 | 0 | 0 | 7,251 |
| 50 | Balástya – Szatymaz | 7,302 | 142 | 1 | 207 | 424 | 516 | 18 | 0 | 0 | 9,589 |
| 50 | Szatymaz – Szeged | 8,452 | 174 | 14 | 171 | 374 | 521 | 24 | 15 | 7 | 10,858 |
| 50 | Szeged – State border | 2,612 | 126 | 2 | 57 | 48 | 73 | 19 | 10 | 0 | 3,280 |
| 5411 | Kiskunmajsa – Kistelek | 477 | 20 | 0 | 37 | 33 | 39 | 14 | 13 | 11 | 698 |
| 5422 | Forráskút – Balástya | 1,413 | 4 | 0 | 39 | 58 | 45 | 54 | 152 | 10 | 1,921 |
| 55 | Domaszék – Szeged | 6,758 | 130 | 46 | 64 | 484 | 349 | 242 | 356 | 63 | 9,190 |
| By night (22-6) | | | | | | | | | | | |
| | | | Bus | | Lorry | | | | | | |
| Road No. | Section | Car (veh./day) | Single (veh./day) | Articulated (veh./day) | Light (veh./day) | Heavy (veh./day | Trailer (veh./day) | Motorcycle (veh./day) | Bicycle (veh./day) | Small speed vehicle (veh./day) | Total (veh./day) |
| 50 | M5 Motorway. – Kistelek | 661 | 29 | 0 | 79 | 78 | 82 | 1 | 0 | 0 | 9,278 |
| 50 | Kistelek | 733 | 16 | 0 | 29 | 38 | 58 | 6 | 0 | 0 | 8,638 |
| 50 | Kistelek – Balástya | 601 | 15 | 0 | 25 | 35 | 61 | 2 | 0 | 0 | 7,251 |
| 50 | Balástya – Szatymaz | 825 | 15 | 0 | 25 | 51 | 61 | 2 | 0 | 0 | 9,589 |
| 50 | Szatymaz – Szeged | 955 | 19 | 1 | 20 | 45 | 62 | 2 | 2 | 0 | 10,858 |
| 50 | Szeged – State border | 295 | 13 | 0 | 7 | 6 | 9 | 2 | 1 | 0 | 3,280 |
| 5411 | Kiskunmajsa – Kistelek | 40 | 2 | 0 | 3 | 3 | 3 | 1 | 1 | 1 | 698 |
| 5422 | Forráskút – Balástya | 117 | 0 | 0 | 3 | 5 | 4 | 4 | 12 | 1 | 1,921 |
| 55 | Domaszék – Szeged | 561 | 10 | 4 | 5 | 40 | 29 | 18 | 27 | 4 | 9,190 |

Remark: Lines marked with grey colour comprise the traffic data referring to the section under examination.

Traffic Table No. 3 **Distribution of the cross-sectional road traffic in 2015 without motorway in the version of HUF 10 / km toll**

| Daytime (6-22) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Bus | | Lorry | | | | | | |
| Road No. | Section | Car (veh./day) | Single (veh./day) | Articulated (veh./day) | Light (veh./day) | Heavy (veh./day) | Trailer (veh./day) | Motorcycle (veh./day) | Bicycle (veh./day) | Small speed vehicle (veh./day) | Total (veh./day) |
| 50 | M5 Motorway. – Kistelek | 10,770 | 308 | 35 | 391 | 554 | 671 | 84 | 16 | 9 | 14,294 |
| 50 | Kistelek | 12,465 | 357 | 40 | 452 | 641 | 777 | 97 | 19 | 10 | 16,543 |
| 50 | Kistelek – Balástya | 11,318 | 324 | 36 | 411 | 582 | 706 | 88 | 17 | 9 | 15,021 |
| 50 | Balástya – Szatymaz | 11,687 | 334 | 38 | 424 | 601 | 729 | 91 | 17 | 10 | 15,510 |
| 50 | Szatymaz – M43 Node | 11,687 | 334 | 38 | 424 | 601 | 729 | 91 | 17 | 10 | 15,510 |
| 50 | M43 Node – Szeged | 11,687 | 334 | 38 | 424 | 601 | 729 | 91 | 17 | 10 | 15,510 |
| 50 | Szeged – State border | 11,464 | 328 | 37 | 416 | 590 | 715 | 89 | 17 | 10 | 15,214 |
| 5411 | Kiskunmajsa – Kistelek | 531 | 15 | 1 | 13 | 31 | 24 | 31 | 120 | 13 | 861 |
| 5422 | Forráskút – Balástya | 963 | 3 | 0 | 26 | 40 | 31 | 37 | 104 | 7 | 1,310 |
| 55 | Domaszék – Szeged | 9,507 | 219 | 41 | 233 | 500 | 571 | 232 | 210 | 83 | 12,549 |
| By night (22-6) | | | | | | | | | | | |
| | | | Bus | | Lorry | | | | | | |
| Road No. | Section | Car (veh./day) | Single (veh./day) | Articulated (veh./day) | Light (veh./day) | Heavy (veh./day | Trailer (veh./day) | Motorcycle (veh./day) | Bicycle (veh./day) | Small speed vehicle (veh./day) | Total (veh./day) |
| 50 | M5 Motorway. – Kistelek | 1,217 | 33 | 4 | 47 | 66 | 80 | 8 | 2 | 1 | 14,294 |
| 50 | Kistelek | 1,408 | 38 | 4 | 54 | 76 | 92 | 9 | 2 | 1 | 16,543 |
| 50 | Kistelek – Balástya | 1,279 | 35 | 4 | 49 | 69 | 84 | 8 | 2 | 1 | 15,021 |
| 50 | Balástya – Szatymaz | 1,321 | 36 | 4 | 50 | 72 | 87 | 8 | 2 | 1 | 15,510 |
| 50 | Szatymaz – M43 Node | 1,321 | 36 | 4 | 50 | 72 | 87 | 8 | 2 | 1 | 15,510 |
| 50 | M43 Node – Szeged | 1,321 | 36 | 4 | 50 | 72 | 87 | 8 | 2 | 1 | 15,510 |
| 50 | Szeged – State border | 1,295 | 35 | 4 | 50 | 70 | 85 | 8 | 2 | 1 | 15,214 |
| 5411 | Kiskunmajsa – Kistelek | 44 | 1 | 0 | 1 | 3 | 2 | 2 | 9 | 1 | 841 |
| 5422 | Forráskút – Balástya | 80 | 0 | 0 | 2 | 3 | 3 | 3 | 8 | 0 | 1,310 |
| 55 | Domaszék – Szeged | 789 | 17 | 3 | 19 | 41 | 47 | 18 | 16 | 5 | 12,549 |

Remark: Lines marked with grey colour comprise the traffic data referring to the section under examination.

Traffic Table No. 4 **Distribution of the cross-sectional road traffic in 2015 without motorway in the version of HUF 20 / km toll**

| Daytime (6-22) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Bus | | Lorry | | | | | | |
| Road No. | Section | Car (veh./day) | Single (veh./day) | Articulated (veh./day) | Light (veh./day) | Heavy (veh./day) | Trailer (veh./day) | Motorcycle (veh./day) | Bicycle (veh./day) | Small speed vehicle (veh./day) | Total (veh./day) |
| 50 | M5 Motorway – Kistelek | 10,351 | 296 | 33 | 376 | 532 | 645 | 80 | 15 | 9 | 13,737 |
| 50 | Kistelek | 11,993 | 343 | 39 | 435 | 617 | 748 | 93 | 18 | 10 | 15,917 |
| 50 | Kistelek – Balástya | 11,077 | 317 | 36 | 402 | 570 | 691 | 86 | 17 | 9 | 14,701 |
| 50 | Balástya – Szatymaz | 11,388 | 326 | 37 | 413 | 586 | 710 | 88 | 17 | 10 | 15,114 |
| 50 | Szatymaz – M43 Node | 11,388 | 326 | 37 | 413 | 586 | 710 | 88 | 17 | 10 | 15,114 |
| 50 | M43 Node – Szeged | 11,388 | 326 | 37 | 413 | 586 | 710 | 88 | 17 | 10 | 15,114 |
| 50 | Szeged – State border | 11,464 | 328 | 37 | 416 | 590 | 715 | 89 | 17 | 10 | 15,214 |
| 5411 | Kiskunmajsa – Kistelek | 820 | 23 | 1 | 20 | 48 | 37 | 48 | 185 | 21 | 1,298 |
| 5422 | Forráskút – Balástya | 1,013 | 3 | 0 | 28 | 42 | 32 | 39 | 109 | 7 | 1,377 |
| 55 | Domaszék – Szeged | 9,566 | 221 | 41 | 235 | 503 | 547 | 233 | 212 | 83 | 12,626 |
| By night (22-6) | | | | | | | | | | | |
| | | | Bus | | Lorry | | | | | | |
| Road No. | Section | Car (veh./day) | Single (veh./day) | Articulated (veh./day) | Light (veh./day) | Heavy (veh./day) | Trailer (veh./day) | Motorcycle (veh./day) | Bicycle (veh./day) | Small speed vehicle (veh./day) | Total (veh./day) |
| 50 | M5 Motorway – Kistelek | 1,170 | 32 | 4 | 45 | 93 | 77 | 7 | 1 | 1 | 13,737 |
| 50 | Kistelek | 1,355 | 37 | 4 | 52 | 72 | 896 | 9 | 2 | 1 | 15,917 |
| 50 | Kistelek – Balástya | 1,252 | 34 | 4 | 48 | 68 | 82 | 8 | 2 | 1 | 14,701 |
| 50 | Balástya – Szatymaz | 1,287 | 35 | 4 | 49 | 70 | 84 | 8 | 2 | 1 | 15,114 |
| 50 | Szatymaz – M43 Node | 1,287 | 35 | 4 | 49 | 70 | 84 | 8 | 2 | 1 | 15,114 |
| 50 | M43 Node – Szeged | 1,287 | 35 | 4 | 49 | 70 | 84 | 8 | 2 | 1 | 15,114 |
| 50 | Szeged – State border | 1,295 | 35 | 4 | 50 | 70 | 85 | 8 | 2 | 1 | 15,214 |
| 5411 | Kiskunmajsa – Kistelek | 68 | 2 | 0 | 2 | 4 | 3 | 4 | 14 | 1 | 1,298 |
| 5422 | Forráskút – Balástya | 84 | 0 | 0 | 2 | 3 | 3 | 3 | 8 | 0 | 1,377 |
| 55 | Domaszék – Szeged | 794 | 17 | 3 | 19 | 41 | 47 | 18 | 16 | 5 | 12,626 |

Remark: Lines marked with grey colour comprise the traffic data referring to the section under examination.

Traffic Table No. 5 **Distribution of the cross-sectional road traffic in 2015 with motorway in the version of HUF 10 / km toll**

| Daytime (6-22) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Bus | | Lorry | | | | | | |
| Road No. | Section | Car (veh./day) | Single (veh./day) | Articulated (veh./day) | Light (veh./day) | Heavy (veh./day) | Trailer (veh./day) | Motorcycle (veh./day) | Bicycle (veh./day) | Small speed vehicle (veh./day) | Total (veh./day) |
| 50 | M5 Motorway – Kistelek | 3,148 | 90 | 10 | 114 | 162 | 196 | 24 | 5 | 3 | 4,178 |
| 50 | Kistelek | 3,508 | 100 | 11 | 127 | 180 | 219 | 27 | 5 | 3 | 4,656 |
| 50 | Kistelek – Balástya | 6,325 | 181 | 20 | 230 | 325 | 394 | 49 | 9 | 5 | 8,394 |
| 50 | Balástya – Szatymaz | 7,041 | 202 | 23 | 255 | 362 | 439 | 55 | 11 | 6 | 9,344 |
| 50 | Szatymaz – M43 Node | 7,068 | 202 | 23 | 256 | 364 | 441 | 55 | 11 | 6 | 9,380 |
| 50 | M43 Node – Szeged | 8,452 | 242 | 27 | 307 | 435 | 527 | 66 | 13 | 7 | 11,218 |
| 50 | Szeged – State border | 5,142 | 147 | 17 | 187 | 264 | 321 | 40 | 8 | 4 | 6,824 |
| M5 | Kiskunfélegyháza - Kistelek | 12,903 | 253 | 18 | 559 | 857 | 1,456 | 27 | 0 | 0 | 17,905 |
| M5 | Kistelek - Balástya | 13,064 | 256 | 18 | 566 | 868 | 1,474 | 27 | 0 | 0 | 18,129 |
| M5 | Balástya – Szeged-North | 12,632 | 248 | 17 | 548 | 839 | 1,425 | 26 | 0 | 0 | 17,529 |
| M5 | Szeged-North– Szeged-West | 8,299 | 163 | 11 | 360 | 551 | 936 | 17 | 0 | 0 | 11,516 |
| M5 | Szeged-West. – State border | 6,048 | 119 | 8 | 262 | 402 | 682 | 13 | 0 | 0 | 8,393 |
| M43 | M5 Motorway – Main road No. 50 | 11,862 | 233 | 16 | 514 | 788 | 1,338 | 25 | 0 | 0 | 16,461 |
| 5411 | Kiskunmajsa – M5 Motorway | 573 | 16 | 1 | 14 | 33 | 26 | 33 | 129 | 14 | 907 |
| 5411 | M5 Motorway – Kistelek | 800 | 22 | 1 | 20 | 46 | 36 | 47 | 180 | 20 | 1,266 |
| 5422 | Forráskút – M5 Motorway | 1,366 | 4 | 0 | 38 | 56 | 44 | 52 | 147 | 10 | 1,857 |
| 5422 | M5 Motorway – Balástya | 1,183 | 3 | 0 | 33 | 49 | 38 | 45 | 128 | 9 | 1,609 |
| 55 | Domaszék – M5 Motorway | 9,753 | 225 | 42 | 239 | 512 | 586 | 238 | 216 | 85 | 12,873 |
| 55 | M5 Motorway- Szeged | 6,238 | 144 | 27 | 153 | 328 | 375 | 152 | 138 | 54 | 8,233 |

continued…..

Traffic Table No. 5 Continuation

| By night (22-6) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Bus | | Lorry | | | | | | |
| Road No. | Section | Car (veh./day) | Single (veh./day) | Articulated (veh./day) | Light (veh./day) | Heavy (veh./day) | Trailer (veh./day) | Motorcycle (veh./day) | Bicycle (veh./day) | Small speed vehicle (veh./day) | Total (veh./day) |
| 50 | M5 Motorway. – Kistelek | 356 | 10 | 1 | 14 | 19 | 23 | 2 | 0 | 0 | 4,178 |
| 50 | Kistelek | 396 | 11 | 1 | 15 | 21 | 26 | 3 | 1 | 0 | 4,656 |
| 50 | Kistelek – Balástya | 715 | 19 | 2 | 27 | 39 | 47 | 5 | 1 | 0 | 8,394 |
| 50 | Balástya – Szatymaz | 796 | 22 | 2 | 30 | 43 | 52 | 5 | 1 | 0 | 9,344 |
| 50 | Szatymaz – M43 Node | 799 | 22 | 2 | 31 | 43 | 52 | 5 | 1 | 0 | 9,380 |
| 50 | M43 Node – Szeged | 955 | 26 | 3 | 36 | 52 | 63 | 6 | 1 | 0 | 11,218 |
| 50 | Szeged – State border | 581 | 16 | 2 | 22 | 31 | 38 | 4 | 1 | 0 | 6,824 |
| M5 | Kiskunfélegyháza - Kistelek | 1,458 | 27 | 2 | 67 | 102 | 173 | 2 | 0 | 0 | 17,905 |
| M5 | Kistelek - Balástya | 1,476 | 27 | 2 | 67 | 103 | 175 | 3 | 0 | 0 | 18,129 |
| M5 | Balástya – Szeged-North | 1,427 | 27 | 2 | 65 | 100 | 170 | 2 | 0 | 0 | 17,529 |
| M5 | Szeged-North – Szeged-West | 938 | 17 | 1 | 43 | 66 | 111 | 2 | 0 | 0 | 11,516 |
| M5 | Szeged-West – State border | 683 | 13 | 1 | 31 | 48 | 81 | 1 | 0 | 0 | 8,393 |
| M43 | M5 Motorway – Main road No. 50 | 1,340 | 25 | 2 | 61 | 94 | 159 | 2 | 0 | 0 | 16,461 |
| 5411 | Kiskunmajsa – M5 Motorway | 48 | 1 | 0 | 1 | 3 | 2 | 3 | 10 | 1 | 907 |
| 5411 | M5 Motorway - Kistelek | 66 | 2 | 0 | 2 | 4 | 3 | 4 | 14 | 1 | 1,266 |
| 5422 | Forráskút – M5 Motorway | 113 | 0 | 0 | 3 | 5 | 4 | 4 | 11 | 1 | 1,857 |
| 5422 | M5 Motorway – Balástya | 98 | 0 | 0 | 3 | 4 | 3 | 3 | 10 | 1 | 1,609 |
| 55 | Domaszék – M5 Motorway | 809 | 18 | 3 | 20 | 42 | 48 | 18 | 17 | 5 | 12,873 |
| 55 | M5 Motorway- Szeged | 518 | 11 | 2 | 13 | 27 | 31 | 12 | 11 | 3 | 8,233 |

Remark: Lines marked with grey colour comprise the traffic data referring to the section under examination.

Traffic Table No. 6 **Distribution of the cross-sectional road traffic in 2015 with motorway in the version of HUF 20 / km toll**

| Daytime (6-22) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Bus | | Lorry | | | | | | |
| Road No. | Section | Car (veh./day) | Single (veh./day) | Articulated (veh./day) | Light (veh./day) | Heavy (veh./day) | Trailer (veh./day) | Motorcycle (veh./day) | Bicycle (veh./day) | Small speed vehicle (veh./day) | Total (veh./day) |
| 50 | M5 Motorway – Kistelek | 5,694 | 163 | 18 | 207 | 293 | 355 | 44 | 8 | 5 | 7,557 |
| 50 | Kistelek | 6,359 | 182 | 21 | 231 | 327 | 396 | 49 | 9 | 5 | 8,439 |
| 50 | Kistelek – Balástya | 8,630 | 247 | 28 | 313 | 444 | 538 | 67 | 13 | 7 | 11,453 |
| 50 | Balástya – Szatymaz | 9,045 | 259 | 29 | 328 | 465 | 564 | 70 | 13 | 8 | 12,005 |
| 50 | Szatymaz – M43 Node | 9,045 | 259 | 29 | 328 | 465 | 564 | 70 | 13 | 8 | 12,005 |
| 50 | M43 Node – Szeged | 9,626 | 275 | 31 | 349 | 495 | 600 | 75 | 14 | 8 | 12,776 |
| 50 | Szeged – State border | 5,422 | 155 | 17 | 197 | 279 | 338 | 42 | 8 | 5 | 7,197 |
| M5 | Kiskunfélegyháza - Kistelek | 7,758 | 152 | 11 | 336 | 516 | 875 | 16 | 0 | 0 | 10,766 |
| M5 | Kistelek - Balástya | 7,758 | 152 | 11 | 336 | 516 | 875 | 16 | 0 | 0 | 10,766 |
| M5 | Balástya – Szeged-North | 7,534 | 148 | 10 | 327 | 501 | 850 | 16 | 0 | 0 | 10,454 |
| M5 | Szeged-North– Szeged-West | 5,711 | 112 | 8 | 248 | 379 | 644 | 12 | 0 | 0 | 7,925 |
| M5 | Szeged-West – State border | 5,780 | 113 | 8 | 251 | 384 | 652 | 12 | 0 | 0 | 8,020 |
| M43 | M5 Motorway – Main road No. 50 | 5,549 | 109 | 8 | 241 | 369 | 626 | 12 | 0 | 0 | 7,700 |
| 5411 | Kiskunmajsa – M5 Motorway | 389 | 11 | 0 | 10 | 23 | 17 | 23 | 88 | 10 | 616 |
| 5411 | M5 Motorway - Kistelek | 415 | 11 | 0 | 10 | 24 | 19 | 24 | 94 | 10 | 656 |
| 5422 | Forráskút – M5 Motorway | 1,385 | 4 | 0 | 38 | 57 | 44 | 53 | 149 | 10 | 1,844 |
| 5422 | M5 Motorway – Balástya | 1,223 | 3 | 0 | 34 | 50 | 39 | 47 | 132 | 9 | 1,663 |
| 55 | Domaszék – M5 Motorway | 9,760 | 225 | 42 | 239 | 513 | 586 | 238 | 216 | 85 | 12,882 |
| 55 | M5 Motorway- Szeged | 8,223 | 190 | 35 | 202 | 432 | 494 | 201 | 182 | 71 | 10,853 |

continued…

Traffic table No. 6 Continuation

| By night(22-6) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Bus | | Lorry | | | | | | |
| Road No. | Section | Car (veh./day) | Single (veh./day) | Articulated (veh./day) | Light (veh./day) | Hevy (veh./day) | Trailer (veh./day) | Motorcycle (veh./day) | Bicycle (veh./day) | Small speed vehicle (veh./day) | Total (veh./day) |
| 50 | M5 Motorway. – Kistelek | 643 | 17 | 2 | 25 | 35 | 42 | 4 | 1 | 0 | 7,557 |
| 50 | Kistelek | 719 | 19 | 2 | 27 | 39 | 47 | 5 | 1 | 0 | 8,439 |
| 50 | Kistelek – Balástya | 975 | 26 | 3 | 37 | 53 | 64 | 6 | 1 | 0 | 11,453 |
| 50 | Balástya – Szatymaz | 1,022 | 28 | 3 | 39 | 55 | 67 | 7 | 1 | 1 | 12,005 |
| 50 | Szatymaz – M43 Node | 1,022 | 28 | 3 | 39 | 55 | 67 | 7 | 1 | 1 | 12,005 |
| 50 | M43 Node – Szeged | 1,088 | 29 | 3 | 42 | 59 | 71 | 7 | 1 | 1 | 12,776 |
| 50 | Szeged – State border | 613 | 17 | 2 | 23 | 33 | 40 | 4 | 1 | 0 | 7,197 |
| M5 | Kiskunfélegyháza - Kistelek | 877 | 16 | 1 | 40 | 61 | 104 | 1 | 0 | 0 | 10,766 |
| M5 | Kistelek - Balástya | 877 | 16 | 1 | 40 | 61 | 104 | 1 | 0 | 0 | 10,766 |
| M5 | Balástya – Szeged-North | 851 | 16 | 1 | 39 | 60 | 101 | 1 | 0 | 0 | 10,454 |
| M5 | Szeged-North – Szeged-West | 645 | 12 | 1 | 29 | 45 | 77 | 1 | 0 | 0 | 7,925 |
| M5 | Szeged-West – State border | 633 | 12 | 1 | 30 | 46 | 78 | 1 | 0 | 0 | 8,020 |
| M43 | M5 Motorway – Main road No. 50 | 627 | 12 | 1 | 29 | 44 | 74 | 1 | 0 | 0 | 7,700 |
| 5411 | Kiskunmajsa – M5 Motorway | 32 | 1 | 0 | 1 | 2 | 1 | 2 | 7 | 1 | 616 |
| 5411 | M5 Motorway - Kistelek | 34 | 1 | 0 | 1 | 2 | 2 | 2 | 7 | 1 | 656 |
| 5422 | Forráskút – M5 Motorway | 115 | 0 | 0 | 3 | 5 | 4 | 4 | 11 | 1 | 1,844 |
| 5422 | M5 Motorway – Balástya | 102 | 0 | 0 | 3 | 4 | 3 | 4 | 10 | 1 | 1,663 |
| 55 | Domaszék – M5 Motorway | 810 | 18 | 3 | 20 | 42 | 48 | 18 | 17 | 5 | 12.,882 |
| 55 | M5 Motorway - Szeged | 682 | 15 | 3 | 17 | 35 | 40 | 15 | 14 | 4 | 10,853 |

Remark: Lines marked with grey colour comprise the traffic data referring to the section under examination.

According to plans this traffic will change in year 2015 in case of the construction of the motorway – when considering also a toll of HUF 10 / km – as follows:

- On road No. 50 between Szeged – State border 856
- On M5 Motorway
  Szeged-North – Szeged-West 1,557
  Szeged-West – State border 1,142
- On road No. 55 between Domaszék - M5 Motorway 1,692
- On road No. 55 between M5 Motorway - Szeged 1,096
  (See further in Traffic Tables Nos. 1-6)

For the sake of easier comparison we gave these values in the next Table No. 7 also in processed form. (In the present study we did not consider the case of HUF 0, i.e. the toll-free status, as this is not expectable even according to the present constellations – see the toll-paying conception of existing M3 Motorway. In this case any unfavourable environmental deviation from the findings of the present study may practically occur only from the aspect of the noise protection regarding the detached farms, but this can be taken into consideration at the elaboration of the detailed drawings, when dimensioning the noise protection walls later on. On the other hand, on the currently loaded main roads a more favourable situation compared to the findings of the present study may develop without toll.)

Table No. 7 **Comparison of the estimated Design Traffic per Hour**

| **In case of HUF 10 / km toll** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Road No. | Section | 1996 (1) | 2015 without motorway (2) | 2015 with motorway (3) | 2 – 1 % | 3 – 1 % | 3 – 2 % |
| 50 | Szeged – State border | 450 | 1,997 | 856 | +344 | +90 | -57 |
| M5 | Szeged-North – Szeged-West | | | 1,557 | | | |
| M5 | Szeged-West – State border | | | 1,142 | | | |
| 55 | Domaszék – M5 Motorway | 1,208 | 1,659 | 1,692 | +37 | +40 | +2 |
| 55 | M5 Motorway - Szeged | 1,208 | 1,659 | 1,096 | +37 | -10 | -44 |
| **In case of HUF 20 / km toll** | | | | | | | |
| 50 | Szeged – State border | 450 | 1997 | 911 | +344 | +100 | -46 |
| M5 | Szeged-North – Szeged-West | | | 1,065 | | | |
| M5 | Szeged-West – State border | | | 1,085 | | | |
| 55 | Domaszék – M5 Motorway | 1,208 | 1,671 | 1,696 | +38 | +40 | +1 |
| 55 | M5 Motorway - Szeged | 1,208 | 1,671 | 1,444 | +38 | +20 | -14 |

It can be stated from Table No.7 that a considerable increase is estimated due to natural traffic development, as shown by the figures; the traffic in the section between Szeged and the State border will expectably increase threefold. The motorway cannot compensate this significant traffic increase in the case of a toll amount of HUF 10/km either beside road No. 50, thus the traffic increase will be approx. 90%. In case of a toll of HUF 20/km a higher traffic increase of almost 100% is to be reckoned with on road No. 50, as compared to the present traffic. The version in year 2015 with toll reduces the traffic by 57% in case of a toll of HUF 10/km and by 46% in case of a toll of HUF 20/km compared to the toll-free version along road No. 50. Along the drive-on roads a traffic decrease of 10-45% or stagnation may be reckoned with.

# 2. INFLUENCING FACTORS AND IMPACT PROCESSES OF PRINCIPLE, ASSESSMENT OF IMPACT AREA

## 2.1. Definition of the influencing factors and impact processes induced by the activity

The first important step of disclosing the environmental impacts is the definition of the so-called potential influencing factors to be considered in connection with the activity, as well as the impact processes generated by the aforementioned factors. In the framework of the present assessment, we do not furnish detailed information on the investment project and the road construction activity, since those are generally known processes. In order to define the influencing factors easier, it is worthwhile to breakdown the project to such steps and phases, from which the environmental impacts are generated. These are the following:

a) Determination of the track
b) *Real estate expropriation, area occupation*
c) *Establishment of mining sites*
d) Earthworks, landscaping, construction of road foundations
e) Construction and operation of organisational and temporary side-facilities
f) *Construction and transport traffic*
g) Construction and operation of water drainage and de-watering systems
h) Regulation of groundwater level
i) Construction of traffic nodes, engineering structures
j) Construction of road structure
k) Plantation of vegetation
l) Construction of facilities for environmental protection (e.g. noise protection walls, game passages, amphibia tunnels)
m) *Traffic during operation*
n) *Traffic change on other traffic tracks*
o) Maintenance of operability (e.g. road maintenance, salting in winter)
p) Operation of connected facilities (pl. filling stations, restaurants, canteens)
r) Accidents, averages of non-natural origin
s) Acts of God

We outlined the environmental problems by italic letters, which are determining in our opinion. The influencing factors and impact processes arising during the listed phases are demonstrated by Figure No. 2 (so-called Impact Process Chart).

Figure No.2. **Potential environmental impact processes of section marked III in Csongrád County of M5 motorway**

| Affected env. element/system | | Influencing factor | | Direct impact | Indirect impacts | Man as final impact carrier |
|---|---|---|---|---|---|---|
| Air | 1 | Construction works | → | Transitional change in air quality | | |
| | 2 | Traffic | → | Permanent deterioration of air quality along motorway | | |
| | 3 | Effect of traffic distraction | → | Permanent improvement of air quality along parallel roads | | |
| | 4 | Average | → | Transitional change in air quality | | |
| Surface and sub-surface waters | 5 | Placement of hydraulic engineering structures | → | Changes in hydrodynamics in surface waters | | |
| | 6 | Development and/or operation of mining sites | → | Changes in hydrodynamics in sub-surface waters | | |
| | 7 | Existence of road structure, embankments, gullies, rainwater drains | → | Change in the running conditions of surface or sub-surface waters, deterioration of their quality | Groundwater pollution | |
| | 8 | Average | → | Provisional quality deterioration of surface waters | | |
| Earth | 9 | Occupation of area | → | Quantitative decrease | | |
| | 10 | Formation of mining sites | → | Quantitative decrease | | |
| | 11 | Defrosting in winter | → | Soil contamination | Increase of soil contamination along motorway due to precipitation | |
| | 12 | Average | → | Soil contamination | | |
| | 13 | Waste treatment in the phase of construction and then in the phase of operation | → | Soil contamination | | |
| Wildlife – ecosystems | 14 | Occupation of area | → | Decrease of habitats | | |
| | 15 | Road track and embankments, traffic | → | Isolating effect | Deterioration of conditions of life along motorway Unfavourable physiological changes along motorway | Degradation migration → Erosion of genes along motorway |
| | 15 | Running over | → | Destruction of individual beings | | |
| | 16 | Disturbing stimuli of traffic (optical, noise, heat, etc.) | → | Disturbance of habitats | | |
| | 17 | Plantation of vegetation | → | Reduction of unfavourable impacts | | |
| Artificial elements | 18 | Appearance of a new artificial element | → | Value change | Worsening of condition along motorway | Increase of need for maintenance along motorway |
| Communal environment | 19 | Construction works | → | Transitional increase of noise level | | |
| | 20 | Traffic | → | Increased noise level along motorway | | |
| | 21 | Effect of traffic distraction | → | Reduced noise level elsewhere | | |
| | 22 | Appearance of new element of infrastructure | → | Reduced traffic elsewhere | | |
| | 23 | Appearance of new element of infrastructure | → | Change in the intercity connections, innovative effects | | |
| | 16 | Appearance of new linear infrastructure | → | Change in the landscape | Changes in the use of landscape | Change in the way and conditions of life |

Of course, the influencing factors occurring in several phases in the same way may be aggregated (e.g. influencing factor No. 1, the construction comprises the emissions from points c) to j) and from point 1), since these are almost of the same feature). The Impact Process Chart is theoretical, which means that in knowledge of the plans the appearance of these environmental processes may be expected.

The structure of the Impact Process Chart is usual for the impact assessments: i.e. that the first column shows the influencing factors as per environmental element. The given influencing factor appears always at the environmental element, on which it has direct impact without transmission. One influencing factor may have a direct impact on more than one environmental elements at the same time, however in different ways. In this case we indicate it at all affected environmental elements. Such are e.g. construction (influencing factors Nos. 1 and 19) or traffic (influencing factors Nos. 2, 16 and 20), or area occupation (influencing factors Nos. 9 and 14). The direct impacts figure in the second column. The arrows sign the multiplication of the impacts towards the final impact carriers. The multiplication may occur in principle through many phases mostly with gradually decreasing, rarely increasing effectiveness. Generally during multiplication the intensity of the impacts has a ceasing tendency. The ecological system and/or the human being are generally the final impact carriers. We handled the latter separately and outlined in the chart, because the impacts affecting the environment i.e. the changes occurring in the status of the environmental elements/systems may be construed and evaluated basically from the aspect of man. Our impact study endeavours to evaluate the impact processes demonstrated on the chart.

## 2.2. IMPACT AREA ASSESSMENT, DETERMINATION OF THE AREA UNDER EXAMINATION

After having disclosed the impact processes of principle the approximate area may be determined, to which the examination is to be extended, i.e. the impact area of the activity may be previously estimated. Upon the previous delimination of the impact area it has to be strived for that all area parts affected potentially should be included in the area under examination.

When delimiting the impact area in case of motorways we may start from the following basic principles:

- As per general experience in case of infrastructure projects we may reckon with significant positive environmental impacts. These impacts have also a territorial projection in case of M5 Motorway, therefore it is worthwhile to make a distinction between positive and negative impact areas.

- In determining the negative impact area, the project phases indicated by italic letters (b, c, f, m) are the most important ones. The first determining influencing factor is the formation of the area occupation, i.e. the track itself and the additional facilities – drive-on roads, nodes, rest areas, filling stations as well as other service facilities (e.g. canteen, restaurant).

- The air pollution of the track and the drive-onn roads and the resulting soil contamination and the noise emission of the traffic contribute to the above, which jointly mean the zone of 200-300 m around the motorway on basis of the relevant domestic and international experiences (see later).

- We construe the mining sites to be explored because of the construction and the deposit areas to be established also as area occupation of the motorway. Besides the area occupation the environment of mining sites becomes primarily an impact area due to the impacts incidentally affecting the sub-surface waters.

- The impact area of noise and air pollution derived from the construction remains within the area affected by the traffic, except for the transportation routes. Emissions generated from transportation may not cause significant load either on basis of their intensity or of their dimensional or temporal extent, consequently they are not determining at the delimiting of the impact area.

- The watercourse sections of several hundred metres measured from the access point, serving as receptacle of the running rainwaters are parts of the impact area, so are the districts of the desiccating basins of approximately several 100 metres. The latter ones due to the impacts to be transmitted by groundwater. The changing impact of structures of hydraulic engineering on water dynamics is effective only in case of larger watercourses.

- The habitats, migration corridors are also a part of the impact area that will be crossed by the motorway.

- Based on a similar train of thought all areas are a part of the impact area, on which some forced changes are expectable in the landscape use due to the existence of the motorway. Those may be primarily the agricultural inclusion areas.

- The existence of the motorway, its separating effect generates changes not only in the habitat of the natural wildlife, but also in the habitat of man. All the settlements, inhabited areas in outskirts belong to the negative impact area, between which the existence of the track hinders or makes more difficult the maintenance of traffic or other connections in the future. Those settlement part belong also here, the development of which is modified by the area occupation of the motorway.

- In principle a part of the impact area would be also the areas affected by average pollutions (air, water, soil), which cannot be, however, delimited in advance. From this point of view only the endangered areas may be delimited, furthermore, the inhabited areas near the track, streams and quasi-natural communities, which are located immediately along the road.

- In the course of shaping the positive impact area too the existence of the motorway is the most important influencing factor, as a consequence of which the present traffic will sensibly decrease on certain road sections.

- The operation of the motorway means the improvement of accident statistics, decrease of the specific petrol consumption, shorter driving time, more comfortable access conditions, which are favourable changes as well. On the one hand these impacts can be bundled to the new track, on the other to those routes, the traffic of which will be decreased by the motorway.

- Considerable environment improvement is expectable on the sections transiting the settlements, where air pollution and noise emission and consequently the health load of the population will decrease.

- The economic revitalisation of the settlements located near the track, the possibility to increasingly join the "blood circulation" of the country and the improvement of the relationships of the settlements newly connected are expectedly further positive consequences. The settlements affected by these impacts are also parts of the positive impact area.

The **area under examination** (i.e. the entire impact area assessed previously) as environmental element on the examined section of M5 Motorway may be featured in consideration of the aforementioned in the following way:

**Air** impact area implies the zone of approx. 200-300 metres along the motorway as well as the zone of the drive-on roads from Szeged and Röszke. The enlargements necessitated by additional investments – in this case nodes and rest areas – have to be added to the above. Nodes are planned in the western part (Domaszék) and southern part (Röszke) of Szeged; establishment of a rest area is to be expected at the altitude of Röszke. The items listed so far constitute the areas of the negative impacts.

Favourable impacts may be expected primarily in the following areas (consequently these are parts of the positive impact area):

- along main road No. 50 (traffic distracting impact), especially in the central area of Szeged
- on the section of the road marked 4301 between Szeged and Röszke.

From the aspect of **surface waters** the impact area includes the sections of several hundred metres of the channels designated for receiving the rainwaters, measured from the motorway. With regard to **sub-surface waters** the pavement environment may be an impact area because of the incidentally changing sub-surface streams, furthermore the smaller or wider hydrogeological region of the mining sites. Besides that the track sections have to be considered and regarded as impact area, in which the groundwater level is high. So far as we know, endangered areas may be found between chainages 161.00 – 161.70; 162.2 – 164.7; 167,1 – 167.3; 168.3 – 169.6; 169.95 – 170.025 and 171.5 – 172.0 km.

However, these areas do not mean the extension of the impact area, as they concern only the direct environment of the track, which already constitutes a part of the impact area.

The impact area regarding **soil** is partly overlapping the aforementioned, i.e. the zone accompanying the track and the drive-on roads – on the one hand through the pollution transmitted through the air, on the other hand through the draining rainwater and the area of the mining sites.

From the aspect of **wildlife** and **ecosystems** the impact area includes all the sections of the track, close to which natural or quasi-natural vegetative and/or animal habitats are to be found. Here the dimension of the impact area is determined by the area of the habitats affected directly (area occupation) and indirectly (disturbance, isolation, barrier impact, degradation, etc.). These are the areas of biotopes geographically connected to the motorway

(and its additional facilities) and in case of stationary creatures those located in a district of approx. 200-300 metres of the motorway. In case of non-stationary wildlife the biotopes may extend to greater distances, e.g. the migration of frogs is possible also from a distance of several thousand metres. The so-called sensitive areas requiring special attention will be listed in Chapter 3.

As far as **artificial elements** are concerned, the positive and negative impact areas may be separated as well. The negative impact area implies the area of the structures affected by the vibration load appearing on the track, which includes primarily the detached farms remaining along the motorway and the settlements and settlement parts located closest (see e.g. holiday resort in Kiskundorozsma – Domaszék).

Logically, positive impact areas are the areas of all facilities, the load whereof will be reduced as a result of the traffic decrease on the present road network (this includes the structures of the settlements located along the roads listed at the air impact area), furthermore the pavement of the relieved sections of the present road network, the use and thus the abrasion cycle of which will decrease. (These latter are first of all the road sections mentioned at the air impact area).

From the aspect of **communal environment** the holiday resorts located near Kiskundorozsma - Domaszék are directly affected. In indirect sense the settlements would also fall in the negative impact area, the development and/or intercity relations of which are hindered by the existence of the motorway. Practically, we do not have to reckon with this factor, as the intercity relations are solved by bridge-crossings. As we have seen in the previous chapter, passages will be constructed in the examined track section more densely than in the average. The reason for that is that the isolating effect in this farm region could be reduced to the minimum only in this way. Even now it may be mentioned that the interrelations of the detached farms located several hundred metres from the new track will worsen to some extent.

Positive impact areas are the relieved settlements (listed at the positive impact area as to air quality) and the regions expectedly affected by the favourable innovative impacts. In the latter case practically all settlements affected may be mentioned.

As to **noise protection**, on basis of the plain character of the area and the location of the road pavement on embankment, the zone of maximum 300-500 metres should be taken into consideration as an area to be examined.

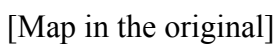
In the terms of **landscape** aesthetics all areas are included in the impact area, from where the track is visible. In this plain area their extent may be even several kilometres. (We did not demonstrate this on the Impact Area Chart because of its minor importance.) From the aspect of landscape use the track belongs to the impact area – as mentioned already several times - , as an area mostly withdrawn from cultivation, further there will be regions, where the agricultural cultivation will be modified in some way, where certain products may not be produced.

Furthermore, the inclusion areas mentioned already belong also here, which cannot be utilised for agricultural purposes in the future. This area remains expectably within the zone of 30-100 metres along the track.

Delimitation of the impact area in this way is demonstrated in Figure No. 3. It can be seen from the above statements and the figure that the planned motorway affects all environmental elements and systems in some way, its impacts are complex. It can be also stated that except for the impact area of landscape aesthetics the area of negative impacts to be examined remains in the 500-metre district of the track almost everywhere (Within this most part of the impacts affects only the zone 200 m on each side of the motorway). Exceptions are the drive-on roads and the channels draining rainwater. The direct environment of road No.50 may be considered as a basically positive impact area.

The area delimited in this way will be specified in the professional chapters, on basis whereof the final impact area will be determined. The aim of the preliminary delimitation (preliminary impact area assessment) is to harmonise the examined areas of the individual professional chapters. It means simultaneously that the final impact area delimited in the professional chapters will necessarily deviate from the area under examination.

Figure 3




Negative impact area

Positive impact area

# 3. SENSITIVITY OF THE AREA UNDER EXAMINATION

On the basis of the present condition of the impact area and of the review of the influencing factors, the areas can be defined, which are sensitive for the impacts affecting them, from certain aspects. The sensitivity determines the examination areas, in case of which the impact assessment has to be carried out with particular attention. Sensitivity must be basically assessed from the aspect of the final impact carriers, i.e. human beings and ecosystems.

The most sensitive points of the motorway section under examination are naturally the residential areas and inhabited areas affected by air pollution and noise emission from the construction and especially from the operation of the motorway. In the present case primarily the areas of holiday resorts located closest to the motorway belong to the sensitive areas.

Over and above these holiday resorts, inhabited areas in the outskirts and detached farms are to be considered also sensitive areas from the aspect of air pollution and noise load. For this reason, in a 200-metre district of the planned track of M5 Motorway (it is identical with the precised noise impact area, and the air impact area remains within this as well) we elaborated an assessment in detail of the facilities that will remain in this zone and will not be demolished. (We did not indicate the facilities located in the track and the node branches and within the boundary of expropriation.) The objects to be protected are the following:

| Serial No. | Chainage km | Side | Facility to be protected | Topogr. Lot No. | Distance from M5 (m) | Its condition (upon survey in 1998) |
|---|---|---|---|---|---|---|
| 113 | 162.3-164 | right | holiday resort | Subasa | 80 | inhabited |
| 114 | 164.3 | left | farm | 040/4 | 130 | inhabited |
| 115 | 164.73 | left | farm | 040/8 | 70 | inhabited |
| 116 | 165.0 | left | farm | 040/8 | 80 | inhabited |
| 117 | 165.1 | left | farm | 040/10 | 140 | inhabited |
| 118 | 165.13 | left | farm | 040/9 | 80 | inhabited |
| 119 | 165.13 | left | farm | 040/2 | 30 | inhabited |
| 120 | 165.05 | right | farm | 037/3 | 60 | inhabited |
| 121 | 165.28 | right | farm | 032/9 | 130 | inhabited |
| 122 | 165.2 | right | farm | 031/14 | 50 | inhabited |
| 123 | 165.22 | right | farm | 031/13 | 100 | inhabited |
| 124 | 165.2 | left | farm | 031/16 | 70 | inhabited |
| 125 | 165.22 | left | farm | 031/17 | 110 | inhabited |
| 126 | 165.6 | right | farm | 031/26 | 60 | inhabited |
| 127 | 166.0 | right | farm | 031/30 | 90 | deserted |
| 128 | 166.3 | right | farm | 028/8 | 80 | deserted |
| 129 | 166.3 | left | farm | 031/32/33 | 30 and 80 | deserted |
| 130 | 166.5 | left | farm | 0145/11 | 40 | inhabited |
| 131 | 166.9 | right | farm | 0175/7 | 60 | inhabited |
| 132 | 167.0 | right | farm | 0145/6 | 40 | inhabited |
| 133 | 167.25 | left | farm | 0141/2 | 80 | inhabited |
| 134 | 167.55 | left | farm | 0159/5 | 70 | inhabited |
| 135 | 167.7 | left | farm | 0159/2 | 110 | inhabited |
| 136 | 167.6 | right | farm | 0159/16 | 80 | inhabited |
| 137 | 167.65 | right | farm | 0159/15 | 40 | inhabited |
| 138 | 167.8 | right | farm | 0159/30 | 80 | inhabited, new building |

| Serial No. | Chainage km | Side | Facility to be protected | Topogr. Lot No. | Distance from M5 (m) | Its condition (upon survey in 1998) |
|---|---|---|---|---|---|---|
| 139 | 167.9 | left | farm | 0150/8 | 80 | deserted |
| 140 | 168.3 | right | farm | 0150/1 | 80 | inhabited |
| 141 | 168.3 | left | farm | 0150/1 | 40 | inhabited |
| 142 | 168.58 | right | farm | | 130 | deserted |
| 143 | 168.75 | right | farm | | 130 | deserted |
| 144 | 168.6 | left | farm | 0150/1 | 120 | inhabited |
| 145 | 168.9 | right | farm | | 100 | deserted |
| 146 | 169.0 | right | farm | | 40 | deserted |
| 147 | 169.15 | left | farm | 048/12 | 60 | deserted |
| 148 | 169.5 | left | farm | 046/9 | 140 | inhabited |
| 149 | 169.5 | right | farm | | 70 | deserted |
| 150 | 169.65 | left | farm | 046/6 | 40 | inhabited |
| 151 | 169.83 | right | farm | 050/5 | 110 | inhabited |
| 152 | 170.02 | right | farm | 075/3 | 80 | inhabited |
| 153 | 170.48 | left | farm | 039/11 | 90 | inhabited |
| 154 | 170.65 | left | farm | 075/12 | 60 | inhabited |
| 155 | 170.86 | left | farm | 075/13 | 90 | inhabited |
| 156 | 171.0 | left | farm | 075/14 | 100 | inhabited |
| 157 | 171.0 | left | farm | 075/15 | 70 | inhabited |
| 158 | 171.0 | right | farm | 082/4 | 130 | inhabited |
| 159 | 171.6 | right | farm | 082/5 | 150 | inhabited |
| 160 | 171.35 | right | farm | 082/9 | 70 | inhabited |
| 161 | 171.45 | left | farm | 082/10 | 110 | inhabited, new building |
| 162 | 171.58 | right | farm | 086/13 | 80 | deserted |
| 163 | 171.58 | right | farm | 086/12 | 40 | deserted |
| 164 | 171.6 | left | farm | 086/10 | 40 | inhabited |
| 165 | 171.6 | left | farm | 086/5 | 80 | inhabited |
| 166 | 171.75 | left | farm | 086/6 | 80 | inhabited |
| 167 | 171.95 | left | farm | 086/4 | 90 | inhabited |
| 168 | 172.1 | left | farm | 086/8 | 90 | inhabited |
| 169 | 172.17 | left | farm | 086/9 | 150 | inhabited |
| 170 | 172.1 | right | farm | 086/14 | 11 | inhabited |
| 171 | 172.3 | left | farm | 088/4 | 100 | inhabited |
| 172 | 172.37 | left | farm | 088/8 | 140 | inhabited |
| 173 | 172.4 | left | farm | 088/9 | 130 | inhabited |
| 174 | 172.5 | left | farm | 088/10 | 110 | inhabited |
| 175 | 172.2 | right | farm | 088/4 | 50 | inhabited |
| 176 | 172.4 | right | farm | 088/5 | 120 | inhabited |
| 177 | 172.55 | left | farm | 088/11 | 100 | inhabited |
| 178 | 173.12 | right | farm | 0114/11 | 120 | inhabited |

**Remark of the editor: The noise protection assessment of the motorway section in Csongrád County was elaborated in one step, the serial numbering of the detached farms was continuous, consequently the initial serial number is 113. 112 farms located in the previous section can be found in the impact study to be elaborated in parallel with this study.**

The several habitats of ecological value disclosed and detailed in the chapter (4.5.) on wildlife protection are located in areas of clean air quality at present, which are jeopardized almost only by the emissions of the motorway. When taking into consideration also the types of the habitats we may qualify them as mid-sensitive from the aspect of air pollution. The valuable

communities are, however, affected not only by air pollution impacts, but also by disturbing factors of various types (light pollution, noise, litter accumulated along the motorway, etc.). In addition, the change of water supply at the mentioned habitat types influences basically the life conditions. For this reason, the natural habitats along the following sections are to be considered sensitive, in view of all impacts of the motorway, on the basis of the nature conservation assessments:

- lawns located to west from chainages 161+000-162+400 km
- lawns between chainages 162+400-163+000 km
- lawn area between chainages 166+700-167+000 km

Areas of high groundwater level (approaching ground level) may also be sensitive:

- between chainages 161.00 – 161.70 km
- between chainages 162.20 – 164.70 km
- between chainages 167.10 – 167.30 km
- between chainages 168.30 – 169.60 km
- between chainages 169.95 – 170.025 km
- between chainages 171.50 – 172.00 km

Living watercourses of small water supply, receiving rainwater, could be similarly sensitive. However, in this area rainwater will not be conducted into living watercourses, the channels will be the primary receptacles, in case whereof sensitivity occurs only from the aspect of use. In certain areas rainwaters will be desiccated, these are the following sections:

- chainages 161 + 500 – 163 + 000 km
- chainages 171 + 000 – 171 + 500 km

Out of these two sections only the first one leads through valuable lawns, therefore only this section qualifies as sensitive from the aspect of rainwater desiccation.

# 4. PRESENTATION OF THE CURRENT CONDITION OF THE ENVIRONMENT, DESCRIPTION AND EVALUATION OF THE EXPECTABLE CHANGES

In the framework of the present impact study we describe the current condition of the environment and the expectable changes –unusually – in a single chapter. Thus the individual impact processes may be traced in a simpler way from their initial condition. We elaborate the condition description and the evaluation of changes in a breakdown according to environmental elements and systems. When registering the basic condition, the detailed examination of the elements and systems is justified, in case of which essential, but at least recognisable, perceptible changes may be expected under the influence of the examined activity. We endeavoured also in the present case to discuss in detail air quality, noise load change, further loads – as dominant impact processes - affecting the final impact carriers, i.e. wildlife and man.

Description of the condition and of impact processes does not require any explanation, measuring, calculating and estimating methods will be presented in connection with the relevant impact process. However, evaluation requires a short introduction and explanation of terms. Explanations for the evaluation and qualifying system were cited from the volume of the Little Environmental Library series of the Publishing House for Economics and Law under the title "Environmental Impact Assessment and Review" (authors: MAGYAR Emőke, SZILÁGYI Péter, Dr TOMBÁCZ Endre), 1997.

On the basis of familiarisation with the main features of the activity, mapping of the impact processes and statement of the adequate sensitivity of the impact area, from among the impact processes of principle included in the Impact Process Chart No. 2

- on the one hand, those may be selected, which really occur,
- on the other hand, it can be stated, in case of which ones significant changes may be expected in the environmental condition.

The following aspects influence the evaluation:

- **Extent of deviation from the condition characteristic for the control environment.**
- **Excess of the existing limit value or any limit point of other accepted standard system.**
- **Spatiality and temporality of the impact.**
- **Reversibility of the processes.** (In case of certain processes, the environmental element or system is able to correct the problem itself, of course up to a certain level. See e.g. self-purification of waters. There are processes, which can be reversed through human intervention and there are some, which are irreversible.)
- **Possibility of preventing the generation of the impact process.** (i.e. the possibility of preventing, reducing the non-desired changes by technological, biological tools.)
- **Rarity and replaceability of the values.**
- **Reliability of assessments.**

In practice several ones from among the above evaluation criteria have a simultaneous effect, i.e. at the same time one change may be below the limit value, affecting a large area, preventable with difficulties, etc. The qualification may be issued on basis of the totality thereof. The qualification may be carried out on the one part for the change in the interval of

the environmental elements, and on the other part for the changes generated in the use of the environmental element. When qualifying the impacts we are working with a scope of categories elaborated by us previously, describing 5 negative and two positive impacts. The qualifying categories and the interpretation belonging to each category are the following:

**Categories of qualification for changes in the condition:**

| Qualification | Explanation |
|---|---|
| Terminating | The changes belong to this category, in which case the qualifying unit of an environmental element/system considered independent or the entire element or system or any independent component of the element/system (e.g. karstic water resources, a given species, population, river section) cease to exist. The case, if the characteristics of the element or system terminate, which determined the ranking, belongs also here (e.g. during construction soil ceases to function as soil) The definition confusing to some extent of the termination is needed, because in may cases it affects only one feature, one species or one element of the reserve, and it is not the entire environmental element, which ceases to exist.) |
| Damaging | This category assumes the common appearance of two factors: One condition is the excess of the relevant limit value, requirement, etc. and consequently the element concerned will be ranked to an inferior quality category. In this case it is not necessarily about the excess of the limit points stipulated in legal form. The other condition is that the change is irreversible, i.e. consequences of the change may be corrected only by human intervention. (The inner processes, self-purification, regeneration ability of the given environmental element does not make it possible any more.) Temporary but periodically repeated changes (e.g. daily load peaks) are considered as irreversible and thus ranked to the damaging category. |
| Loading | Two unambiguously distinct cases may be ranked to the category: In the first case the irreversibility described above still exists, however the change does not mean the excess of the limit value or any other qualifying barrier (e.g. sewage conductions not generating any change in the quality category of the receptacle, which would exceed the emission limit values.) In the second case, excess of the limit occurs, however the impact may be reversed without intervention. Either for the reason, because the influencing factor is of a one-up, terminating character or for the reason, because the impacts occur continuously, but their intensity is negligible (e.g. temporary use of an area as construction site, if the situation prior to use may be self-reconstructed within a foreseeable period.) |
| Supportable | If undesired changes can be shown, however they do not influence any essential characteristic feature of the examination unit. In this case durable or frequent excess of limit values is not possible. Besides that, in this case impacts are restricted to a small area (e.g. sewage conductions to insignificant extent, temporary use of access roads). |
| Neutral | That impact belongs to this category, the existence of which can be justified, however the caused change is so small that it cannot be perceived. (The impacts may be ranked to this category, which are insignificant at normal operation, however in case of average they may have serious consequences.) |
| Improving | Changes moving a quantitative or qualitative characteristic feature of an environmental element/system into positive direction. We rank any improvement to this category, when no new value comes into being, but existing values are increasing (e.g. improvement of the quality of given water resources or the conditions of life of an ecosystem.). |
| Value adding | This category assumes the appearance of new elements, systems and their independent parts considered valuable from environmental aspect in the impact area or changes occurring in the features of the existing elements and systems, which add value to them. The latter means generally the moving of the qualification into a favourable direction. Appearance of new values generates the enrichment of the environment. In case of waters, a new value may be e.g. the appearance of water surfaces appropriate for recreation. |

**Qualifying Categories of Changes in Use**

| Qualification | Explanation |
|---|---|
| Terminating | Existing use terminates in respect of the whole element. |
| Restricting | Using possibility decreases or certain utilisation possibility of the element terminates (e.g. reserve may not be used as potable-water.) |
| Disturbing | Uses may be maintained, but circumstances are worsening. (Potable water needs pre-treatment.) |
| Neutral | Everything remains unchanged. |
| Improving | No new utilisation possibility appears, but its existing circumstances improve. |
| Expanding | Also new utilisation possibility appears due to the change in condition. |

In view of the targets of the impact assessment, out of the two groups of **the qualifying categories the qualification of the change in condition is more essential**, although it is conceivable that the undesirable change of utilisations may mean an excluding cause (however it occurs only seldom). It is not calculated in the qualifying categories, but needs to be emphasised that the evaluation is strongly influenced also by the probability of the occurrence of the influencing factor and/or the impact.

## 4.1. GEOGRAPHICAL FEATURES

The track under examination leads through the large landscape of Alföld (Plain Land – macro-region), in the area of the small landscape of Dorozsma-Majsa sand ridge (micro-region) (administrative territory of Domaszék) belonging to the plain region of Duna-Tisza köze (meso-region), furthermore through the small landscape of South-Tisza Valley (administrative territory of Szeged-Kiskundorozsma, Röszke) belonging to the medium landscape of Lower-Tisza region. We demonstrate the general geographical features of the small landscapes according to the Small Landscape Cadastral Record* in table form:

| **Area utilisation** | | | | |
|---|---|---|---|---|
| Feature/Small landscape | Sand table-land in Dorozsma-Majsa 1,700 km$^2$ | | South-Tisza Valley 1,000 km$^2$ | |
| | ha | % | ha | % |
| City | 3.1 | 5.270 | 6.0 | 6.000 |
| Ploughland | 57.6 | 97.620 | 73.2 | 73.200 |
| Garden | 1.0 | 1.700 | 0.4 | 400 |
| Vineyard | 4.7 | 7.990 | 0.6 | 600 |
| Meadow, pastureland | 14.0 | 24.570 | 6.7 | 6.700 |
| Forest | 17.3 | 29.110 | 7.2 | 7.200 |
| Water surface | 0.8 | 1.360 | 4.4 | 4.400 |
| Other (flood area, deserted area, mining site) | 1.1 | 2.380 | 1.5 | 1.500 |
| Protected area from the above | 3.1 | 5.347 | 24.8 | 24.860 |

| **Relief conditions** | | |
|---|---|---|
| Feature/Small landscape | Sand ridge in Dorozsma-Majsa | South-Tisza Valley |

* Cadastral Record of the Small Landscapes of Hungary, Hungarian Academy of Sciences, Research Institute of Geographical Sciences, 1990.

| | | |
|---|---|---|
| Altitude above sea level | 80 – 140 m | 77 – 91 m |
| Type | 3/4 slightly rolling plain land, 1/4 lengthwise, dammed basin | plain land on flood area level |
| Relief on average | below 0.5 m/km$^2$ | 0 – 2 m/km$^2$ |
| **Geological features** | | |
| Feature/Small landscape | Sand ridge in Dorozsma-Majsa | South-Tisza Valley |
| Sub-surface layers and layers nearby | Quarternary paleo-Danubian alluvial cone deposited on Pannonian sediment | several hundred metres fluvial, Pleistocene and Holocene sediment deposited on the Pliocenic successive strata in several km thickness in some areas |
| Surface layers | sand, sand drift, loess sand | Holocene watery mud, bog clay, clayed mud |
| **Pedological features** | | |
| Feature/Small landscape | Sand ridge in Dorozsma-Majsa | South-Tisza Valley |
| Main types | 36% humus sand soils, 20% sand drift, 19% sodic soil, 12% meadow, 9% sand soils of black earth feature | 43% watery meadow soil, 28% meadow soil, 13% black earth |
| Fertility | majority of the soils is of weak fertility in classes VII and VIII | mostly average or weaker |
| **Important climatic features** | | |
| Feature/Small landscape | Sand ridge in Dorozsma-Majsa | South-Tisza Valley |
| General features | warm - dry | warm - dry |
| Annual sunshine period | 2,080 – 2,090 hours | in the north 2,050, in the south 2,080-2,090 hours |
| Annual average temperature (average temperature)) | 10.5 – 10.7 °C | 10.5 – 10.6 °C |
| Average temperature of the vegetation period | 17.5 °C | 17.6 °C |
| Annual average precipitation (precipitation quantity) | 570 – 590 mm | in the south 520, elsewhere 540-580 mm |
| Precipitation quantity of the vegetation period | 310 – 330 mm | 320 mm |
| Days with snow cover | 30 - 32 | 28 - 30 |
| Aridity index | 1.19 – 1.24 | in the south and north approx. 1,35, elsewhere 1.21 – 1.30 |
| Prevailing wind direction | in sequence north, northwest, southeast | in sequence north – northwest, south – southeast |
| Average wind velocity | 3 m/s | 2 m/s |
| **Vegetation** | | |
| Feature/Small landscape | Sand ridge in Dorozsma-Majsa | South-Tisza Valley |
| Flora | typical for the Duna-Tisza köze (Praematricum) | typical for the region Tiszántúl (Crisicum) |
| Important potential forest communities | oak forests in bares, areas with lilies and sodic oak forests | osier park forests and bushy osier-holts, oak, ash, elm park forests, oak forests in bares |
| Sylviculture | young hard-leaf forests (annual growing – 3.0 m$^3$/ha) | young and middle-aged, mostly soft-leaf forests (annual growing – 4.5 m$^3$/ha) |
| Characteristic agricultural cultures | rye (15-20 q/ha), autumn barley (15-25 q/ha), maize (25-30 q/ha), cattle-turnip (200-400 q/ha) | autumn barley (20-25 q/ha), maize (25-50 q/ha), alfalfa (30-70 q/ha), onion (75-100 q/ha) |
| **Hydrological features** | | |

| Feature/Small landscape | Sand ridge in Dorozsma-Majsa | South-Tisza Valley |
|---|---|---|
| Characteristics | dry, lack of water | dry, scattered draining, considerable lack of water |
| Watercourses | only channels to Tisza: Dong brook, Fehértó-Majsa Main channel, Dorozsma-Majsa Main channel, Domaszék Main channel, Sziksóstó-Paphalom Main channel, Körösér Main channel, average water quality: class II | from left side:Cutoff-Tisza at Cibakháza, Hármas-Körös, Kurca, Vekerér Main Channel, Kórógyér Main Channel, Hódtó-Kistisza Main channel, Kósd Main channel, Maros<br>from right side: it has only smaller tributaries: Pejtsik channel Cutoff-Tisza at Alpár, Alpár-Nyárlőrinc channel, Vidre brook, Dong brook Main channel, Percsora Main channel, Algyő Main channel, Tápé Main channel, Szillér-Baltó-Fertő Main channel, Cutoff-Tisza at Gyálarét, Tisza and Hármas-Körös: class II, Maros and the channels class III |
| Lakes | 14 lakes of more or less constant water quantity<br>310 ha total area (e.g. Lake Nagysziksós – 99 ha, Lake Madarász – 37 ha, Lake Öszeszék – 50 ha) | many lakes, 14 natural lakes, 49 ha, largest lake: Szeged Rókus lake (12 ha), 33 cutoffs (690 ha), - Cutoff-Tisza at Gyálarét is the largest (116 ha), 29 basins, 5500 ha, Lake Fehér at Szeged is the largest (1324 ha) |
| Groundwater | situated mostly higher than 2 metres, its quantity is not considerable, its chemical feature is of calcium-magnesium-hydrogen-carbonate, hardness generally 15-25 nk°, sulphate content 60-300 mg/l | generally between 2-4 m, its quantity is not considerable, its chemical feature is generally calcium-magnesium-hydrogen-carbonate and sodium, hardness generally 15-25 nk°, sulphate content 60 mg/l, close to settlements it exceeds also 300 |
| Stratum waters | the quantity is generally below l l/skm$^2$, many artesian springs from greater depth with large water output, thermal springs – bath utilisation | l-1,5 l/skm$^2$, water output generally 200 l/min., many artesian springs and thermal springs (due to intense exploitation temperature and water output decreasing) |
| Utilisation level of surface and sub-surface water reserves | surface approx. 80%, sub-surface 20%, springs approx. 60% | surface approx. 80%, sub-surface 20%, springs approx. 60%. |

## 4.2. AIR

We elaborated the chapter on air quality in compliance with Act LIII of 1995 on the General Rules of the Protection of Environment and Government Decree No.152/1995 (XII.12.) on the Scope of Activities Subject to Environmental Impact Assessment as well as after prior reconciliation with the competent authorities.

The chapter on air quality includes the presentation of the current air quality situation, assessment of the expectable impacts of the planned project (construction and operation period) delimitation of the impact area, description of the environmental measures, uncertainty factors and the summary.

### 4.2.1. CURRENT AIR QUALITY SITUATION

The planned track leads through outskirts, mostly through agricultural lands, it avoids the larger settlements. However it approaches many detached farms to 30-150 metres, it leads between chainages 162.3 – 164.0 km along the small gardens in Subasa, a planned holiday resort. Chapter 3 contains the distance of these facilities, to be protected, from the planned motorway.

Currently in the northern part of the planned track the air quality is very good, it mostly complies with the background pollution values, however in the district of Szeged the operating oil-wells may pollute the air. The main road No. 5 significantly loads the air quality of the settlement by transiting Szeged.

The **National Public Health and Medical Officers Service (ÁNTSZ) of Csongrád County** continuously performs air quality tests in Szeged, the data of which it sends to the Johann Béla National Public Health Institute for the preparation of the documentation of the National Immission Measurement Network.

The tested air pollutants controlled by limit values are the following: sulphur dioxide, nitrogen dioxide, settling dust, flying dust, lead. From among the components tested a great part of the nitrogen dioxide, settling dust, flying dust and lead concentrations may be linked to the air pollution generated by the traffic.

Tables Nos. L1 and L2 show the immission data of 1997 for the period without heating and of 1997-98 for the heating period, received from the Air-hygiene Department of the National Public Health Institute.

Table No. L1 **Air quality data (RIV measurement network) of 1997 – half year without heating**

| | Nitrogen-dioxide | | Settling dust | | Flying dust | | Lead | |
|---|---|---|---|---|---|---|---|---|
| | Average | Excess of limit value | Average | Excess of limit value | Average | Excess of limit value | Average | Excess of limit value |
| Place of measurement | µg/m$^3$ | % | g/m$^3$/month | % | µg/m$^3$ | % | µg/m$^3$ | % |
| Kistelek | 34.58 | 0 | 6.97 | 0 | 328.7 | 83.3 | - | - |
| Szeged | 48.75 | 9.7 | 25.51 | 7.2 | 240.3 | 82.1 | 0.31 | 42.9 |

Table No. L2 **Air quality data (RIV measurement network) of 1997-1998 – heating half year**

| | Nitrogen-dioxide | | Settling dust | | Flying dust | | Lead | |
|---|---|---|---|---|---|---|---|---|
| | Average | Excess of limit value | Average | Excess of limit value | Average | Excess of limit value | Average | Excess of limit value |
| Place of measurement | µg/m$^3$ | % | g/m$^3$/month | % | µg/m$^3$ | % | µg/m$^3$ | % |
| Kistelek | 46.96 | 6.4 | 3.85 | 0 | 130.60 | 80.0 | - | - |
| Szeged | 67.86 | 26.3 | 6.35 | 2.4 | 157.03 | 71.0 | 0.18 | 0 |

By evaluating the data of the table it can be stated that in Szeged the nitrogen-dioxide concentration is significant in the heating half year, which shows a considerable (26.3%) limit value excess. The reason for these values is probably the traffic load.

In case of flying dust concentration substantial limit value excess (71-83.3 %) may be stated in both places of measurement, especially in the half year without heating the average of flying dust concentration is the multiple of the limit value. The relatively high flying dust lead content measured in Szeged shows that a big part of the dust is generated by the traffic.

Table L3 demonstrates the data received from the Env**ironmental Inspectorate of the Region Alsó-Tisza** (Lower Tisza) for 1997, which were measured by the air emission monitoring station operated at the section of main road No. 5 at the crossing to Szeged, at the corner of Kossuth Lajos and Damjanich Street.

Table No.L3 **Air quality data (ATIKÖFE) in 1997**

| | $NO_2$ | | $NO_x$ | | CO | | Flying dust | | Ozone | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Average | Excess of limit value | Average | Excess of limit value | Average | Excess of limit value | Average | Excess of limit value | Average | Excess of limit value |
| Month | $\mu g/m^3$ | % | $\mu g/m^3$ | % | $\mu g/m^3$ | % | $\mu g/m^3$ | % | $\mu g/m^3$ | % |
| I | 45.7 | 0 | 69.0 | 0 | 1,160 | 0 | 61.6 | 3.2 | 23.5 | 0 |
| II | 42.7 | 3.5 | 80.1 | 7.1 | 847 | 0 | 46.4 | 0 | 30.3 | 0 |
| III | 32.1 | 0 | 43.8 | 0 | 481 | 0 | 54.2 | 0 | 47.9 | 0 |
| IV | 25.9 | 0 | 36.5 | 0 | 462 | 0 | 42.6 | 0 | 56.4 | 0 |
| V | 25.7 | 0 | 32.4 | 0 | 294 | 0 | 34.3 | 0 | 66.3 | 0 |
| VI | 21.8 | 0 | 31.8 | 0 | 226 | 0 | 32.5 | 0 | 65.1 | 0 |
| VII | 28.8 | 0 | 40.2 | 0 | 328 | 0 | 34.7 | 0 | 57.0 | 0 |
| VIII | 25.7 | 0 | 38.1 | 0 | 375 | 0 | 39.7 | 0 | 45.5 | 0 |
| IX | 20.7 | 0 | 38.0 | 0 | 530 | 0 | 42.2 | 0 | 46.0 | 0 |
| X | 55.7 | 0 | 102.5 | 16.6 | 659 | 0 | 42.7 | 0 | 29.9 | 0 |
| XI* | - | - | - | - | 878 | 0 | 50.2 | 3.3 | 21.1 | 0 |
| XII* | - | - | - | - | 951 | 0 | 44.0 | 0 | 16.9 | 0 |

* Due to breakdown of the instrument no data were available for $NO_2$ and $NO_x$ components.

On the basis of the data indicated in the table it can be found that in case of CO and ozone no limit value excess was measured during the whole year. Limit value excesses were measured in case of $NO_2$ component in February, in case of the $NO_x$ concentration in February and October, probably originating from heating in the first line. Due to breakdown of the instrument in November and December no measurements were made for these components.

The flying dust concentration exceeded the limit value only in January and November, to a small extent.

The difference between the results of the two test series may be explained, on the one hand, by the diversity of the measurement methods and, on the other hand, by the different sampling places.

### 4.2.2. AIR QUALITY EXAMINATIONS MADE IN FRAMEWORK OF THE PRESENT WORK

Considering the entire section of the motorway in Csongrád County the **KRONA Kft. Environmental Office** performed air quality measurements for the basic status in the settlements located closest to the planned track, at the edge of Szatymaz and Kiskundorozsma, as well as at the crossing section of Kistelek and Szeged (measurement places are shown in the charts of Annex No. 2). Annex No. 3 comprises the minutes of the air quality tests and the detailed analysis of the long-range air immission values estimated on basis of the measurement results. Sampling for the section currently examined was carried out at the crossing section of Szeged in a 2-metre distance from the edge of the carriageway, on the side affected by the wind, with a sampling height of 1.6 metres.

#### 4.2.2.1. Evaluation of the present air quality

The measurement results are to be evaluated on the basis of Section 4.2. of standard No. MSZ 21854-1990 on “Purity requirements of ambient air”. Accordingly:
“The air quality is suitable in an area, if the concentration of the pollutants exceeds neither the short-term nor the long-term air quality limit values.”

| Hazard level of pollutants | Excess of limit value is tolerable | | | | |
|---|---|---|---|---|---|
| | Extent | Yearly event number | | Yearly duration in % | |
| | 24 hours and 30 minutes | 24 hours | 30 minutes | 24 hours | 30 minutes |
| 1 | 1.1 times | 0 | 9 | 0.0 | 0.05 |
| 2 | 1.5 times | 1 | 18 | 0.3 | 0.10 |
| 3 | 2.0 times | 4 | 35 | 1.0 | 0.20 |
| 4 | 2.5 times | 7 | 53 | 2.0 | 0.30 |

| Polluting material | Hazard level | Limit value [microgram/$m^3$] | | |
|---|---|---|---|---|
| | | Annual | 24 hours | 30 minutes |
| Carbon monoxide | 2 | 2,000 | 5,000 | 10,000 |
| Nitrogen oxides | 2 | 100 | 150 | 200 |
| Flying dust | 3 | 50 | 100 | 200 |
| Lead | 1 | - | 0.3 | 0.3 |
| Hydrocarbons [petrol] | 4 | - | 1,500 | 5,000 |

We summarized the results of the measurements performed in Table No. L4. For comparability, we indicate all measured results again, by highlighting the measurement result relating to the present road section (III) with grey background.

Table No. L4 **Summarizing table of examination results**

| Site | | Present status | | | | |
|---|---|---|---|---|---|---|
| | | vehicle/hour max. | Air pollution (average in mg/m3) | | | |
| | | | CO | $NO_x$ | Dust | Petrol |
| Kistelek | 50 | 650 | 0.434 | 0.180 | 0.113 | 1.271 |
| Szeged | 50 | 3,200 | 0.601 | 0.213 | 0.052 | 1.323 |
| Szatymaz | M5 | - | <0.2 | 0.030 | 0.085 | 0.530 |
| Kiskundorozsma | M5 | - | <0.2 | 0.071 | 0.074 | 0.477 |

On the basis of the test results under consideration of all sampling sites the following can be stated:

- As to the **carbon monoxide** pollutant, limit value excess cannot be stated at any of the sampling points, the air quality is **appropriate**.

- The concentration of **nitrogen oxides** exceeds both the 24-hour and the annual limit value in the area of Szeged in the region loaded by the present traffic, in the area of Szeged the 30-minute value too, in each case. The air quality is **inappropriate**.

- In case of **flying dust** all samples exceed the annual limit value.
  With the exception of Kistelek the air quality is **tolerable** in case of flying dust pollutant.

- With regard to **lead** pollutant no excess of limit value can be stated in any of the sampling points, the air quality can be named **appropriate**.

- Regarding **all organic** (petrol) pollutants no limit value excess can be experienced in any sampling points, the air quality can be named **appropriate**.

It can be stated from the figures, however, that with the exception of dust pollutant the **highest values were measured at the measurement point in Szeged.**

#### 4.2.2.2. Assessments carried out on basis of the measurement results

Further on we examined the conditions to be expected along main road No. 50 in the region of Szeged as well as the expectable impact of M5 Motorway at the border of the inhabited area of Kiskundorozsma and we compared it with the present status (see Table No. L5).

Table No. L5 **Results of the estimation**

| Site | | Present status | | | | |
|---|---|---|---|---|---|---|
| | | vehicle/hour max. | Air pollution (average in mg/m3) | | | |
| | | | CO | $NO_x$ | Dust | Petrol |
| Szeged | 50 | 3,200 | 0.601 | 0.213 | 0.052 | 1.323 |
| Kiskundorozsma | M5 | - | <0.2 | 0.071 | 0.074 | 0.477 |

| Site | | Status to be expected in 2015 (toll HUF 10 / km) | | | | |
|---|---|---|---|---|---|---|
| | | vehicle/hour max. | Air pollution (average in mg/m3) | | | |
| | | | CO | $NO_x$ | Dust | Petrol |
| Szeged | 50 | 1,561 | 0.293 | 0.104 | 0.025 | 0.645 |
| Kiskundorozsma | M5 | 2,272 | 0.095 | 0.036 | 0.022 | 0.019 |

| Site | | Status to be expected in 2015 (toll HUF 20 /km) | | | | |
|---|---|---|---|---|---|---|
| | | vehicle/hour max. | Air pollution (average in mg/m3) | | | |
| | | | CO | $NO_x$ | Dust | Petrol |
| Szeged | 50 | 1,702 | 0.320 | 0.113 | 0.028 | 0.704 |
| Kiskundorozsma | M5 | 1,260 | 0.053 | 0.020 | 0.012 | 0.011 |

#### 4.2.2.3. Conclusions

On the basis of the measurements and calculations the following essential statements may be made:

- In 2015 the expectable air quality status will not exceed, in the region of **Kiskundorozsma**, the limit value in case of any pollutant examined, consequently the air quality will be expectably **appropriate** from the aspect of the M5 Motorway.

- In the region of **Szeged** the improvement of air quality can be expected on basis of the traffic data put to our disposal. In the case of **nitrogen oxide** pollutant the air quality

will be presumably **tolerable**, while with regard to the **rest of the pollutants** the qualification **appropriate** may be forecast.

**This estimation refers to the critical, expectably most unfavourable status, since in Szeged it reckons with the air concentration to be measured at the pavement at a distance of 2 metres from the edge of the road, furthermore it considers only the traffic increase, leaving out of account the expectable decrease of the specific emission.**

### 4.2.3. EXPECTABLE ENVIRONMENTAL IMPACT OF THE PLANNED INVESTMENT PROJECT

#### 4.2.3.1. Air pollution during the construction

At the construction works the following phases, operations result in environmental pollution:

- movement of machineries, transport traffic,
- loading operation,
- asphalt preparation,
- incineration of wastes on the spot.

In the present phase no information is available about the conditions and technology of the construction, thus expectable impacts may be assessed on basis of former experiences, examinations only. In the same way we know, in this phase, only the mining sites to be taken into consideration, but we do not know the ones actually designated. The environmental plan for the construction has to be prepared at the level of the detailed drawings, in the knowledge of the organisational plan in order to keep the unfavourable impacts at a minimum value and to comply with the limit values.

Among the air pollutants generated during the construction, dust will be expectedly the most important one, which endangers primarily the vegetation (it hinders the gas exchange). Tar damp coming into the air in the course of asphalting lasts a much shorter time and is harmful primarily for animals, like the paints and dissolvent gases coming into the atmosphere in the course of painting the pavement signs by spray.

The air emission load originating in the public road transport of building materials and the operation of machineries – primarily nitrogen oxides, sulphur dioxide, heavy metals and carbon black – may be concentrated in space and time, therefore it may cause problems in settlements located close to the motorway.

Dust may be generated by vehicle traffic, loading of the transported materials, landscaping and constructing technology to an extent subject to the feature of the used basic materials. Dust pollution might be especially considerable in sandy soils in the district of mining sites and on the transport routes. Therefore, from the aspect of air purity protection mining sites located near the motorway or not very far away may be recommended for exploitation, in case of which transportation can be solved by bypassing the inhabited area. The detailed description of the possible mining sites to be reckoned with is included in Annex No. 6. In the areas taken into account in the section under examination transportation can expectably be dissolved without touching any inhabited areas, nevertheless the lorries transporting materials must be covered for the sake of dust pollution reduction. Deposited earth materials are to be sprinkled in regular intervals until reuse for protection against dusting, furthermore, incineration of wastes on site is to be avoided.

In the sections to be constructed, it is advisable to grass the banks as soon as possible and to carry out the vegetation plantation.

The air pollution from construction is in each case temporary and as it is about a linear facility, each section is loaded by the air pollution for a relatively short time, which is well dispersed in the entirety of the impact area both in space and time.

First of all the constructing and site preparation areas and their district of approx. 100 metres are the areas of construction loaded by air pollution. We qualify this load as **supportable**.

The supportable qualification may be justified by the following:

- temporary, relatively short load,
- its extent is negligible as compared to the load of the operation,
- construction is implemented locally, only in shorter sections at the same time,
- air pollution generated during the construction may be reduced by appropriate measures (see e.g. construction organisation, sprinkling, covering of transport vehicles).

#### 4.2.3.2. Air pollution during operation

***A) Air pollution originating in traffic***

The air pollution originating in traffic is determined primarily by the total emission of the vehicles, which is subject to the following factors:

- Extent and composition of the traffic (proportion of cars, lorries and within this that of heavy lorries);
- Hindrance of the traffic (magnitude and spread of the driving speed);
- Geometrical shaping of the route;
- Specific emission of the vehicles;
- Provision of the vehicles with environmental equipment (catalytic converter, feedback of exhaust, afterburner);
- load of the vehicles (heavy vehicles);
- quality of the used fuel (octane number, unleaded petrol).

We elaborated the air **emission calculations** on the basis of the traffic data forecast to 2015, received from the Client and the specific emission values calculated from the expectable modernisation of the vehicle park (BORSI Zoltán, KTI).

We computed the emission values for three possible versions: motorway with toll (HUF 10/km), motorway with toll (HUF 20/km) and the so-called "0" solution without motorway, as well as for the four most characteristic components: CO, $NO_x$, formaldehyde and carbon black (Tables No. L6-8). For information and comparability we included in the tables not only the assessed emission values of section marked III under examination, but also those of the total section in Csongrád County. (We highlight the results of the examined section by grey background)

Table No. L6 **M5 motorway toll version (HUF 10/km), average daily air emission values (µg/ms) estimated for 2015**

| Route No. | Section | CO | $NO_x$ | Formaldehyde | Carbon black |
|---|---|---|---|---|---|
| 50 | 1. M5 Motorway – Kistelek | 24.35 | 69.24 | 0.383 | 3.44 |
| 50 | 2. Kistelek | 29.00 | 82.46 | 0.456 | 4.09 |
| 50 | 3. Kistelek – Balástya | 50.38 | 140.94 | 0.799 | 7.12 |
| 50 | 4. Balástya – Szatymaz | 54.49 | 154.93 | 0.857 | 7.68 |
| 50 | 5. Szatymaz – M43 Node | 54.49 | 154.93 | 0.857 | 7.69 |
| 50 | 6. M43 Node – Szeged | 65.43 | 186.11 | 1.029 | 9.22 |
| 50 | 7. Szeged – State border | 39.84 | 113.30 | 0.626 | 5.62 |
| M5 – 1 | Kiskunfélegyháza – Kistelek | 348.69 | 490.77 | 2.052 | 24.60 |
| M5 – 2 | Kistelek – Balástya | 353.48 | 496.85 | 2.078 | 24.91 |
| M5 – 3 | Balástya – Szeged-North | 342.36 | 480.89 | 2.013 | 24.12 |
| M5 – 4 | Szeged-North – Szeged-West | 224.53 | 315.63 | 1.321 | 15.38 |
| M5 – 4 | Szeged West – State border | 163.68 | 230.10 | 0.962 | 11.17 |
| M43 | M5 Motorway – Main road No. 50 | 321.02 | 451.27 | 1.692 | 22.62 |

Table No. L7 **M5 motorway toll version (HUF 20/km), average daily air emission values (µg/ms) estimated for 2015**

| Route No. | Section | CO | $NO_x$ | Formaldehyde | Carbon black |
|---|---|---|---|---|---|
| 50 | M5 Motorway – Kistelek | 44.07 | 125.33 | 0.693 | 6.21 |
| 50 | Kistelek | 52.49 | 149.29 | 0.825 | 7.40 |
| 50 | Kistelek – Balástya | 66.78 | 189.91 | 1.050 | 9.41 |
| 50 | Balástya – Szatymaz | 70.46 | 200.86 | 1.107 | 9.93 |
| 50 | Szatymaz – M43 Node | 70.46 | 200.86 | 1.107 | 9.93 |
| 50 | M43 Node – Szeged | 74.45 | 211.71 | 1.171 | 10.50 |
| 50 | Szeged – State border | 41.95 | 119.28 | 0.660 | 5.91 |
| M5 | Kiskunfélegyháza – Kistelek | 209.92 | 295.09 | 1.235 | 14.80 |
| M5 | Kistelek – Balástya | 209.92 | 295.09 | 1.235 | 14.80 |
| M5 | Balástya – Szeged North | 203.91 | 286.80 | 1.199 | 14.38 |
| M5 | Szeged North – Szeged West | 154.56 | 217.26 | 0.909 | 10.89 |
| M5 | Szeged West – State border | 156.43 | 220.02 | 0.920 | 11.03 |
| M43 | M5 Motorway – Main road No. 50 | 150.25 | 211.34 | 0.883 | 10.59 |

Table No. L8 **M5 version without motorway, average daily air emission values (µg/ms) estimated for 2015**

| Route No. | Section | CO | $NO_x$ | Formaldehyde | Carbon black |
|---|---|---|---|---|---|
| 50 | M5 Motorway – Kistelek | 76.07 | 209.28 | 1.207 | 10.72 |
| 50 | Kistelek | 88.93 | 245.22 | 1.411 | 12.53 |
| 50 | Kistelek – Balástya | 84.60 | 238.52 | 1.337 | 11.95 |
| 50 | Balástya – Szatymaz | 89.67 | 255.52 | 1.416 | 12.69 |
| 50 | Szatymaz – M43 Node | 89.67 | 255.52 | 1.416 | 12.69 |
| 50 | M43 Node – Szeged | 89.67 | 255.52 | 1.416 | 12.69 |
| 50 | Szeged – State border | 97.93 | 258.02 | 1.485 | 13.19 |

Since MOL RT. will discontinue the production of leaded petrol within one year, lead emission therefore need not be counted with at long-term calculations.

While estimating the emission values, we had the assumption that by 2015 the domestic vehicle park will be much more up-to-date, and therefore primarily the specific emission of carbon monoxide will be significantly reduced, by 70-80% for lorries and by 90-95% for passenger cars.

***B) Examination of the transmission of air pollution and the effects of precipitation***

Critical air pollution evolving in the area of traffic roads primarily depends on the following factors:

- Density of traffic and its distribution in time; composition of vehicles; extent of total emissions, which is subject to emission factors and average speed.
- Extent of unfavourable transmission conditions, frequency of their occurrence.
- Linear source configurations: bank, ground level road, gully etc.
- Extent of basic load.
- Extent of building-in and conditions of roughness.
- Effect of vegetation and protective wall bordering the roads.

The long-term (2015) air emission calculations were performed taking into consideration the above factors by applying the domestic standard method (MSz (Hungarian Standard) 21459/2-81: Determination of the transmission of air pollutants, Calculation of the polluting effect of area-surface sources and linear sources) 10-50 metres away from the edge of the road (Table No. L9-11). The air immission concentrations were defined for three components: carbon monoxide, nitrogen dioxides and carbon black. The estimated pollution of the entire section in Csongrád County is included too for the purpose of comparability. (The results of the examined section are highlighted by grey background.)

Table No. L9 **Average air immission concentrations (µg/m$^3$) per 24 hours, estimated for 2015, originating in traffic, in the area of the M5 Motorway (HUF 10/km) as a function of distance (m)**

| Road | Section | CO | | | $NO_x$ | | | Carbon black | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 10m | 20m | 50m | 10m | 20m | 50m | 10m | 20m | 50m |
| 50 | 1. | 5.6 | 3.2 | 1.2 | 16 | 9 | 3 | 0.77 | 0.45 | 0.16 |
| 50 | 2.* | 6.7 | 3.8 | 1.5 | 19 | 11 | 4 | 0.94 | 0.53 | 0.19 |
| 50 | 3. | 11.6 | 6.7 | 2.5 | 32 | 18 | 7 | 1.6 | 0.93 | 0.33 |
| 50 | 4. | 12.5 | 7.1 | 2.6 | 35 | 20 | 7 | 1.7 | 1.0 | 0.4 |
| 50 | 5. | 12.5 | 7.1 | 2.6 | 35 | 20 | 7 | 1.7 | 1.0 | 0.4 |
| 50 | 6. | 15.0 | 8.5 | 3.3 | 42 | 24 | 9 | 2.1 | 1.2 | 0.5 |
| 50 | 7. | 9.2 | 5.2 | 2.0 | 26 | 15 | 6 | 1.3 | 0.7 | 0.3 |
| M5 | 1. | 80.2 | 45.3 | 17.4 | 113 | 64 | 23 | 5.5 | 3.2 | 1.3 |
| M5 | 2. | 80.2 | 45.3 | 17.4 | 114 | 65 | 23 | 5.7 | 3.2 | 1.3 |
| M5 | 3. | 78.8 | 44.5 | 17.1 | 111 | 63 | 23 | 5.5 | 3.1 | 1.2 |
| M5 | 4. | 51.7 | 44.5 | 17.1 | 73 | 41 | 15 | 3.5 | 2.0 | 0.77 |
| M5 | 5. | 37.7 | 21.3 | 8.2 | 53 | 30 | 11 | 2.6 | 1.4 | 0.52 |
| M43 | | 73.8 | 41.7 | 16.1 | 103 | 58 | 21 | 5.2 | 2.9 | 1.1 |

Remark: The air immission concentration of inhabited areas is more unfavourable than the above values due to the extent of building-in and background pollution.

Table No. L10 **Average air immission concentrations (µg/m$^3$) per 24 hours, estimated for 2015, originating in traffic in the area of the M5 Motorway (HUF 20/km) as a function of distance (m)**

| Road | Section | CO | | | $NO_x$ | | | Carbon black | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 10m | 20m | 50m | 10m | 20m | 50m | 10m | 20m | 50m |
| 50 | 1. | 10.1 | 5.7 | 2.1 | 29 | 16 | 6 | 1.4 | 0.8 | 0.31 |
| 50 | 2. | 12.1 | 6.8 | 2.6 | 34 | 19 | 7 | 1.7 | 1.0 | 0.37 |
| 50 | 3. | 15.4 | 8.7 | 3.3 | 44 | 25 | 10 | 2.2 | 1.2 | 0.47 |
| 50 | 4. | 16.2 | 9.2 | 3.5 | 46 | 26 | 10 | 2.3 | 1.3 | 0.49 |
| 50 | 5. | 16.2 | 9.2 | 3.5 | 46 | 26 | 10 | 2.3 | 1.3 | 0.49 |
| 50 | 6. | 17.1 | 9.7 | 3.7 | 49 | 28 | 11 | 2.4 | 1.4 | 0.52 |
| 50 | 7. | 9.4 | 5.3 | 2.1 | 27 | 15 | 6 | 1.4 | 0.76 | 0.29 |
| M5 | 1. | 48.3 | 27.3 | 10.5 | 68 | 34 | 15 | 3.4 | 1.92 | 0.74 |
| M5 | 2. | 48.3 | 27.3 | 10.5 | 68 | 34 | 15 | 3.4 | 1.92 | 0.74 |
| M5 | 3. | 46.9 | 26.5 | 10.2 | 66 | 37 | 14 | 3.3 | 1.9 | 0.72 |
| M5 | 4. | 35.6 | 20.1 | 7.7 | 50 | 28 | 11 | 2.5 | 1.4 | 0.54 |
| M5 | 5. | 40.0 | 20.3 | 7.8 | 51 | 29 | 11 | 2.5 | 1.4 | 0.55 |
| M43 | | 34.5 | 19.5 | 7.5 | 49 | 27 | 11 | 2.5 | 1.4 | 0.55 |

Remark: The air immission concentration of inhabited areas is more unfavourable than the above values due to the extent of building-in and background pollution.

Table No. L11 **Average air immission concentrations (µg/m$^3$) per 24 hours, estimated for 2015, originating in traffic in the area of the present route, without the construction of the motorway as a function of distance (m)**

| Road | Section | CO | | | $NO_x$ | | | Carbon black | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 10m | 20m | 50m | 10m | 20m | 50m | 10m | 20m | 50m |
| 50 | 1. | 17.5 | 9.9 | 3.8 | 48 | 27 | 10 | 2.5 | 1.4 | 0.54 |
| 50 | 2. | 20.4 | 11.6 | 4.4 | 56 | 32 | 12 | 2.9 | 1.6 | 0.63 |
| 50 | 3. | 19.5 | 11.0 | 4.2 | 55 | 32 | 12 | 2.7 | 1.6 | 0.60 |
| 50 | 4. | 20.6 | 11.7 | 4.5 | 59 | 33 | 13 | 2.9 | 1.7 | 0.63 |
| 50 | 5. | 20.6 | 11.7 | 4.5 | 59 | 33 | 13 | 2.9 | 1.7 | 0.63 |
| 50 | 6. | 20.6 | 11.7 | 4.5 | 59 | 33 | 13 | 2.9 | 1.7 | 0.63 |
| 50 | 7. | 22.5 | 12.7 | 4.9 | 59 | 33 | 13 | 3.0 | 1.7 | 0.66 |

Remark: The air immission concentration of inhabited areas is more unfavourable than the above values due to the extent of building-in and background pollution.

The tables contain the air immission values originating in traffic only. This value is increased in the inhabited areas, by the pollution from settlements. There is a difference between the data measured by the RIV measurement network and ATIKÖFE in 1997 at the settlements, as a consequence of the measurement methods and measurement sites.

This value varies

- in the area of Szeged between 20.70-67.86 µg/m$^3$

for the contaminant component originating mostly in traffic (nitrogen dioxide).
Characteristically, the values of the heating season are higher, due to communal pollution and unfavourable weather conditions.

At these settlements air pollution values, it is difficult to separate the traffic-related pollution from the other ones. Therefore, at long-term calculations referring to 2015, especially in the case of inhabited areas, it would be too unreliable to add the completely uncertain background pollution to the concentration calculated from traffic.

The situation is more simple along the motorway, where there is no other industrial pollution, unlike e.g. the area of Algyő, since the data provided by the station measuring the background air quality (Kecskemét – K-puszta) can be added to the calculated values. In the case of $NO_2$ this value is in the average between 8-10 $\mu g/m^3$, which is much lower than the value originating in traffic. The measurement station does not test CO and carbon black.

The low values found concerning carbon monoxide can be explained by the development of the domestic vehicle park by 2015: it will be much more up-to-date, with lower consumption and mostly equipped with a catalytic converter – thus their specific emission will be significantly reduced in compliance with the aforementioned and the EU directives (by 70-80% for lorries and by 90-95% for passenger cars).

Taking into account the above tables it can be stated that the average air immission values calculated for 24 hours do not reach the air pollution limit values for any one of the components, even at 10 metres. For the purposes of comparison with the peak hour and a limit value of 30 minutes the Design Traffic per Hour (MOF) was taken for basis, which can be calculated according to standard MSZ-07-3713 from the average daily traffic, as per its definition busier traffic occurs during 30 hours per year.

Calculating with the above, the traffic-related air emission value is 2-3 times the average emission, in exceptional cases, in the event of the simultaneous occurrence of unfavourable atmospheric conditions and peak-hour traffic, air pollution may be 5-fold.

Calculating with this worst case scenario, it can be stated that along the M5 Motorway the limit value will be complied with within 50 metres at a toll of HUF 10/km and within 20 metres at a toll of HUF 20/km in case of $NO_x$.

In the case of the other components, no excess of the limit value is expected beyond 10 metres.

It must be emphasised that the above values apply to air pollution arising from traffic only; these values are supplemented by the so-called background pollution in each case.

Analysing the air immission data of the M5 Motorway in two versions it can be stated that pro rata the volume of the expected traffic, greater air pollution can be estimated in the version of HUF 10/km.

However, when examining the air immission data of main road No. 50, it can be stated that pro rata the traffic distraction, air pollution is the most favourable in the version of HUF 10/km and least favourable in the case of the “0” solution, without motorway, concerning all components.

#### 4.2.3.3. Effect of traffic distraction

At the crossing section of main road No. 50 in Szeged, air pollution is reduced in proportion to traffic distraction; as a consequence **the life conditions of the settlement's inhabitants will improve**. In this case the values calculated on the basis of the version of HUF 10/km are unambiguously more favourable. The effect is thus **improving**; its extent is the function of the toll amount.

#### 4.2.3.4. Air pollution from average

In the case of public road accidents (e.g. collision, overturning or inflammation of a tanker transporting ethylene) air pollution from average can also occur. This is fortunately a very rare event and its impact in increasing the level of air pollution can be ignored, since it is about a one-time and local emission. A problem can be caused only, where the track leads directly along the inhabited areas. In this case, the load may increase manifold compared to the normal operating emissions, for a short time, in a small area. This has a much stronger impact on the indirect impact carriers too (soils, waters, wildlife, man). Comments and regulations on cases of average are included in Annex No. 4.

Due to the above-mentioned reasons, the pre-qualification of the impact cannot be performed on the new track of M5 Motorway. A major environmental hazard exists here at the sections along the settlements and the detached farms. **In order to reduce the risks, an action plan concerning cases of average and the methods of damage prevention shall be included in the motorway operation instructions.**

During the estimation of risks, the positive impact areas shall be considered as well, accordingly the present central area of main road No. 5, the densely inhabited central areas of Szeged. In this respect it can be stated that considerable reduction of the risks can be expected, since the transit traffic of vehicles transporting hazardous materials can be prohibited in inhabited areas (if the alternative route is already available). **Thus in this inner area section a significant reduction of risks is expectable.**

### 4.2.4. PRECISION OF THE IMPACT AREA, THE NECESSARY ENVIRONMENTAL MEASURES

From the aspect of air purity protection, the previously delimited impact area can be precised as follows:

- Along M5 Motorway — in case of a toll of HUF 10/km — 50 m
- Along M5 Motorway — in case of a toll of HUF 20/km — 20 m
- Along main road No. 50 — in case of a toll of HUF 10/km — 20 m
- Along main road No. 50 — in case of a toll of HUF 20/km — 20 m
- Along main road No. 50 — without motorway — 30 m

Thus, according to our calculations, the pollution from traffic can even **be damaging without any kind of technical measures** in inhabited areas within 50 metres. However, most of the objects to be protected along the planned track are located farther than 50 metres. The plans recommend the planning of a noise-screening wall, which can be applied at the same time for

the reduction on harmful substances, for the majority of them and for those located within 50 metres anyhow.

Inner areas of settlements do not fall in the 50-metre zone. From the 66 detached farms located in the exmined area 10 are located closer than 50 metres from the track; 2 are located at 50 metres. From the 10 farms located within 50 metres the ones at chainages 165.13, 167.0, 167.65, 168.3, 169.95 and 171.6 are inhabited; those at chainages 166.3, 166.5, 169.0 and 171.58 are abandoned. Both farms located at 50 metres (at chainages 165.2, 172.2) are inhabited. **Therefore 8 farms may be considered endangered, the recommended technical solutions shall be necessarily applied in order to reduce air pollution, or they must be expropriated.**

**The noise-screening wall constructed approx. 10 metres from the edge of the motorway and 1.5 metres from the boundary of expropriation towards the motorway results in a 20-50% reduction of air pollution** based on various references in the professional literature. The negative impact of the noise-screening wall, especially if it is placed on both sides, is that it prevents the ventilation of the motorway. Along M5 Motorway the objects to be protected are generally located on one side only at one time.

In case of constructing noise-screening walls the impacts of traffic can be reduced to the **supportable-loading** category in case of every detached farm, even in the event of unfavourable weather and considering the limit values of short duration, from the aspect of air purity protection. Elsewhere the impact of air pollution from the traffic running on the M5 Motorway can be qualified as **supportable-neutral**.

It should be emphasised, however, that **according to the calculations made for an average of 24 hours, the concentration of harmful substances falls below the limit value already within 10 metres**, i.e. significant air pollution that can be qualified as harmful, occurs only outside the expropriation boundary.

### 4.2.5. MAJOR UNCERTAINTIES AND MISSING DATA

We feel material uncertainties at the calculation of air immission values during the motorway operation phase. Beyond minor traffic uncertainties, there are great uncertainties concerning the specific vehicle emission estimated for 2015, which depends on economic growth and technological development.

The EU regulation on emission applicable beyond the turn of the millennary provides a point of reference, which will be followed by us, even if with some delay. Expectedly the vehicles with two-stroke engines currently used will no longer be in traffic, all motor vehicles operating with petrol will be equipped with a catalytic converter. We hope that our vehicle park will be in line – or at least approximate – the modern Western European types. In case the vehicle park remains below the expected level of development, this may cause even significant deviation from the calculated results.

Some uncertain assumptions have to be made concerning the standard calculations of transmission too, (wind direction and speed, stability constant, etc.). The latter ones, however, do not significantly influence the results.

### 4.2.6. IMPLEMENTATION OF THE MONITORING SYSTEM

We consider important that the constructor elaborates an environmental action, labour safety and average plan prior to the commencement of the motorway construction.

The objective of monitoring and control during the construction is to check the observance of the above environmental estimations. In case of complaints from the inhabitants, measurements at random may be recommended at the transport routes touching the inhabited areas.

The control of air quality is justified at the Subasa gardens in the operation phase. The effect of the noise-screening wall might be measured at the same time.

### 4.2.7. SUMMARY OF STATEMENTS ON THE PROTECTION OF AIR PURITY

With the construction of the planned motorway, a linear air polluting source appears on an area having had appropriate air quality so far.

**Based on the air immission calculations, in an average of 24 hours the concentration of harmful substances are under the limit value beyond 10 metres, thus any major air pollution occurs only within the expropriation border.**

**In case of objects to be protected, the impact of air pollution can be decreased by the construction of noise-screening walls.**

**At Szeged, in the passage section of main road No. 50, air pollution will be reduced to a considerable extent** – proportionately with traffic distraction –, **generating improvement in the life conditions of the settlement's inhabitants**. Beyond environmental benefits, traffic on the motorway involves a lower hazard of accidents.

**Based on the above, we recommend to construct the section of M5 Motorway between Kiskunfélegyháza and the State border primarily in the toll version of HUF 10/km or as low as possible, because of the greater effect of traffic distraction effect, in compliance with the environmental measures, from the aspect of air purity protection.**

## 4.3. SURFACE WATERS

The track of M5 Motorway does not touch surface living waters (stream or river), but it passes over channels used for various purposes (inland water drainage, irrigation). These latter are listed as follows:

- Matyér-Subasa main channel at chainage 164 + 026 km
- Kunhalom channel, branch I at chainage 166 + 910 km
- Ábrahámszék channel at chainage 167 + 910 km
- Simonköz channel correction at chainage 169 + 080 km
- Bátaszék channel at chainage 170 + 540 km
- Kancsaltó channel at chainage 172 + 538 km
- Börcsök-farm channel at chainage 173 + 410 km
- Siskóhalom channel at chainage 173 + 948 km
- Paphalom channel at chainage 174 + 684 km

### 4.3.1. RAINWATER DRAINAGE

The extent of water pollution resulting from the drainage of rainwater is simultaneously influenced a number of factors. The most important factors include traffic density, road surface and the climatic conditions (precipitation, etc.).

The direct pollutants of solid and fluid consistence originate during traffic partly in the abrasion of automobiles. During the friction of tyres, the substances deposited on the road surface are primarily caoutchouc-type organic polymers/compounds with sulphur content and carbon black. Their common characteristic feature is that although they are organic substances, they cannot be easily decomposed biologically due to their structure.

Certain metals (lead, chromium, copper and nickel) are also released into the environment in the same way, however to a lower extent. Among these, the role of zinc is the most important, not only because its proportion is relatively high, but also because it occurs in the form of salts which dissolve the easiest– even if they are less toxic.

The substances dripping from vehicles (petrol and diesel oil, engine oil, gear oil, brake fluid, underspraying compounds, antifreeze compounds) have a great impact in the present domestic conditions. In the traffic forecast for 2015, however, the traffic of more modern vehicles in a better technical condition is expected; therefore the impact of this factor is assumed to become negligible.

The majority of the listed substances are organic substances; nevertheless, they contain many pollutants that are not petroleum derivatives. Among the fuels, petrol contains a relatively high level of lead compounds (although their level is continuously decreasing owing to the spread of the use of unleaded petrol), but other heavy metals can occur in traces. As far as lubricants are concerned, primarily their zinc content is significant. In used motor oils, lead originating in petrol accumulates, but during usage their chromium, nickel and copper content increases considerably as well.

The various additives mixed to the fuels (including lubricants) contain further polluting metals, but principally organic phosphoric compounds. In the course of traffic, the metal and other component parts of the automobiles abrade naturally, for the normal operation of which no lubricants are applied. For the most part, the pulverisation of the brake pads shall be considered, but other, not so obvious processes should also be taken into account, e.g. the falling of substances due to the corrosion of the chassis and the car body.

From the materials deposited on the pavement the most dangerous environmental pollutants are, mainly in the case of older vehicles, the asbestos fibres, the carcinogenic effect of which is widely known. Due to its insolubility, asbestos does not belong to the substances particularly dangerous from the aspect of water quality, at least in cases, when it cannot directly get into the water to be used for human consumption, on the other hand this factor is not significant due to the technical improvement of the vehicles. Besides the asbestos fibres, metals also get rubbed off from the vehicles. Among these, the largest volume is represented by copper used for the enhancement of heat resistance, but the level of nickel, chromium and lead is measurable, as well.

As an impact of vehicle traffic the pavement itself is continuously pulverising, the generated dust generally contains rough-grained particles splitting off in an agglomerated way. With regard to its volume, the finer fraction with a particle diameter below 0.05 mm is small, but owing to its colloidal or quasi-colloidal features, this is the type of dust that is more

detectable in water. Dust generated by the abrasion of pavement contains mainly insoluble inorganic compounds; the slight organic part is dominated by hydrophobic substances of large molecules.

The way of harmful substances depositing on the pavement and the surrounding surfaces greatly depends on the weather and climate conditions, the relief, the extent of building-in of the environment, the method of rainwater drainage and some other factors.

In precipitation-free weather conditions the strength of air movement is decisive. In wind-free, dry weather the dust containing the polluting substances remains quietly on the road surface. Although the slip-stream caused by the vehicles passing by drifts the finer dust particles, during the gaps in traffic they fall back partly on the pavement, partly on its direct environment (within a distance of 1-3 metres).

In windy weather, air circulation lays the dust deposited on the pavement surface and the aerosols in a wide zone along the road. The various fractions are separated at this point, the distance covered by the polluting substances of different particle sizes depends on wind power and on the turbulence of air flow. However, the level of mixing increases in the proportion of distance, therefore the harmful effect decreases.

In rainy weather, 34-83% of the rainwater falling on the road surface drains off the pavement depending on the pavement material, its convexity and a number of other factors. The pavement is to be considered completely impermeable in principle. This rainwater contains – as floating substance or as a solute – the majority of the pollutants. The extent of the pollution level of rainwater varies within a wide range, depending on location, time and many special parameters, it is also strongly depending, at a given spot, on e.g. how much time has elapsed from the beginning of the rain. The estimation of concentration is therefore rather difficult, but the aggregate volume of the load, dispersed in space and time cannot be significant, especially, if an improved technical standard is associated with the increasing traffic.

Besides the polluting substances originating in vehicles and the road surface, the salting material dispersed during the winter months as antislip agent also gets into the rainwater running off. According to the applicable Decree, this level may be up to 1,200 g/m$^2$/year, which corresponds to a value of 20 g/m$^2$/day in the average. In extreme cases the concentration appearing in the surface waters might be greater than desired, however, taking into account that the receptacles are not living waters, this may not cause any serious problem either.

Based on the assessments performed by the Anti-corrosion and Environmental Association for Transport, Communication and Constructions, the heavy metal pollutants deposited on the surface of the pavement and drained by rainwater are the following:

- Lead 0.46 mg/l
- Zinc 0.36 mg/l
- Chrom 0.23 mg/l
- Nickel 0.15 mg/l
- Copper 0.15 mg/l

The precipitation, enriched by pollutants deposited on the pavement, is drained into channels for the most part of the track. The receptacles are inland waters and irrigation channels, which are sensitive for pollution owing to their size and small water output rate. This effect would

be loading with regard to the small streams already loaded with pollution, especially in unfavourable precipitation conditions. However, since they primarily collect the waters of shorter sections, the value of enrichment by pollutants cannot be too high, they generally reach these receptacles with adequate thinning water. Therefore the qualification of the load is **supportable**.

According to the experiences – based on the monitoring of Phase 1 – the drained rainwater do not cause considerable changes in the quality of the waters drained in the channels. After the privatisation of agricultural lands, the demand for increased water usage and the expansion of irrigation facilities may occur also in this region. The transformation of agriculture is in progress even now; its impacts on water management are not clearly visible yet. Therefore, although it would be desirable, but today is not yet possible to perform estimations, taking into account the modifications of water use relating to area utilisation of the areas along the motorway.

Along certain sections desiccating of rainwater is also performed – by necessity – owing to the establishment of game passages. These sections are the following:

- between chainages 161 + 500 – 163 + 000 km
- between chainages 171 + 000 – 171 + 500 km

Desiccating may cause problems in areas, where there are valuable habitats in the neighbourhood that can be regarded as sensitive for polluted waters, or where high groundwater levels must be taken into account from the very beginning. From the two sections listed above, the first one is located beneath an area valuable from the aspect of nature conservation.

When planning and implementing the water supply and wastewater drainage of the connected facilities established along the motorway (rest areas, filling stations, etc.) the unfavourable impacts can be prevented by taking into consideration the environmental requirements. Planning and implementing require more intense attention on sections, where high groundwater levels can also occur.

### 4.3.2. WATER POLLUTION FROM AVERAGE

In the case of water pollution from average, the same action mechanisms come into operation, as those described under rainwater drainage. The difference is that in the event of average various unforeseen types and quantities of pollutants get into the environment abruptly, impulsively. (Comments relating to averages are comprised in Annex 4.)

Water pollution from average can primarily happen when tilting into channels or their direct environment. Its occurrence has a very low probability, however it can be considered dangerous. It is much more dangerous than the constant small-scale pollution from normal operation. The latter is even, the self-cleaning capacity of watercourses can cope with the moderate load. On the contrary, the pollution from average may, with regard to the low water outputs, destroy at least temporarily the wildlife of the watercourse, thus also its self-cleaning capacity. Such pollution from average can be localised well at places, where a sluice is built in the reservoir ditch before the receptacles. In these cases the extent of pollution is not expected to exceed the supportable impact.

Elsewhere the pollution from average can permanently or temporarily load or damage the water quality. This risk is greater, where there are wet, humid habitats near the track, or

higher groundwater levels need to be considered. The impact can be qualified exactly only in knowledge of the actual situation, since it is highly depending on location and pollutant. The risk of water pollution from average is supportable; the utilisations (irrigation) may be temporarily hindered or restricted.

The action plan relating to averages shall be elaborated in the framework of the motorway operation instructions.

### 4.3.3. SHAPING OF HYDRAULIC ENGINEERING FACILITIES

Due to the relatively small size and water output of the channels, the placement of the new engineering structures will not cause noteworthy modifications in water dynamics. No major correction should be taken into account in this case. Therefore, the impact is considered **neutral**.

## 4.4. EARTH, SUB-SURFACE WATERS

In the present case it seemed to be purposeful to discuss in one chapter the issues related to earth, soil and sub-surface waters. This is justified by their narrow correlation, similar sensitivity for loads, but in the area under examination primarily by the fact that no surface living watercourse is touched by the track. See the track in Annex No. 5/I.

Data made available for the impact study:
- Concise layout drawing M = 1:100,000
- General layout plans (project No. 49.106/02/2-103) of the licensing plan of Section II of M5 motorway between Kecskemét and the State border. M=1:2,000
- General expert opinion of geotechnics. UVATERV, GEO-TERRA Kft.

### 4.4.1. GEOLOGICAL AND HYDROGEOLOGICAL FEATURES OF THE AREAS TOUCHED BY THE PLANNED TRACK

#### 4.4.1.1. Geological features

A whole series of experts dealt in detail with the geology of the area (Sümeghy 1953, Erdélyi 1955, Rónai 1961, 1982, Molnár 1961, 1965, Pécsi 1965, 1967, Urbancsek 1977, Mike 1979). The area under examination stretches at the southern part of the ridge of Duna-Tisza köze and from here in southern direction it continues on an incline lowering towards Tisza. The track runs approximately in the strike direction of this inclination.

Duna-Tisza köze has three special parts [1].
- The first one is the Danube Valley of our times, a broad plane stretching along the left bank of the river.
- The second one is the northern part of the sand ridge, which leans against the Gödöllő hills and inclines therefrom to southeast. A central backbone stretches in the line of Nyáregyháza, Lajosmizse and Kecskemét. The area inclines to the west and east therefrom in the direction of the Danube and Tisza.
- The third, southern area of the sand ridge is separated by a resolute saddleback between Solt and Kiskunfélegyháza from the northern area. The area under examination too belongs here. The parts, elevated to a height from 160 to 170 metres at the Danube Valley,

of this southern part are inclined abruptly to west-northwest, and sloping to east, towards the Danube (90 m) and Tisza (80 m).

The **substratum** is in a depth of 400 to 2,200 m under the ridge. The crystalline basement deepened to a depth of more than 3,000 m is covered by Miocene detritic rocks and Eocene "flish" sandstones towards the Tisza Valley in southeast.

The **Pannonia formations** settled down in a depth of 200 to 2,000 m over the rock bottom. The **cover of the Quaternary** over the layers of Pannonia lakes is several 10 metres thick in the Danube valley, 50 to 300 m on the ridge and it becomes to 200 to 500 metres thick on the part inclined towards Tisza. Below these layers the altitude position of Pannonia surface determines the sub-surface stratigraphic conditions of the area, the thickness, dimensions and connections of the water producing layers of the Quaternary. This Pannonia basement consisting of clay for the most part is inclined sloping on from west to east and gradually from north to south.

The **sediments of the Quaternary** are the most important surface formations of the area. This area is a big alluvial cone of Old Danube. At the beginning of Pleistocene the river ran in several branches from the Pest gulf in the direction Kecskemét-Csongrád-Szeged, several branches, however, had a route towards east, Cegléd, while others to the south, Kiskunhalas and Jánosfalva. During 1.5 to 2 million years the branches of the river migrated to west. Therefore, the gravels of Old Danube are to be found in different depths and they are not to be found everywhere in the whole area.

**Sand drift** is dominant among the formations of the ridge. The surface of the sandy area of the ridge is covered by sand drift in a depth of several 10 metres. The eastern part of the southern ridge is a landscape consisting of mere sand drift, which is divided by narrow depressions with caustic sludge. The groundwater reaches the surface on large areas in a rainy autumn or upon the melting of the snow and it can cause serious damages as inland water. In a bigger depth the **fluvial sand** and at several traces **gravel** is also to be found in the riverbed branches and in the form of detrital cones. At the top of the ridge the Quaternary layers are 100 to 200 m thick, however, the Pannonia basement is strongly deepening towards Tisza Valley, thus here the thickness of the fluvial sediments reaches 300 m, while in the south even 700 m.

**Loess** is another widely spread formation of the ridge. To the south the thickness thereof increases too, not only its superficial spread. The loess cover in the Kecskemét region runs, properly said, in the borderlines of Lajosmizse-Nagykőrös-Kecskemét-Kiskunfélegyháza in a V-form bend in northwest – southeast direction up to the catchment area of Tisza. (See Annex No. 5, Figure No. II). Its surface is not evenly plain, since the small depression filled by lakes from time-to-time and the wide alkali flags are frequent, particularly east-southeast from Kiskunfélegyháza. Here the fossil longitudinal sand-hills directed from northwest to southeast are covered by a loess layer with a thickness of 1.5 to 2 m. In a bigger depth sand drift is settled.

South from the sandy, sludgy loess covers, in a northwest to southeast direction between Kiskunmajsa-Jászszentlászló and Szeged the large **sand ridge** of Majsa-Dorozsma stretches. Its monotony is diversified by slight longitudinal depressions running regularly in northwest to southeast direction up to the Tisza Valley, and flats with caustic sludge and sodic soil. The

surface sand covers at some places the deeper-laying surfaces with a basement of meadow limestone and caustic sludge. The carbonate content of the meadow limestone precipitated in the groundwater. Thus the subsoil has a high carbonate content, which provides an excellent habitat for the peacheries at the borderline of Dorozsma.

From the aspect of the motorway the abyssal position of groundwater, the properties and spread of the sub-surface layers are the most important issues. Therefore in the layout plan No. III of Annex No. 5, we have drawn up the spread map of the formations to be found in a depth of 2 m under the surface. It can be seen from the layout plan that in this depth

- there is a lot of sand with medium, small and fine drains, which is only rarely interrupted by a small area of sludgy sand, sand flour or sludge, and
- harder sludge layers with sand flour are to be found south from the line Sándorfalva-Kiskundorozsma-Domaszék,
- while these are replaced by clayey formations in a depth of 2 metres south from the line Szeged-Röszke.

The abyssal spread of the sand layers of a depth of 2 metres is 8 to 9 m in the environment of our track under examination, according to the map of KUTI L. (Annex No. 5/IV). The development of these sub-surface formations has been uncovered in detail by the borings of soil mechanics made in the track of the motorway in a depth of 5 m for the most part. The borings were made in intervals of 300 metres, 422 borings on the whole in a total length of 3,112 current metres. We described these borings in a sketchy form in the Appendix in Annex No. 5 in the form of a table. The borings of soil mechanics proved entirely the geological image outlined hereinabove, relating to the layers to be found in a small depth.

The thickness of the Quaternary layers is 100 to 200 m on the top of the ridge, while the Pannonia basement is strongly deepening towards Tisza Valley, thus here the thickness of the fluvial sediments reaches 300 m, while in the south even a depth of 700 m. Deeper the **fluvial sand** and at some places **gravel** is also to be found in bed branches and in the form of detrital cones. The deep borings of the region show a frequent alternation of the sandy and of the clayey-sludgy formations in the abyssal spread of the layers.

In general we can say that the layers of the southern area part are harder. In our bore logs the loess layers may also occur as sludgy sand, clayey sand layers in most cases.

If we carry out the breakdown of the type of layer above along the motorway, in case of the boring No. K-61 of 170.1 m in Röszke, then the percentage distribution of sand, sludgy sand and clayey layers is shown by the following table:

| | B-9 | K-61 |
|---|---|---|
| | % | % |
| sand | 44.0 | 20.0 |
| sludgy sand | 13.5 | 12.0 |
| clayey | 42.5 | 68.0 |

This shows clearly the layer compositions becoming harder and harder to the south. These stratigraphic sections may be considered characteristic in the borings we could study in the environment of the planned motorway. These borings with a depth between 10 and 300 m were prepared in general in order to make wells serving for potable water supply. We

described the boring points and wells documented in the environment of the planned motorway on the basis of the data obtained from the archives of Water Directorate of Lower Tisza Region and VITUKI Rt. on layout plan No. I of Annex No. 5.

We estimated the infiltration factors and free clearance volumes of the layers included in the borings from the stratigraphic descriptions of the hydrogeological logs obtained from the archives referred to above and on the basis of grain distribution diagrams standardised in the course of the explorations made by MÁFI earlier in this region [2], based on the empirical correlations developed earlier in VITUKI for our area under examination [3] according to the following table; it has to be noted, however, that according to our calculations the water output and suction data of the hydrogeological logs are not in harmony with the qualification of the water providing layers "sand with medium grain". The filtering surfaces indicated cannot provide a specific water output of 100 to 160 l/min/m over a water output of 1,000 l/min. The geological sections, touching this region too, from the earlier explorations by MÁFI referred to above [2] indicated a rough sand layer with a good faculty of water provision here, in this depth, in a wide territorial extension. This seems to be demonstrated also by the circumstance that the filtering surfaces of the majority of the wells located here are to be found regularly in depths of 100-180-200 m, just in the zone of rough sand layer described by MÁFI. Therefore we valued the filtered layer of these wells as rough sand layer in the course of our further examinations. This hypothesis has also been supported by our calculations made with filtering devices, which showed a value of 0.28 to 0.5 mm for the efficient Kozeny grain dimension of the layers located here [3], which falls in the band of rough sand from among the bands of the typical grain distribution diagram of the MÁFI exploration. We summarise the stratigraphic parameters estimated and taken into consideration later on as follows:

| | dh mm | k m/s | no |
|---|---|---|---|
| rough sand | 0.980-0.150 | 3.4.10-3-9.2.10-5 | 0.30-0.28 |
| sand with small to medium grain | 0.150-0.018 | 9.2.10-5-2.6.10-5 | 0.28-0.25 |
| sand with fine to small grains | 0.018-0.085 | 2.6.10-5-1.2.10-6 | 0.25-0.11 |
| clayey sand, sludgy sand | 0.085-0.005 | 1.2.10-6-9.0.10-8 | 0.11-0.05 |
| sandy clay, sand | < 0.005 | < 9.0.10-8 | < 0.05 |

#### 4.4.1.2. Soils, sensitivity of soils

In the environment of the track of the planned motorway, south from Szatymaz we find **meadow soils** with adobe and loess, and **"solonyetz" meadow soils**. At the height of Röszke this is replaced by sandy soils in the nature of chernoziom, then **meadow soils with adobe and loess** appear up to the State border.

The chemical and pollution components of the soils are not available to us. As known to us, no such comprehensive survey has been made in the area examined by us. This however will not hinder the continued work, since the track of the motorway is running in an area, which has not at all or has scarcely been affected by pollution from traffic. Thus in the present state of affairs we have not to reckon or we have to reckon only to a negligible extent with soil contamination derived from public road traffic along the new track. This may be taken into consideration upon the qualification.

The recording of the basic status will be made immediately prior to the execution of works, in the course thereof it will be possible to survey the geological environment too in a more detailed manner.

The adobe meadow soils and the marchy sandy meadow soils have been categorised to class VII of fertility, with a 30.1 to 40% soil value (in the percentage of the fertility of the most fertile domestic soils). The other ones belong to fertility class VIII with a 20.1 to 30% soil value index [4].

Based on the aforementioned we could see that the surface of our area under examination is covered by sandy soils. In our wording the **sensitivity of soils** means, down to what a depth these surface soils securing a relatively good infiltration stretch, whether the level of groundwater and the levels of groundwater course are moving in this sand soil, i.e. whether any potential pollutions reaching them through infiltration from the surface can reach without obstacle the groundwater. On the chart of Annex No. 5/IV we can see the development map of Dr KUTI L. regarding the composition of 10 m below the surface of Duna-Tisza köze. On the basis of the chart we can state that our track of the planned motorway will run all along the area of code No. *21*. According to the description of the legend, we can expect down to a depth of around 8 to 9 m the spread of the upper sandy layers above, a layer of fine rock flour and clay.

Exceptions may be the relative deep ranges, touching the motorway, of the flats with caustic sludge, with a harder covering layer outlined in Annex No. 5/II. The inland water appearing periodically therein leads to the conclusion of a bad permeability of the covering rock. Thus, from the aspect of the sensitivity of soils **the track of the motorway runs for the most part in areas with covering layers sensitive for pollution, where the infiltration of any potential pollution down to the groundwater may only be reduced by a longer length of infiltration.** Thus from this aspect the areas are the most sensitive, where the groundwater is closest to the surface.

#### 4.4.1.3. Groundwaters, sub-surface waters

It is a characteristic feature of the ridge area limited by Tisza that the layers retaining the groundwater have a possibility of connection with the layers of the rough-grained alluvial cones located deeper. Thus there is a potential possibility for the infiltration to the depth of the groundwaters. Consequently, the pollution of groundwater may reach the water of the deeper layers, on the one hand, and, on the other hand, the stratum water pressure levels reduced in consequence of the waters extracted from these deeper layers exert a draining effect on the groundwaters. Besides other impacts this can also result in the diminution of the groundwater levels [5].

In the environment of the planned motorway track, the average depth below the ground of the groundwater alternates between 1 and 3 metres [6] in a manner visible in the layout plan No. V of Annex No. 5. In the layout plan we marked the national groundwater measurement wells located in the neighbourhood of the motorway, which have a longer series of data, whose characteristic water level data we present as follows (high water: NTV, medium water: KÖTV, low water: KTV):

| No., place of groundwater well | NTV<br>cm below | KÖTV<br>cm below | KTV<br>cm below | Annual average<br>fluctuation |
|---|---|---|---|---|

| | ground | ground | ground | (cm) |
|---|---|---|---|---|
| 947 Szeged | 55 | 181 | 218 | 109 |
| 948 Szeged | 25 | 138 | 248 | 119 |
| 950 Kiskundorozsma | 62 | 170 | 255 | 104 |
| 952 Kiskundorozsma | 236 | 323 | 466 | 70 |
| 2788 Szeged | 32 | 135 | 201 | 107 |
| 2820 Szentmihálytelek | 308 | 434 | 524 | 112 |
| 996 Röszke | 98 | 203 | 259 | 91 |

The data of the table above have been elaborated by the use of the series of data of the years 1956 to 60. The earlier analysis by VITUKI elucidated that this time interval characterised well the mass of data of the perceptions made prior to and after that. If we observe the time series of 3 selected wells of Annex No. 5/VI, we can see that e.g. the average water levels of the years from 1956 to 60 approach very well the imaginary average of the full data series up to the years from 1975 to 80, the beginning of the lowering of groundwater levels.

In Duna-Tisza köze it was possible to draw up the stratigraphic lines of the groundwater levels to be considered average, by the use of the data of quite a lot of groundwater monitoring wells; we can see the hydroisohypses falling in the environment of our area under examination in the layout plan No. V of Annex No. 5. It can be seen very well from the diagram that the hydroisohypses are nearly parallel with the planned track of the motorway, thus the direction of infiltration indicates an infiltration nearly perpendicular thereto, towards Tisza. The pressure distribution, influenced also by water extraction, of the water retaining layers is less well known, but presumably the direction of infiltration without water extraction shows also towards Tisza. Dr M. Erdélyi defined a so-called “0” line, to the west from which the downstream of the groundwater is feeding the stratum waters, while to the east therefrom the pressure level of the stratum waters exceeds the level of groundwaters, thus here we can speak about artesian water pressure. This “0” line of a direction nearly north-south stretches in the neighbourhood of the track.

Towards the end of the ’70s a lowering of groundwater started in our area, which has not yet been experienced until then [5], which exceeded even 3 metres on the top of the ridge in the 1990s [7]. This lowering of the groundwater level affected the whole area of the ridge of Duna-Tisza köze and they are affecting it even in our days. However, in the environment of the planned track running from Kiskunfélegyháza to Röszke almost the “0” line of this elevation is stretching, thus here there was no considerable change (lowering) in the groundwater levels to date. We can understand a lowering of 2 to 3 m of the groundwater level by a considerable change. However, the groundwater level of the Röszke well has been lowering only about 1 m as of 1983 (see the time series of Annex No. 5/VI).

According to our examinations [5] in the neighbourhood of the track:

| | |
|---|---|
| the infiltration reaching the groundwater is | 150 mm |
| the evaporation from the groundwater is | 113 mm |
| downcourse below the surface is | 17 mm |

Thus in the area under examination the average underground depth of groundwater is located in depth intervals of 1-2 or 2-3 metres in the environment of the track. **On layout plan V of Annex No. 5 we indicated with dotted line the parts along** the full Csongrád County section **of the motorway, which are located, based on the aforementioned, in the areas**

**the most sensitive for pollution.** Thus in these areas the average groundwater level is located in a depth of 1 to 2 m below the ground, and high groundwater levels approaching closely the ground level can also be expected.

We have somewhat more knowledge about the qualitative data of groundwaters than about those of the soils. The following table present the data of groundwater quality of several settlements close to the track, based on the data of RÓNAI A. [1] (for the sake of comparison we present not only the wells of Üllés and Mórahalom being closest to the section under examination, but two more wells in Csongrád County too):

| | $Na^+$ | $K^+$ | $CA^{++}$ | $Mg^{++}$ | $Fe^{++}$ | $NH_4^+$ | $Cl^-$ | $HCO_3^-$ | $SO_4^-$ | $NO_3^-$ | Total of dissolved salt |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Üllés | 79 | 12 | 61 | 89 | - | - | 79 | 527 | 138 | 16 | 1,001 |
| Csengele | 81 | 8 | 199 | 68 | - | - | 150 | 384 | 304 | 128 | 1,328 |
| Kiskunmajsa | 600 | 48 | 61 | 24 | - | 1 | 195 | 1,519 | 74 | 34 | 2,573 |
| Mórahalom | 83 | 150 | 118 | 82 | ny | - | 130 | 674 | 158 | 113 | 1,521 |

According to the map enclosures of the KTM informative material [8] published in 1995 the total of dissolved substances in the groundwaters in a depth interval of 0 to 10 m alternates between the value limits of 500 to 1,000 mg/l in the north and between 1,000 to 5,000 mg/l south from the region of Szatymaz, in our area under examination, while the nitrate content does not exceed the value of 40 mg/l. The sample areas of the expedition exploration in the year 1994 avoided our area under examination, thus we had no data of heavy metal concentration for example.

#### 4.4.1.4. Climatic conditions

The last year with a precipitation around the average was the year 1980. Since then dry years, which were often draughty, followed. In the table below we summarise the meteorological data of the average and dry periods:

| | 30-year average | dry period |
|---|---|---|
| Precipitation mm | 533 | 496 |
| Temperature °C | 10.1 | 10.4 |
| Evaporation mm | 412 | 399 |
| Infiltration mm | 150 | 124 |
| Temperature total °C | 3,869 | 3,977 |
| Sunshine hours | 2,185 | 2,011 |

Some more characteristic meteorological data:

| | |
|---|---|
| Average precipitation of the winter half-year | 225-250 mm |
| Average, maximum precipitation of 24 hours | 75 mm |
| Average, maximum temperature of year | 35-36 °C |
| Average, minimum temperature of year | -17÷ -18°C |
| Dominant wind direction | northwest |

### 4.4.2. ENVIRONMENTAL IMPACT

In the part relating to the soil and sub-surface waters we have to examine, whether our motorway section to be constructed may endanger the man and our facilities serving the life of human being, given the fact that even the motorway will serve the man.

For this sake we have to take into consideration the factors, consisting of the elements of substance and energy emission derived from the implementation and operation of the planned motorway section, and getting into the environment, exercising an impact on the soil and through this, by the way of infiltration, on the groundwater:

- lead emission from the vehicles running on the motorway,
- washing-in of the oil pollution getting on the motorway, primarily in case of averages,
- effect of salty solutions, which can be washed in in the course of the de-frosting of the motorway,
- the effect of the occupation of area, from the uses of the environmental elements.

In the course of the examination of the impacts from the track we have to take into consideration the potential possibilities of pollution that may be realised by the motorway in relation

- to the **hydraulic works** operating close to the track, to the **area of water bases, prognostic**, **studied already or proposed for exploitation** on the basis of previous water exploration,
- to the **lakes and water-basins** close to the track,
- to the **regions of landscape protection or other protected areas** touched by the track versions,
- finally, we have to take into consideration, **to what an extent the tracks will touch areas sensitive for pollution.**

It may cause a problem that **dug wells** still existing in this area serve the potable water supply in this region of detached farms.

#### 4.4.2.1. Estimation of the impact of lead emission from vehicles*

The potential restriction of **land use** may result from the precipitation of pollutants derived from the road track and getting into the air. Primarily, the sediments derived from lead (or other heavy metals) could involve a danger. The maximum value, predicted along the track, of lead concentration in the air, defined at a distance of 10 metres, is 0.69 to 0.97 $\mu g/m^3$.

We calculated the quantity of precipitating lead on the basis of the precipitation speed defined based on standard MSZ 21459/1-81 Definition of the Transmission of Air Pollutants. The speed of precipitation is $6.10^{-3}$ m/s in case of a grain dimension of 10 μm. This gave a value of 10.73 to 15.0 $mg/m^2/30$ days in case of the predicted maximum surface load value at a distance of 10 metres (at the Mogyoród section of M0 motorway the predicted maximum value of surface load was 11.2 $mg/m^2/30$ days). Let us examine the most unfavourable status:

i.e. the surface sand soil dominant otherwise in our area under examination, with a surface load of 15 $mg/m^2/30$ days, and let us suppose that the average actual

* Remark: Although we know that this problem will be considerably mitigated through the spread of unleaded petrol, nevertheless the use of leaded petrol may not be totally excluded (see e.g. foreign cars), we wish to present the calculations, therefore, as the worst case to be taken into consideration. The calculations made in respect of lead allow conclusions to any potential movements of other heavy metals, less mobile than lead, in the road environment.

annual infiltration from the precipitation of the winter half year is the quantity of precipitation which will wash in the full annual surface lead load into the soil. Based on the earlier examinations by VITUKI [9] made with lysimeter it was found that the depth function of infiltration is in general constant below the root zone, beside a delay time increasing with the depth. If we neglect, for the sake of safety, the retention in the root zone, we receive from the table of the previous chapter the actual annual infiltration value of 150 mm of our sandy covering layer considered prevailing.

The annual surface load is 12x15 mg/m$^2$/month = 180.0 mg/m$^2$/year. 150 mm is 150 litres on a surface of 1 m$^2$, thus it is sure that the initial lead concentration in the infiltration will not exceed a concentration of 180.0/150=1.2 mg/l.

Nowadays we do not have yet processes, whereby we could calculate reliably the lead retention capacity of soil in the process of infiltration. Therefore, we followed the process below by the use of data from the literature:

An approximative process is well-known from the Soviet special literature [10], which is connected to the distribution factor $K_d$ defined by experiments:

$$K_d = \frac{a_0 - a_1}{a_1} \cdot \frac{V}{m}$$

In the equitation above the dimension of distribution factor $K_d$ is cm$^3$/g.

- $a_0$ is the initial concentration value of the solution used in the course of the experiment, while $a_1$ is the concentration of the solution at the end of the experiment.
- V is the volume of the liquid phase in cm$^3$ and
- m is the mass of the solid phase in grams.

The literature referred to above gives the distribution factors for various soils and for various radionuclides in the form of tables. It is obvious that they cannot be used in our case. However, we found the description of an experiment in the literature [11], which defined also the lead content profiles developed in the soil at the end of the experiment, in the course of the transfiltration of water, containing lead, through a lysimeter filled with sand. In the course of the experiments, after an infiltration of 1,000 days an infiltration of pure water during 500 days followed. In the period of 500 days the profile of lead content was transformed, it reached larger depths of course, without any change in the total quantity of lead. Based on the published informative data, the distribution factor defined by the formula above could be calculated, which gave the values of 288 and 366 cm$^3$/g calculated for different depth domains. If we leave out of account the experimental character and several other factors, we can evaluate that the distribution factor of sand soils is in a magnitude order of 100 for lead and its probable value may be between 100 and 500 cm$^3$/g. At the same time the experiments gave the result that the lead retention capacity of sand may reach the value of 1.6 g/kg of dry material.

Based on the aforementioned we should calculate the depth, where the lead content of the solution filtrating downwards among the grains reaches already the limit value permitted in the standard due to the lead retention of soil: i.e. $a_1$= 0.05 mg/l, with the most unfavourable distribution factor of 100 cm$^3$/g. In the equation of the distribution factor, V water volume is,

according to an infiltration of 150 mm/year, 150,000 $cm^3$ on 1 $m^2$. If we calculate from this correlation the m = h.F.γ soil mass, the h depth can be defined. If γ = 1.5 $g/cm^3$

$$h = \frac{a_0 - a_1}{a_1} \cdot \frac{V}{K_d \cdot F \cdot \gamma} = \frac{1.2 - 0.05}{0.05} \cdot \frac{150{,}000}{100 \cdot 10{,}000 \cdot 1.5} = 2.3\ \text{cm}$$

**Thus the calculation above shows that (if we estimate with safety the lead linkage) the most part of the lead will already be retained by the upper soil strata in the course of the annual infiltration.** With regard to the fact that we have taken into consideration the most unfavourable feature of covering layer and the largest expectable surface load, thus our finding above must be true also for the environment of the full track of the motorway, even if the adaptation to the natural circumstances of our values, based on a single experiment, resulted in an error of one magnitude order.

Checking the reliability of our procedure, we calculated also with the results of a boring [12] beside Váci avenue, available to us. The lead content of the soil samples taken from this boring was, on 0.2 m, 354 mg/kg, on 1.0 m 4.1 mg/kg and on 3 metres 2.1 mg/kg. The boring was made in the area of the Holocenic gravel terrace with a sandy covering layer. With certain logical hypotheses, e.g. saying that lead accumulation has been lasting for 20 to 35 years in the soil, the distribution factor was to be estimated to 140 to 250 $cm^3/g$, which can be considered, as to its value, identical with the results gained from the Cambridge experiments.

However, the lead content values of the soil, defined between chainages 106-130 km of M1 motorway [13] are interesting, which are not changing much even in the function of various depths of 0 - 25 - 40 cm, and not even in the function of distances of 5 - 25 metres. These average values are values between 9.6 and 12.68 mg/kg. Similar values have been shown between chainages 62 - 105 km of M1 motorway, although the data are here somewhat higher (between 20.32 and 12.98 mg/kg in the average). If we take into consideration that the background values can be put to 5 - 10 mg/kg on the basis of foreign data and to about 20 mg/kg on the basis of domestic data, and that the measurements of background values along the planned M0 motorway [14] led too to similar results, then we must think either that the lead precipitating annually is integrated in the organisms of plants or that the extremely small quantities increase only by a value of about 4-5 mg/kg the lead content of the upper layer of around 40-100 cm of the covering stratum in the course of lead accumulation of around 15 years. We could also say that the most part of the lead reached the groundwater, but this is contradicted not only by our present calculation, but also by the examination in Váci avenue referred to already, or by the lead profiles measured beside the dump of Mosonmagyaróvár by VITUKI [15]. Even the lead content values, measured during long years, of the groundwater were by far below the limit value and they did not even show a tendency of increase. By the way, we have to mention here that the Mosonymagyaróvár examinations referred to, which extended to a depth of 6 m, made probable a value of 10-15 mg/kg, as background value of the lead content of soil.

Let us suppose in connection with the distribution and accumulation of lead that we have to reckon with a lead pollution (unchanged – nearly identical to the present one) for further 10 years after the commissioning of the motorway. This means that:

- During 10 years the surface load will be 1,800 $mg/m^2$.
- The quantity of infiltrating water will be 1,500 litres, i.e. 1,500,000 $cm^3$.
- Counting the upper layer of 10 cm the mass thereof is 150 kg on 1 $m^2$.

- If we calculate the concentration of the water, leaving the stratum of 10 cm, from the formula of the distribution factor, $a_1$ = 0.012 mg/l.

Based on the aforementioned the mass of the lead remaining in the stratum of 10 cm is:

1,800 mg – 1,500 l x 0.012 mg/l = 1,782 mg

Supposing the worst case, i.e. a lead emission identical with the current one, **the lead content accumulating in 10 years in the stratum of 10 cm is 1,782/150=11.9 mg/kg. If we add the background value of 10 mg/kg, then the magnitude order of the expectable maximum lead content of soil will be, after the operation of 10 years of the motorway, 20 mg/kg, which is much lower than the MI value of 100 mg/kg permitted for agriculture** (MI 08-1735-1990. Technical Guideline for the Branch of Agriculture and Food Industry. Disposal of wastewaters and sewage sludge on arable land). The magnitude order of this defined value is identical to the values measured in the environment of M1 motorway.

However, at the crossings of the planned M5 motorway the surface load may increase in consequence of the superposing of the impact from two tracks. The estimated maximum value should be 20 mg/m$^2$.30 days. The annual surface load is 241.2 mg/m$^2$. Thus the initial value of concentration is 1.31 mg/l. The depth h, below which the concentration of the infiltrating water is already lower than permitted: 3.1 cm. The lead concentration of the upper layer of 10 cm is, during 10 years, maximum 16 mg/kg, i.e. it is around 26 mg/kg together with the background value.

**Thus we can state that the injury to be taken into consideration from the aspect of the land use along the motorway will not be realised in consequence of the precipitation of lead pollutant derived from the motorway and getting into the air, even if the spread of unleaded petrol develops in difference from the current plans** (the distribution of leaded petrol will continue). **Simultaneously we can also state that the wells of the water works will not be presumably polluted with lead under the effect of the motorway** (and as a consequence of this calculation carried out with other heavy metals either), independently of their distance from the motorway. Thus its effect will be capable to be shown, but it will not exceed the qualification “supportable”. In this, the decrease of the lead content of petrol plays a part too. (Here we dealt with lead as a highly dangerous heavy metal pollutant; if we made similar calculations in case of other pollutants, we would receive similar values, thus the pollution can be shown in the immediate proximity of the motorway, but it causes loads below the limit value thereof.)

#### 4.4.2.2. Impact of the washing-in of oil pollution getting on the motorway in case of average

The definition or estimation of the quantity of hydrocarbon derivatives (petrol, gasoline, engine-oil, etc.) getting on the motorway is not a simple task, we know only that the soil and groundwater pollution derived therefrom is not considerable in our judgement. It is not considerable for the reason either, because the shaping and installation of the motorway calculate with such pollution and it is prevented that pollution should get immediately and without control and treatment on or into the soils along the motorway.

In our judgement, we have to count with the oil pollution of soil and groundwater, in connection with the motorway, in case of the accidents and averages of trucks and lorries transporting fuel, as we could learn it, properly said, on the basis of past accidents. Currently

we have to judge, in the knowledge of the environmental features of the motorways, what can be the consequences of an accident occurring potentially, whether we have not to make changes, which (assuring a certain period of time) allow various measures for damage prevention.

In connection with the aforementioned we should suppose that, like e.g. in case of Zanat, 15,000 litres of fuel gets on the surface of soil along the motorway. We should take into consideration that we have to count with the most unfavourable sandy covering layer securing rapid infiltration, as to the features of the area under examination.

We evaluated that **in the worst case 2 days are required** from the occurrence of the accident for perception and **for taking and executing the measures of damage prevention required for rescue.** Thus we have to estimate the period, during which the oil having got on the surface will reach the groundwater. (Thus according to the logics of impact assessment our calculation is based again on an extreme case, on the worst case.)

Let us suppose that the area affected by discharge is unfavourably small: 100 $m^2$, thus the petrol poured out will cover the soil initially in a thickness of around 15 cm. If we count with the discharge of petrol with the most unfavourable cinematic viscosity ($v_o$=0.6.$10^{-6}$ $m^2$/s), then the infiltration factor of 2.3.$10^{-5}$ m/s of sand, defined for water, will be 3.8.$10^{-5}$ m/s in a medium saturated with petrol, while it will be 9.7.$10^{-6}$ m/s in an unsaturated condition. According to Pioger and Zunker [16] the period of reaching the bottom of a layer of 1 m thickness is approximately:

$$t = \frac{n_0}{k(1-n_0)}\left(m + \frac{h+Sz-L}{1-n_0}\ln\frac{h+Sz-L}{h+Sz-L+(1-n_0)m}\right)$$

where t is the period required for reaching the surface of groundwater, $n_0$ is the free clearance volume, k is the infiltration factor, h is 0.15 m in our case, Sz is the capillary suction, L is the resistance of the air included in the soil, m is the depth of groundwater below the ground.

Calculating with the above correlation (supposing as an approximation that Sz=L) the following periods of access can be calculated:

depth of 1 m 0.26 day
depth of 2 m 0.60 day
depth of 3 m 0.99 day

**We can see that the condition of a period of access of 2 days supposed hereinabove is not given in natural circumstances.** However, with a good stand-by organisation it may be reached that the damage prevention could be executed, from the motorway engineering premises, as rapidly as during half a day with appropriate machines. Despite that **it can be recommended that the safety of groundwater against pollution should be created through artificial circumstances in the areas defined in the previous chapters, sensitive for pollution, primarily in those having a high groundwater level, since the motorway will run through a region of detached farms, where potable water supply is provided, to a high percentage, even today by groundwater wells. This technical protection has already been integrated in the plans, since the stretch-out of technical textile and geo-**

**grid has been prescribed in this area,** which increases considerably the period of infiltration.

As to safety we can evaluate so that **the track, with the technical solution included in the plans** (technical textile and geo-grid) **provides appropriate protection even in case of averages occurring potentially.** The oil pollution of groundwaters can be avoided even in the most sensitive sections, where the groundwater is high, thanks to the considerable increase of the period of infiltration.

According to the experiences obtained to-date, these statements apply, logically, to other averages connected to the transportation of fluids (alkalis, acids etc.), in the interest of protecting groundwaters from pollution.

Our planned track of motorway will cross the following major channels and watercourses, running from north to south: Algyő Channel, Matyér-Subasa Channel. The Algyő channels give water to the **landscape protection district of Lake Fehér. The shaping of the crossing engineering structures of this channel must provide full protection even in case of average, in order to avoid that a large quantity of pollutant could get into the water of the channels or into the groundwaters of the neighbourhood, in the proximity of the motorway.**

Thus in this section, the construction of a barrier of 300 metres on both sides of the motorway can be proposed in each direction from the central line of the culverts, in a length of 600 metres in total, which will impede that a transporting vehicle should leave the motorway in consequence of an accident occurring just here, although with a very small probability, and it has to be ensured through the structural formation that the pollutant getting here on the motorway could not reach the area with good infiltration and the watercourse along the motorway. The application of a "liquid seal" covering layer, formed along the length of 600 metres of the track, could also provide a solution.

The speed of spread of the pollutant having got into the groundwater can be presumed to be approximately equal to the actual streaming velocity of groundwater, which can be estimated to a value around 0.01 m/day in case of the sand strata of our area ($v = k.I/n_o$).

#### 4.4.2.3. Impact of the salty solutions washing in, in the course of de-frosting the motorway

According to the joint communication No. 1988 KM-ÉVM-BM-KVM the maximum quantity of smelting agent with chloride contents (NaCL, $MgCl_2$) used for the anti-slipping of public areas in winter, is 1,200 g/m$^2$/year. According to earlier studies "the dispersed salt causes soil contamination only in a band of 1 metre measured from the edge of the road crown even in critical periods. After a certain period of time the salt is diluted under the effect of precipitation and it is not accumulated in soil."

Let us calculate as informative data, what is the specific salt quantity that can be dispersed on the motorway during a year, if:

- the salt quantity dispersed during a year is washed into the groundwater during a month in full quantity, due to some reason,
- which groundwater is, regarding the widths of one current metre and a sandy groundwater retaining layer with a thickness of six metres ($n_0 = 0.22$) 1 x 6 x 1.3 x 0.22 = 1.72 m$^3$,
- and if we can tolerate a chloride pollution of 350 mg/l in the groundwater.

Supposing magnesia chloride the chloride content of 350 mg/l means a salt content of 470 mg/l. The total salt quantity is thus 0.8 kg. Considering that the half width is 10.5 $m^2$ on a section of 1 current metre of the track, thus **the specific salt quantity that may be dispersed is 77 g/$m^2$/year. This is only about the double of the quantity that may be dispersed on one occasion.** The figures above are based on a strong hypothesis, but they enlighten that **we have to reckon with salt pollution along the motorway from the aspect of groundwater.** This is also indicated by the data of the monitoring wells, in Csepel Island, of M0 motorway.

It is not necessary to withdraw any areas from cultivation in consequence of salt pollution. In case of plantation belonging to the road the salt resistance of plant species has to be taken into consideration.

#### 4.4.2.4. Impacts from the phases of construction of the motorway

In the current phase the construction and execution are not yet known in full details. Therefore **it is purposeful to prescribe that the constructor should reconcile its ideas with the competent authorities prior to the start of works.** Reconciliation should cover the designation and formation of provisional containers for waste and dangerous waste, originating in the construction, and the designation and establishment of fuel containers for the muckshifters in the proximity of covering layers sensitive for pollution and of groundwater, taking into consideration not only the features of the covering layer, but also the general streaming directions of groundwaters. It is desirable to use isolating plates (e.g. PE foil) for the establishment of provisional containers.

#### 4.4.2.5. Impact from the occupation of area by the motorway on the groundwater course of the affected area

Determining factors of a water budget in natural status are: actual Btv infiltration (reaching the groundwater), Etv evaporation from groundwater, Rh lateral affluence, Re lateral effluence, F perpendicular upstream, L perpendicular downstream and V negative or positive storage. In our case we can neglect the factors F and L due to the sand layer supposed here nearly impermeable (and regarding a longer period the storage factor is zero too, since in a longer period of time the groundwater budget is well-balanced). The equation of groundwater budget to be recorded for the a area, more exactly, for the volume of the groundwater retaining stratum and for a definite period is the following:

$$Btv + Rh = Etv + Re + V$$

This equation may create a correlation even between factors, which do not originate in the same time or period, since the actual infiltration occurs mainly in winter, while evaporation in summer.

The implementation of the motorway reduces only virtually the value of infiltration, since summer rainwater is also collected and infiltrated, and thus a part thereof increases the groundwater stock. However, summer evaporation ceases to exist on the paved area, thus the summer surplus infiltration may result in an increase to a smaller extent, at a magnitude order of centimetre in our judgement, below the motorway and in the close proximity. The development of larger differences is impeded by the equalisation of the groundwater of the more remote areas and of the areas under the motorway. We can word it so that **we cannot**

**expect perceptible level changes in the groundwater levels due to the implementation of the motorway.**

#### 4.4.2.6. Impact of the motorway on the water supply wells in the environment of the track

Based on the informative data obtained from the Water Directorate of Lower Tisza Region we indicated, in layout plan No. 1 of Annex No. 5, the water supply well presumably operating today, with their numbers and drilling depths.

At the same time, the map of the sub-surface water cadastral record indicates, in layout plan No. VII of Annex No. 5, the areas and wells of the water-works, of the industrial and agricultural water-works, the number of the wells of water-works, the depth interval of the filtration of wells, indicating by letters, whether the water stock used is groundwater (T), sub-surface stratum water (R'), or stratum water (R), and, finally, the capacity of the water-works in 1,000 $m^3$/day and the average water production to-date (may we here remark that there is an obvious overlapping between the two maps).

**In connection with the impact of the motorway here we would like to make reference to the fact that our calculations made to-date made obvious that the pollutions that may come into being due to the construction of the motorway cannot reach the water of the wells, having a depth exceeding 100 metres as to the majority of them, but this is also valid for the wells with a depth level of 20 m, save for the case of average.**

However, Government Decree No. 123/1997 (VII.18.) provides, in case of motorways, for the protection of water bases, future water bases and hydraulic facilities serving water supply as follows, remarking that as witnessed by Schedule No. 5/VII. no water base or future water base has been designated in the proximity of our track, in a proximity to be taken into consideration.

Section 2 of the general provisions of the Decree prescribes protection in case of sub-surface water bases through the designation, formation and maintenance of protecting profiles, protecting areas, internal, external and hydrogeological protective zones.

According to Schedule No. 2 to the Decree the designation is made on the basis of the following periods of access:

| | | | |
|---|---|---|---|
| internal protective zone: | | 20-day period of access | section of the protective profile on the surface, but at least 10 metres from the water outtake |
| external protective zone: | | 6-month period of access | if there is no surface section, than there is no protective profile |
| hydrogeological protective zone: | | | |
| | zone A | 5-year period of access | section of protective profile on the surface |
| | zone B | 50-year period of access | section of protective profile on the surface |

According to the restrictions of Schedule No. 5 to the Decree:
it is forbidden to conduct a motorway (other road) in the internal protective zone,
it is forbidden to conduct a motorway in the external protective zone (it may be permitted in case an of existing motorway, or in case of impermeable rainwater drain ditch, depending on the result of environmental impact assessment)
motorways may be conducted in hydrogeological zone "A" depending on environmental impact assessment, while
there is no restriction in zone "B".

According to the aforementioned we have to deal with the access periods of the internal and external zones and of zone "A". The periods of access consist of two parts: on the one hand, from the time requirement of infiltration, and, on the other hand, from the time requirement of the lateral water movement in the water-producing layer. Examining the directions of groundwater stream it is obvious that the wells located west from our motorway cannot be polluted, in the proximity of the motorway, from the potential pollutants derived therefrom, save potentially for the wells located in the immediate proximity of the motorway, since the sub-surface waters stream from west to east, thus the pollutions infiltrated in the neighbourhood of the motorway spread in the eastern direction. Let us thus examine, first of all, the period of infiltration on the eastern side of our track. According to recommendation MI-10-432-87 the $t_v$ period of access can be defined approximately with the following correlation:

$$tv = \frac{m_f^2 n_f}{k_v h}$$

where $m_f$ is the thickness of the covering layer, $n_f$ is the resultant porosity thereof, $k_v$ is the resultant of the vertical infiltration factor thereof, h is the difference of the pressure heights of the water producing layer and at the upper part of the covering layer.

In the course of our examination we should step forth from north to south.

- Well No. 19(49.7) of Domaszék **falls virtually within the band of the motorway too.** Due to the small depth and the thick sandy covering layer it is certain that the period of access is by far below 5 years and **it is possible that the motorway will touch the internal and possibly the external protective zones of the well.** According to the registration the well is located in the area of the transformer station of DÉMÁSZ.
- We could not manage to gather extensive information on well No. 30(202) of Domaszék. It is to be known about it that it was made in 1985, it is a well still operating, its owner is probably a private individual. **It is purposeful to examine the exact location of the well.**
- Well No. 23(1769) of Domaszék is a thermal well established through the refilling of a dead CH boring of 3,480 m. **It is a positive well, thus any downstream of pollution is excluded. Its virtual proximity to the motorway requires examination anyhow.** According to the registration it is owned by Szegedi Flóraton Kft.
- From among the wells of Röszke we mention first **wells Nos. 12, 13, 15, 18, which are virtually located close to the motorway**. We could not acquire the data thereof. We know about the wells the following:
  12(145) 1910 is a positive well still operating. In the 1950s it was originally registered at the address Tombácz Antal, District II, Farm 170.
  13(120) 1896 is a positive well. District I, Farm 375.
  15(?) is a positive well. Széll Imre, District III, Farm 187.
  18(~100) 1948 is a positive well. Varga József, District III. Farm 185.

- Well 34(27.5) of Röszke is a well, which is not operating, it was only a trial boring.
- Röszke 61(170) is a well of 1991. It provides the maximum operational water output of 1000 l/min at a depth of -9.8 m, at a rest level of -3.0 m. The resultant vertical infiltration factor defined on the basis of the boring log is $6.8.10^{-9}$ m/s. Besides an effective porosity 0.02 the vertical period of access to be calculated for the top of the filter, located at 142 metres, is **6.6 years > 5 years** besides a pressure difference of 2 m (here we have not to reckon with full suction due to the distance), thus we need not calculate the horizontal period of access any more.
- We could not acquire further information on well 47(164) of Röszke. Like in the case of the southern wells with a harder covering layer here too we can suppose that already the vertical period of access exceeds 5 years.

We have to remark the following, in connection with the examinations above:

a) It is true that the horizontal co-ordinates according to a certain system are given in case of the majority of the registered wells, but according to the experiences these are only informative values, which have not been defined by measurement in most cases, but by reading from map, thus differences of several hundred meters can also be conceived.
b) According to our information it may occur that wells without permission and/or not recorded are also to be found in the region of the track.
c) The stratigraphical data are the results of technical estimation in the knowledge of the water output and filter structure of the wells. Due to the nature of the borings, no parameter definitions based on more exact examinations are available, or they are only available in a small percentage.

### 4.4.3. PLANNED MINING SITES

According to the data supply of the competent Szolnok Mining Authority (see Annex No. 1) the mining sites established in the proximity of the track of M5 motorway are the following (here we will list all mines of Csongrád County, since the definitive mining sites have not yet been determined and the distances are not too large, thus the material can be transported in principle from anywhere to anywhere):

- Csengele I. sand — licensed, exploitation not yet commenced
- Balástya I. sand — licensed, exploitation not yet commenced
- Szatymaz I. sand — licensed, exploitation not yet commenced
- Szeged II. sand — licensed
- Szeged III. sand — licensed
- Röszke I. sand — licensing procedure suspended at local government's request
- Röszke II. sand — environmental licensing in progress
- Röszke I. sand — licensing in progress

**When constructing the track efforts shall be made to use the listed and licensed mining sites for gaining materials.** If the quantities of materials to be produced here prove to be too little, only then should we think about opening new mining sites. We present the listed and further places to be taken into consideration as mining sites in Annex No. 6 in detail. We draw the attention to the fact that the mining sites to be newly opened are in themselves activities subject to environmental impact assessment. Therefore, the licensing procedures relating to them have to be instituted a good time prior to the commencement of road construction, taking into consideration the required quantities of materials.

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## 4.5. WILDLIFE - ECOSYSTEM

### 4.5.1. PURPOSE AND METHOD OF WORK

The chapter on wildlife protection has been prepared for the detailed environmental impact assessment prescribed by law for the implementation of M5 motorway. In the course of the work the plants and animals in the area affected by the project and in the expectable impact area, as well as the disturbing effects exercised expectably on wildlife by the implementation and operation of the motorway have been, surveyed. This chapter has been prepared by the chartered experts of ecology and biology of Ornish Kft. and the Hungarian Association of Ornitology and Nature conservation, under the professional guidance of ecologist Kovács Éva.

The site examinations were made in May to August 1998, in the optimum period from the aspect of the survey of wildlife. According to the general practice of science and nature conservation we carried out the qualification and evaluation of the motorway's impact area from the aspect of wildlife protection primarily on the basis of the examination of the vegetation. This was complemented by the survey of the vertebrata of habitats. Besides surveys on the site we also studied and evaluated the published literature, available to us about the region.

We carried out the description and characterisation of the vegetation of the areas under examination through the classification into the *appropriate categories of habitat* corresponding to the *General National Habitat Classification System (Á-NÉR),* which has been created as a part of the *National Bio-diversity Monitoring System* (NBmR) and is functioning as a basic pillar of the nature conservation information system. (We provided the code of the category characterising the given habitat in brackets.) Where we deemed it important, we provided also the *value numbers of degradation by Seregélyes* of the

characterised habitats (the use thereof is also a recommendation by NBmR). The categories of the five-grade scale of this latter are the following:

1. The natural status is **totally degraded,** the original vegetation cannot be recognised, practically only weeds and unimportant species are to be found.
2. The natural status is **strongly degraded,** the original community can only be found in traces, the dominant elements thereof occur sporadically, in a proportion, which is not characteristic, weed-like plants occur in masses.
3. The natural status is **moderately degraded,** the elements of the original vegetation are present in an appropriate proportion, but colouring elements occur scarcely, there is a considerable proportion of weeds and unimportant species.
4. The status is **quasi-natural,** human intervention is unimportant, the number of species is near to the maximum characteristic for the community, the proportion of colouring elements is important, the proportion of weeds and unimportant species is not considerable.
5. The status is **natural** or it can be deemed natural, the proportion of colouring elements (for the most part protected species) is dominant, among them rarities in the nature of relict are also to be found, species qualified as weeds can scarcely be found.

### 4.5.2. DELIMITATION OF THE EXPECTABLE IMPACT AREA

The area affected directly by the project, i.e. to be built in due to the construction of the motorway, the track of the planned motorway are contained in Annex No. 7/I of the impact study. Annex No. 7/II describes the areas critical from the aspect of wildlife protection.

The full indirect impact area important from the aspect of wildlife protection is composed of the aggregated impact areas of a number of influencing factors, however, it is practically impossible to define objectively the real boundary of a good number thereof, like e.g. the impact area of the isolating effect exerted on certain organisms of wildlife, on the basis of our today's knowledge. Naturally, we have to reckon very seriously with the impact of influencing factors in such nature too, since e.g. the isolating effect above is practically one of the most important factors from the aspect of wildlife protection, in connection with the implementation of the motorway, at the same time the extent of the indirect impact area to be realistically estimated may well approach the impact area of air pollution and noise load caused by traffic. On the basis of general practical experiences this will be a zone of about 200 metres in the average on both sides of the road, i.e. of a total width of 400 metres, therefore we selected this band as area under examination from the aspect of wildlife protection. Similarly Annex No. 7/I describes the full indirect impact area, important, estimable and expectable from the aspect of wildlife protection.

### 4.5.3. GENERAL CHARACTERISATION OF THE IMPACT AREA

The planned motorway section will run through the Dorozsma-Majsa sand ridge and the small regions of the South-Tisza Valley. From the aspect of orography the most part of the surface of the landscape affected is a slightly undulating and slightly articulated plain, which has no living watercourse crossed by the planned motorway section. The most part of the track runs through areas under agricultural cultivation or subject to intense sylviculture with no natural wildlife, but at several spots it touches also natural habitats.

### 4.5.3.1. Original natural vegetation of the region touched by the track

In consequence of the versatile conditions of micro-morphology and environmental conditions the original natural vegetation in the full indirect impact area was highly diverse. In the environment of the track section falling on the area of the Sand Ridge in Duna-Tisza köze a versatile mosaic of sand vegetation was proliferated. The more precipitous sand-hills were covered by open sand lawns. On the sand surfaces offering less extreme environmental conditions closed sand desert meadows have been formed, lots of places were ornamented by aspen groves with or without junipers. The closing communities of areas suitable for the growing of forests were open and closed sand oak woods. In the areas lying deeper marshy meadows in the intervals of cones were to be found, in the depressions with no run-off periodical salty lakes came into being, surrounded by the appropriate sodic zonation (blind sodic soil, sodic plantation, sodic marsh, sodic meadows). Another type of watery habitats was represented by non-salificating marshes, marshy meadows of the plain. Descending from the Ridge to the areas of inundation of Tisza Valley the proportion of watery and sodic habitats increased to the detriment of the various types of sand vegetation, although these latter ones continued to be represented at the higher levels.

The destruction and transformation of the natural vegetation has been in course for a very long time, for a period of time to be measured even in the scale of several hundred years, in larger dimensions in this region. The oak forest has been cut almost restless (in today's track of the motorway no original spots of oak forest have remained to tell the tale). The closed sand lawns having a soil quality suitable for the purpose of agricultural cultivation has been ploughed over (their remainders are not touched by the track either), the sand lawns having less favourable features have been afforested with tree species strange for the landscape, while the most part of the watery habitats have been drained. From among the natural and quasi-natural habitats having remained along the track of the motorway no forest area is to be found. The majority of the remaining natural vegetation consists of minor fragments of marshy vegetation marshy meadows, sodic meadows and stronger sodic habitats. At the same time the proportion of the lawns having a character inclining to the nature of steppe meadow is already negligible and the proportion of lawns in the nature of marshy meadow is also very small.

### 4.5.3.2. Features of land use in the region touched by the track

We have analysed a band of a width of 200 m each, i.e. 400 m wide on the whole, to be found on both sides of the track of the full Csongrád County section under examination, designated from the aspect of wildlife protection, from the viewpoint of land use. From this land area of nearly 2,400 hectares:

- 0.1% is the area of settlements,
- 65.6% are ploughland,
- 1.6% are orchards,
- 9.8% of the area under examination are a very heterogeneous complex of habitats, it is covered by the mosaic of small spots of small gardens, orchards, vineyards, hayfields and pasture-lands
- 2.2% are forest,
- 1.1% are habitats with shrubs and afforestation,
- 19.6% are lawns and marshes with various water supply – from dry to fresh, with a humidity condition extending up to a drying marsh meadow, and

- stagnant waters are also touched by the band under examination to a totally negligible extent.

From the impact area, articulated as aforementioned, of the motorway the areas of lawn and marsh amounting to 19.6% are the ones carrying natural values, which are considerable from the aspect of wildlife protection. It can be stated in relation to section marked III under examination that the proportion of dry lawns is somewhat higher and that of ploughlands is somewhat lower than these average data.

The valuable natural habitats influenced by the implementation of the motorway are for the most part plain marshy meadows, sodic meadows and other humid sodic habitats. From among them Nagy-szék, which is located at the beginning of the track under examination, rather closely to the track, is a sodic area subject to national protection on the basis of Section 23, subsection (2) of Act LIII of 1996 on the Preservation of Nature. This area was subject to local protection prior to the publication of the Act, it enjoys nationwide protection nowadays, and in the near future it will get into active treatment of nature conservation by the authority of nature conservation competent for the area.

The planned motorway section will not run through any nature conservation area. However, the several natural habitats to be found along the track provide a shelter for a number of protected plant and animal species. Hereinbelow we will discuss in detail the natural values endangered by the implementation of the planned motorway section and the measures required for their protection.

### 4.5.4. DEFINITION OF THE INFLUENCING FACTORS AND OF THE NATURAL ELEMENTS BEING THE IMPACT CARRIERS

#### 4.5.4.1. Occupation of area to occur through the building-in of the track in the area affected directly by the project

**Save for several smaller spots of habitats** (to be made known at the discussion of the given track section) **the occupation of area by the track will not, in general, involve the full destruction of natural values,** i.e. natural habitats or the population of protected species, as expected. Where this will occur nevertheless, we indicate it at the detailed track analysis of the impact study, like any possible partial damage to or destruction of natural values. Thus the qualification of impact will be rated from **destroying** to **neutral**, depending on the value and use of the various spots.

#### 4.5.4.2. Establishment of the mining sites of building materials to be used for the construction

The opening of new mining sites involves naturally the destruction of the original – artificial or natural – habitats affected. Therefore, the mining sites already existing have to be preferred in the course of selection. Despite that we have given, in the course of the detailed analysis, the areas, where no mining sites may be established due to the aspects of wildlife protection, and we have commented the areas found suitable for the establishment of mining sites. (This list contains all areas potentially suitable; any actual operation will only be concentrated to a much smaller place.) We have included the evaluation and the map depicting the area in Annex No. 7.

Taking the evaluation into consideration and using primarily the existing mining sites the impact can be classified in the category **supportable** from the aspect of wildlife protection.

If a protected or highly protected bird species (bank swallow or bee-eater) begins to develop a nest colony at a mining site in a pit, in the shaped bank wall, the competent authority of nature conservation shall be immediately notified of the case, and the further works shall be stopped until it will take a measure. If the birds have not yet finished the building of nest, the authority of nature conservation will, according to the usual practice of nature conservation, certainly license the continuation and accelerated completion of the mining activity, since thereby the protected birds will still have the possibility of searching for new places of nest, waiving the potential nest places destroyed. If there are finished nests in the bank wall, with birds sitting on the eggs, the authority of nature conservation will prohibit, pursuant to the laws in force, any further mining activity at the given bank wall section.

#### 4.5.4.3. Air pollution from construction work.

Based on the experiences the air pollution from construction works extends to the immediate district of 100 to 200 m of the project, its effect is provisional and restricted to the period of construction. Its effect from the aspect of wildlife protection is negligible in comparison with the air pollution during the operation of the facility; the impact is thus **supportable**. The same applies to the noise and vibration load occurring during the construction.

#### 4.5.4.4. Air pollution, noise and vibration load during the operation of the motorway

The impacts of the air pollution, noise and vibration load by traffic relating to wildlife are permanent, it is practically impossible to take any measures directed to wildlife protection against them.

The values of natural vegetation of the region concerned are represented by the various types of lawns, which are considered relatively resistant against the pollution of such type, as compared e.g. to the areas of natural forest. Air pollution will let its impact be felt certainly in the agrarian habitats located within the impact area. As an expectable effect of air pollution in case of the affected wood vegetation the vitality, speed of growing and the measure thereof, the expectable lifetime, resistance against other environmental impacts and pathogens will decrease. Air pollution lets its impact be felt for the most part in the vineyards and orchards from among the agrarian habitats, which may have its consequences in the decrease of crop and the deterioration of quality. The root crops, vegetables are the following on the sensitivity list, the cereals are damaged the least by air pollution.

The air pollution within the impact area results in a decrease to different extent of the fitness of the individual beings, of their chances of survival and proliferation, from the aspect of the fauna. The effects of noise and vibration will, expectably, affect unfavourably primarily the vertebrata, causing a decrease of fitness. The diminution or even disappearance of the populations of animal species more sensitive for disturbance is expectable within the impact area.

Thus the impacts resulting from the operation of the motorway can be classified, in respect of the totality of wildlife, in the **supportable** category, in respect of more sensitive populations and habitats in the **burdening** category.

#### 4.5.4.5. Change in the water run-off conditions of the areas affected

The remaining humid sodic and non-sodic flats, with standing water in spring, of the region and the communities thereof represent practically the highest natural value affected by the implementation of the motorway. At the same time the constructed road can change most of all the water budget relations of these areas lying deeper, since the embankment it is running on will impede any further natural watercourse through two separated parts of the crossed humid flat. This effect may involve, on some places, a considerable drying in comparison with the original hydraulic conditions, and potentially an increased water accumulation in other places. The two phenomena influence equally unfavourably the conditions of survival of the living beings of communities, natural or quasi natural, adapted to the original conditions of water budget, therefore, efforts have to be made in order to preserve the original water stream through the implementation of culverts between the separated area parts. The channel formed for collecting the waters, which run off from the body of the track exercise also a draining and drying effect on the lawns along the motorway, if it is established at the level thereof, since it will logically collect also the waters infiltrating from the lawn and drain them from the area. Thus attention shall be paid, besides the lawns valuable from the aspect of wildlife protection, to the point that the water running from the body of the track should be drained with a technical solution, which will not cause the effect above. Thus the draining effect will become **supportable** from the viewpoint of wildlife protection.

It is often difficult to draw the limit of the impact area of this influencing factor, at the same time the attack points considerable from the viewpoint of wildlife protection can be usually well designated.

#### 4.5.4.6. Soil contamination resulting from the winter salting of the road surface, from oil discharge, etc.

From among the possibilities of soil contamination mainly the pollution resulting from salting can have local importance, but not too many measures for wildlife protection can be planned in connection therewith, over and above those prescribed by the general regulation of environmental protection. The impact area can be designated in general within a district of 20 to 50 metres of the road. The influencing factor will affect primarily the vegetation and the invertabrata. The construction of rainwater drainage channels will considerably reduce the dimension of the impact, thus the load is to be expected **supportable**.

#### 4.5.4.7. Isolating effect of the constructed road and the connected facilities (game fence, etc.)

The isolating effect will affect lots of groups of wildlife. It has a detrimental effect primarily on the fauna, on the species thereof with a limited mobility (unable to fly), but also the populations of lots of zoochor plant species, whose crop is disseminated by animals (mainly the plant species disseminated by invertebrata, ants, snails, etc.) will suffer from the consequences thereof. The isolating effect results in the populations' fragmentation, division into smaller groups, which reduces the chances of survival of the population (pieces) due to many causes appearing together (increased endogamy and genetic flow, the magnitude of the population fragments, i.e. the number of beings will dangerously approach the minimum population magnitude able to proliferate or it will be even smaller, etc.). Certain populations

will be partially or fully separated from their earlier places of nutrition, hibernation (reptiles) or reproduction, this latter is a well-known serious danger e.g. for the amphibians.

The impact is permanent and is one of the most dangerous impacts from the aspect of wildlife protection. Therefore every possible effort shall be made in order to reduce the dimension thereof. Thus the damaging-burdening effect will be attenuated, to an extent of **burdening** for certain populations and to **supportable** for other populations, as expected.

#### 4.5.4.8. Running-over – running down

Apart from the planned game fence system (which will, however, and we should not forget it, increase even more the extent of isolating effects) no other really efficient measures for the protection of wildlife can be planned against running-over caused by motor vehicles. The impact is permanent, it endangers mainly big insects and birds. By well-considered afforestation and shrub plantations within the motorway and along the track the number of running-over can be slightly decreased. Efforts have to be made for selecting plant species, which are e.g. less suitable for the nesting and nourishment of birds and entice them therefore less into the environment involving the danger of accident, for the formation of such a structure of hedging. Even in this case the impact is **burdening** for the wildlife of the surrounding habitats.

#### 4.5.4.9. Harmful impacts of unreasonable afforestation and hedging in connection with the implementation of the motorway

While the plantation of vegetation is absolutely favourable from the visual and aesthetic aspect, at the same time it may involve several harmful effects from the aspect of wildlife protection, if it is not done with due circumspection:

- In the previous section we have already mentioned the effect of the hedges and forest bells planted as lane separation and along the road, enticing the birds and increasing the number of accidents of running-over. It is purposeful to make efforts for selecting plant species, upon the afforestation, which do not offer good nourishment for birds and are less suitable for nests due to their physiognomy, at least at the track sections crossing the natural or quasi-natural habitats or located close to them.

- It can be a serious source of danger, if plant species are used for lawn and forest along a motorway section crossing natural habitats, which are able to proliferate as aggressive weeds at the given habitat, and squeeze out the indigenous species living there, destroying practically the original community. Therefore it is forbidden to plant small-leave silver willow, whose commonly known name is sliver tree (Eleagnus angustifolia) in the neighbourhood of sodic areas. Namely, in case of such a type of natural habitats this species is recorded as the most dangerous aggressive arborescent weed, which is very difficult to suppress, if it has gained a footing already somewhere.

  Based on the aforementioned we propose to plant the following species, in the case of M5 motorway, in the proximity of natural or quasi-natural habitats, depending on the condition of habitat:
  - *Deciduous trees:*
    Acer campestre
    Quercus robur
    Fraxinus angustifolia ssp. Pannonica

Populus alba
Populus x canescens
Populus tremula
Salix spp.
Ulmus minor

- *Pines:*
  Juniperus communis
- *Shrubs:*
  Craetegus monogyna
  Corylus avellana
  Acer tataricum
  Rosa canina
  Rosa spinosissima
  Euonymus europaeus

In other habitats (disturbed, degraded or highly urbanised region) and in the separating lane species occurring in the larger region of our country (e.g. Celtis australis) may also be planted.

- A forest belt or hedge belt planted beside natural lawns destroys physically a part of the habitat whished to be protected and, additionally, it changes the climate of the neighbouring areas, it inhibits the wind, it has an effect attenuating the extremities of climate, it shadows the neighbouring areas. This changes the conditions of life of the original community, affects harmfully a lot of species and offers a possibility for the establishment and proliferation of weed species.

- It is a special source of danger if the planted forest belt or hedge belt allows the establishment and proliferation of pathogens, pests, predators non-desirable at the given place, which have not been established so far at the natural habitat. Thus e.g. it is not a good idea to afforest in the proximity of the nest places of bank birds – sandpipes, godwits, green plovers, etc., – for that reason either that it offers an opportunity of nesting and establishment for the magpies, which prefer to plunder the nests.

- A planted forest belt may considerably increase the isolating effect between separated lawn parts, e.g. from the aspect of flying invertebrata (insects. Translator's remark.).

Although we will mention this again in the detailed track analysis, we consider desirable to stress here too that the plantation of so-called protecting forest belts, hedges, close to or within the lawn areas representing a considerable value of the region has usually no practical use for nature conservation. Their variable negative impacts are in general much more considerable, than their role attenuating to some extent the air pollution, noise and interference. Therefore, **where the planned motorway track runs through any type of area valuable for nature conservation, there the afforestation is in general undesirable from the aspect of wildlife protection.** Taking this into consideration and complying therewith the impact may be **supportable** or even **neutral**.

### 4.5.5. ECOLOGYCAL CONNECTIONS OF THE REGION AFFECTED BY THE PROJECT AND THE WIDER ENVIRONMENT THEREOF

In principle the construction and operation of motorways may have an importance for wildlife protection not only at the local level, but also at the regional level concerning a larger area. The damaging of the so-called ecological network, ecological corridors will influence also the natural habitat network and system of connections of the wider environment of the motorway.

Here solely the Algyő channel can have such an impact, which is connected with Lake Fehér and with the sodic habitat chain thereof. Therefore, it is important to comply with the prescription defined in the previous chapter in the interest of the protection of water quality.

### 4.5.6. DETAILED TRACK ANALYSIS

In this part we will highlight the motorway track sections important from the aspect of wildlife protection. We will describe the natural values of the environment of the given motorway track and the measures to be taken in order to preserve them.

#### 4.5.6.1. Lawns falling west from chainage 161+000–162+400 km

In the course of the detailed track analysis it is worthwhile to mention Kiskundorozsma Nagy-szék, as a protected area of local importance. It is a mosaic of very nice sodic habitats, in which we find the sodic vegetation of Duna-Tisza köze (Lepidio-Puccinellietum limosae) (F4), Camphorosmetum annuae (F4) and sodic meadows (Agrostio-Caricetum distantis) (F2), the spots of which are alternating, but we find also a small reedy area (B1), marches with "csetkáka" (B3) and areas with "zsióka" (B6), in the deeper parts, while the higher ridges are covered with steppe-like sand lawns (H5). Eleagnus angustifolia appeared in several spots in the area, it constitutes a forest belt on the eastern side of the protected area (S7). The northern part of the lawns (around a cattle-grid), close to the planned Kiskundorozsma node is strongly degraded, it consists mostly of species resistant for disturbance, and weeds. Save for the northern parts the area is rich of valuable plant species, there are several thousand pieces of protected Plantago schwarzenbergiana. Early in spring several thousand pieces of Crocus reticulatus are blooming in the sand ridges, like the highly protected Ophrys sphegodes. The area has two protected plants blooming in the autumn: Spirantes spiralis and Colchicum erenarium. The fauna of the area is not particularly rich. In the more humid periods of spring and possibly in autumn it may be a place for rest, breeding and nutrition of water and bank birds: godwits, green clovers, red footed sand pipers, black-headed gulls, and pochards.

The motorway to be constructed will not, as expected, touch the area either directly or indirectly, since the sand ridges stretching between the track and the protected area of local importance will probably isolate sufficiently the protected lawns from the harmful effects.

#### 4.5.6.21. Lawns between chainage 162+400–163+000 km

These lawns will be directly destroyed maximum in a small part by the road construction work, however, through the full indirect impact area a somewhat larger part thereof will be affected. In the deeper parts of the valley a drying reed (B1xO1) is growing, this is surrounded by a sodic meadow (Agrostio-Alopecuretum pratentis) (F2), at the highest parts we find the weeding remainders of earlier dryer steppe meadows. The highest botanical value of the lawns is the protected community of Astragalus asper.

**Direct and indirect impacts of the occupation of area**

In the course of the construction works

- ~ 30 pieces of Astragalus asper will be destroyed.

**Proposals for the protection of wildlife**

- In the areas of lawn and in those withdrawn from cultivation no mining sites may be installed, no dumping or area for preparatory works may be established, afforestation is not proposed either; we do not see any possibility for other measures on the merits for the protection of wildlife.

#### 4.5.6.22. Lawn area between chainages 166+700–167+000 km

Here the track touches the edge of a sodic marsh meadow (Agrostio-Caricetum distantis) (F2) coloured with reed in good condition (B1). From among the protected botanic values of this watery habitat around 300 pieces of Cirsium brachycephalum and about 300 pieces of Orchis laxiflora ssp. palustris are worth of mentioning.

**Direct and indicrect impacts of the occupation of area**

The following will be destroyed in the course of the construction works:

- ~ 100 pieces of Orchis laxiflora ssp. palustris;
- ~ 50 pieces of Cirsium brachycephalum.

**Proposals for the protection of wildlife**

- The proposals for wildlife protection are identical with the description in the previous clauses, i.e. here too it is not proposed to occupy any area for mining, dumping and preparatory works, afforestation is not recommended and rainwaters have to be drained omitting any drying effect.

### 4.5.7. PROPOSALS FOR MEASURES AIMING TO PROTECT WILDLIFE, SUPPLEMENTING THOSE LISTED IN THE DETAILED TRACK ANALYSIS

#### 4.5.7.1. Proposal for constructing a game fence

We propose to construct up to a height of 2.5 m the game fence protecting the track, for the sake of protection of big game. No aspects of nature conservation can be enforced in the shaping of the game fence, therefore the proposal above can be considered to be in the nature of game protection and traffic safety.

#### 4.5.7.2. Monitoring system

It can be considered necessary anyhow to monitor the impact exercised on the wildlife by influencing factors, which are indirect from the aspect of wildlife protection, functioning during the operation of the motorway. However, at the present section we cannot find any habitat of an importance highlighted from the aspect of nature conservation, which would justify the implementation of biomonitoring. The 4 monitoring points proposed on the earlier Csongrád County section will presumably be sufficient for demonstrating the changes occurring along the full section.

#### 4.5.7.3. Proposals related to afforestation accompanying the implementation of the motorway

We have already made known the areas hereinabove, where it is not proposed, from the aspect of wildlife protection, to carry out protecting afforestation accompanying the motorway. Our further proposals are the following:

- In each track section, efforts have to be made for afforestation primarily with indigenous, domestic tree species (see the species listed above), particularly in case of the protective afforestation flanking the track from outside, since protective afforestation carried out on large areas with adventive tree and shrub species is extremely harmful from the aspect of wildlife protection, since such species can spread and colonise, from case to case expressly aggressively, the natural habitats. In case of afforestation and plantation of shrubs for space separation, separating the lanes of opposite traffic directions it is less required to insist on the use of domestic species, only the application of species capable to a high degree of colonisation must be excluded in our natural habitats. Particularly afforestation and shrubbing with Robinia pseudo-acaccia, Eleagnus angustifolia, Amorpha fruticosa and Ailanthus altissima must be avoided, these species involve namely the biggest problem of nature conservation for the moment, as they spread aggressively and destroy habitats in Duna-Tisza köze.

- When planning the afforestation, reference is often made by the investors to the restraint that there is no sufficient choice of species and varieties, and no sufficient quantity of saplings is available from the distributors in "suitable" sizes, which are several years old and at least 1.5 to 2 metres. Therefore they are often constrained to bypass other aspects upon the planning of the afforestation and they take only the possibilities of purchase into consideration. The situation would be highly facilitated, if it were possible to eliminate the ideology of afforestation with trees "seeming at once to be developed", namely afforestation could usually be carried out with younger saplings of smaller sizes. And it is true that there is an appropriate choice and quantity to be purchased from such saplings, even from domestic species, in the country. (Very often there are no serious professional arguments for afforestation carried out with big saplings. Why would it be impossible to wait the time, till a sapling of 0.5 to 1 m grows to a size we would often like to see at once, practically in one or two years? Why should we "spoil" an alley, the tree species thereof, which are to exist for decades, alleging the fact that in the given moment there were not big saplings in appropriate number from the really optimum tree species.

### 4.5.8. SUMMARY OF THE CHAPTER ON WILDLIFE PROTECTION

In the study we have defined the expectable extent of the full direct and indirect impact area, formed by the influencing factors, intervening in the course of the construction and operation of the M5 motorway section under examination and important from the aspect of the protection of wildlife. According to the experiences, a zone of a width of around 200 metres in the average on both sides of the motorway, i.e. of a total width of around 400 metres is worthwhile to be involved in the examinations of wildlife protection, due to the multiplying effects coming from other elements (air, soil and water).

We explained the brief characterisation in terms of nature geography of the areas touched by the track of the future motorway section studied (Kiskunfélegyháza – State border) and by the impact processes accompanying the construction and operation, we outlined the original

natural vegetation thereof and we provided the distribution thereof according to the methods of land use, developed further somewhat. Applying this to the full Csongrád County section this is the following:

| Method of land use | Percentage proportion |
|---|---|
| ploughland | 65.6% |
| lawn + withdrawn (areas most important from aspect of wildlife protection) | 19.6% |
| small patchy mosaic of small gardens, orchards, vineyards, hayfields, pasture lands, etc., heterogeneous complex of habitats | 9.8% |
| forest | 2.2% |
| orchard | 1.6% |
| shrubs, areas under afforestation | 1.1% |
| area of settlements | 0.1% |
| stagnant water | negligible extent |

At the section under examination the proportion of dry lawns is somewhat higher.

We have made known the influencing factors important from the aspect of wildlife protection, existing during construction and operation, and we have defined the natural elements receiving the impacts. We have carried out the brief analysis of the following influencing factors:

- Occupation of area occurring through the building-in of the track on the area touched directly by the project.
- Establishment of mining sites for building materials used for the construction.
- Air pollution from construction works.
- Air pollution during the operation of the motorway.
- Change in the watercourse conditions of the areas affected.
- Soil contamination resulting from the winter salting of the road surface, oil discharge, etc.
- Isolating effect of the constructed carriageway and the connected facilities (game fence, etc.)
- Running-over / running-down.
- Harmful impacts of afforestation and hedge plantation, which have not been thought over, related to the implementation of the motorway.

We have found that the area designated directly for building-in and the full indirect impact area important from the aspect of wildlife protection will run, for the most part, through areas subject to agricultural cultivation or intense sylviculture with no natural wildlife. They do not touch any nature conservation areas of local or national importance, declared to be protected prior to the publication of Act LIII of 1996 on the Preservation of Nature or by the traditional process of protection.

In our detailed track analysis we made known, in a breakdown by km chainage the natural values of the areas touched by the impact area and made proposals for the measures to be taken in order to protect them.

| Area of high importance for wildlife protection, | Proposed culvert and amphibian passage | Proposed game passage | Other proposal for wildlife protection | We do not see any possibility for measures |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| given by delimiting km chainages | | | | on the merits for wildlife protection |
| 161+000-162+400 | | | | x |
| 162+400-163+000 | | | x | |
| 166+700-167+000 | | | x | |

Other measures for wildlife protection, which have not been explained in the table but are proposed in most cases in the detailed track analysis:

- No mining should occur on area parts of lawn or withdrawn from cultivation.
- No deposit area and area for preparatory work should be established in such areas.
- No afforestation should be carried out along areas valuable from the aspect of nature conservation.
- The drainage of water in lawn or withdrawn area should be dissolved with a technical solution, which will not exercise any drying effect on the neighbouring areas.
- It is proposed to build a game fence of a height of 2.5 m on the full track section under examination.
- In connection with the afforestation accompanying the construction of motorway we proposed to prefer domestic indigenous tree species, and to omit the use of some adventive tree species proliferating aggressively.

We did not deem necessary to monitor the section under examination from the aspect of wildlife protection.

## 4.6. ARTIFICIAL AND COMMUNAL ENVIRONMENT

### 4.6.1. ARTIFICIAL AND BUILT ENVIRONMENT

As made known already in Chapters 1 and 3, the track does not touch any settlements, it will bypass them at a smaller or bigger distance. However, a part of the area affected is densely built in with detached farms, the track cannot bypass all of the farms. Therefore, expropriations will be required prior to the construction of the track, and the buildings located on the track or in a district of around 30 m thereof will be demolished.
The track will not touch any historic monument.

According to the information by the competent Directorate of Museums of Csongrád County (see Annex No. 1) the track of M5 motorway touches the following archaeological sites:

- Kiskundorozsma 26/54: settlement from the age of Sarmatas
- Kiskundorozsma 26/55: settlement from the prehistoric age and from the late Middle Age
- Kiskundorozsma 26/60: settlement from the late Bronze Age
- Kiskundorozsma 26/72: settlement from the age of Sarmatas
- Kiskundorozsma 26/73: settlement from the early Bronze Age
- Röszke 48/60: settlement from the Bronze Age
- Röszke 48/82: settlement from the age of Avars

On the track, the excavations of rescue have already been carried out partially, and partially they are in progress at present. We draw the attention to the point that if a new site is opened, over and above the sites well-known to-date, in the course of the landscaping works, the

works must be stopped, the competent authority is to be notified and the construction may only be continued after the termination of the excavations of rescue.

### 4.6.2. NOISE AND VIBRATION

The noise and vibration load is the most important influencing factor jeopardising the communal environment in the course of the construction and operation of the motorway. Therefore, we will highlight and mention them in detail as follows.

#### 4.6.2.1. Definition of the impact area and of the facilities to be protected

We have prepared the noise examination for the facilities to be protected in the direct and indirect impact areas.

We examined the noise conditions of both areas in the following situations:
- in current status,
- in reference status (2015)*,
- in the planned future status in 2015, in case of a toll of HUF 10/km and HUF 20/km.

**A) Direct impact area**

The direct impact area is the environment of 200 to 300 m (from the axis) of the planned M5 motorway track. In the given case (plain area for the most part, free transmission, etc.) the size of the direct impact area depends primarily on the magnitude of traffic. We established the delimitation of the impact area from the night noise load values of the full construction status (year 2015), in case of a toll of HUF 10/km. Beyond the impact area the expectable noise load will not exceed the limit values.

Starting from the traffic sections (see the chapter on traffic) we have taken into consideration the following impact areas in the individual regions:

| | impact area d (m) | |
|---|---|---|
| | residential area | holiday area |
| M5 motorway | | |
| 1. Szeged North – Szeged West | 120 | 280 |
| 2. Szeged West – State border | 100 | |

The detached farms located within a district of 200 metres of the track, thus within the direct impact area have been presented in Chapter 3. On the basis thereof it can be stated that 66 pieces of objects to be protected belong to the direct impact area. From this 53 pieces are inhabited detached farms or small gardens, 12 pieces are abandoned detached farms and the Subasa holiday area.

We count the areas, located closest to M5 motorway, of Kiskundorozsma, Sziksós holiday area to the direct impact area.

* We understand by reference status the future status, which would come into being, if M5 motorway were not constructed.

According to a reconciliation held with the Inspectorate of Environmental Protection of Lower Tisza Region, we took into consideration limit values defined for holiday areas, since perspectivically the Subasa small gardens (chainage 162.3 - 164 km) will be declared holiday area.

The area of nature conservation under local protection in Nagyszék (the protection extends to the indigenous lawn) is located at a distance of more than 300 m from the track (chainage 161.0-162.4). In the indigenous lawn there is no fauna, there are no visitors, it is not built out and published for visitors. Therefore this area does not need any noise protection. (See the enclosed opinion in Annex No. 1.)

***B) Indirect impact area***

The indirect impact area shall mean the district of 80 m of the main roads, where a smaller noise load (e.g. along main road 50) or a higher noise load (e.g. by-road No. 5512) is expectable due to the construction of M5 motorway.

By indirect impact area we understand the environment of the full section of main road No. 50, as well as the environment of by-roads marked 5512 and 5431 leading to the node of M5 motorway, as well as the environment of main road No. 55.

Main road No. 50 traverses an area built in with residential buildings, the central area of Szeged (Dorozsmai út, Kossuth Lajos út, Londoni krt., Moszkvai krt., Petőfi S. krt., Szabadkai út). Here main road No. 50 is also one of the internal main traffic roads of the settlement, the residential buildings are at a distance of 5 to 20 m from the edge of the road. Main road No. 55 runs in the outskirts of Domaszék, thus we have not deemed necessary the examination. The direct and indirect impact areas are illustrated in figure one included in Annex No. 2.

### 4.6.2.2. Prescriptions of noise protection

According to Decree No. 4/1984 (I.23.) of the Minister of Health the equivalent "A" sound pressure level of the noise derived from traffic may not exceed, in areas being newly planned or having a changed area use, the following values:

- along main traffic roads, in a residential and institutional area, in case of dense or loose urban development:
  in daytime: $L_{Aeq} = 65$ dB
  at night: $L_{Aeq} = 55$ dB
- along traffic roads in case of loose development, and in holiday areas along main traffic roads:
  in daytime: $L_{Aeq} = 60$ dB
  at night: $L_{Aeq} = 50$ dB

in the proximity of the buildings.

The reference periods are 16 hours in daytime and 8 hours at night. The health authority may license an excess of 5(10) dB taking into consideration the opinion of the authority of environmental protection. In the rooms of the buildings the values of the standard MSz 18151/1-82 "Immission noise limit values. Equivalent A-sound pressure levels permissible in

the rooms of residential and public buildings." shall be complied with in case of closed doors and windows.

### 4.6.2.3. Current noise conditions and the evaluation thereof

We have established the current noise conditions of both the indirect and the direct impact areas through on-the-spot measurements and calculations.

***A) Method of noise assessment***

We have carried out the measurement of traffic noise, the assessment and the definition of the defined noise load taking into consideration the prescriptions of standards Nos. MSZ 18150/1-83 "Assessment of immission noise features. Definition of design "A" sound pressure levels occurring in the environment and rooms of residential, holiday and public buildings" and MSZ 13-183/1-92 "Measurement of traffic noise. Noise from public road traffic", as well as the local features, the traffic conditions and the experiences of earlier measurements.

On the basis of the above design traffic data (see the chapter on traffic), layout plans, features of building-in, measurement results and earlier experiences of measurement we have established the designed noise load by calculation, according to the prescriptions of standard No. MSZ 07-3720-1991 "Calculation of traffic noise. Public road noise."

***B) Direct impact area***

M5 motorway will run on a totally new track, on a big part of the area of planning there is no noise source currently, thus the noise level is determined by the sounds of nature and by the noises coming from far away. A noise load can be mentioned in the environment of certain existing main roads and by-roads and the railway line.

We have established the current noise conditions of the area of planning in the environment of the facilities to be protected, listed in Chapter 4.7.1.1. We have selected the measurement points in such a manner that they should constitute the measurement points and starting data of the monitoring system to be implemented.

**- Points of examination**

To present the status expectable after the road construction, to illustrate the changes we have selected the following representative points of examination. The measurement points are illustrated by the figures included in Annex No. 2. Since the expert opinion of noise protection has been prepared on a single occasion for the whole section in Csongrád County, therefore the basic status was recorded distributed on the settlements affected. In case of the section marked III, examined by the present impact study, the affectedness of the settlements is lower than in case of the section marked II/B, thus here the number of the points designated for the measurement of the basic status is also lower. However, for the sake of comparison we give the measurement results of the full section, highlighting by underlining the information relating to the present section.

Measurement point 1
Csengele, Felszabadulás út 34.

Main noise source: by-road No. 54121

Measurement point 2
Kiskundorozsma, Sziksósi út 97.
Main noise source: by-road No. 5408.
The value measured in this point of measurement can be considered characteristic for the Sziksós part of by-road No. 5408.

Measurement point 3
Szatymaz, Kossuth Lajos utca 85.
Main noise source: by-road No. 4525.

We carried out noise measurements and traffic counting in the above points of assessment in July 1998.

**- Results of examination**

We summarise the data of current noise load as follows:

| Measurement point mark | settlement | LAM dB day | night |
|---|---|---|---|
| Z1 | Csengele | 59.0 | 52.0 |
| Z2 | Kiskundorozsma, Sziksós | 64.5 | 57.4 |
| Z3 | Szatymaz | 54.3 | 48.0 |

**- Evaluation of the results of examination**

If we compare the results of examination for the sake of information with the limit values prescribed by Decree No. IV/1984 (I.23.) EüM for newly planned areas, it can be stated that the noise load exceeds the limit value prescribed for traffic roads as follows: in Szatymaz currently not at all, in Csengele no excess in daytime, excess of 2 dB at night, in Kiskundorozsma an excess of 4.5 dB in daytime and 7.4 dB at night.

In the environment of the detached farms there is no noise source currently, thus the noise level is determined by the sounds of nature and by the noises coming from far away. The noise load is below 45 dB in daytime and 40 dB at night. We can mention a noise load only in the proximity of the existing main roads and by-roads and the railway.

***C) Indirect impact area***

We have carried out examinations in order to illustrate the noise conditions of the indirect impact area

- along main road No. 50 in Kistelek and Szeged
- along main road No. 5411 in Kistelek,
- along road No. 5422 in Balástya

The measurement points are described in the figures of Annex No. 2.

**- Points of examinations**

Measurement point 4
Kistelek, Petőfi utca 36/a
Main noise source is main road No. 50.
Due to an identical building-in and an identical traffic the noise load measured in Kistelek may be deemed characteristic also for the areas along main road No. 50 of Balástya.

Measurement point 5
Szeged, Kossuth L. sugárút 36.
This is an area built in unbroken rows from both sides. This is a busy main road of Szeged, with tramway. The transit traffic on main road No. 5 towards main road Nos. 43 and 47 is considerable. Since in Szeged a new relief road was opened for the traffic directed to the State border between Kossuth L. avenue and Szabadkai street through Vásárhelyi Pál street in the past period, traffic has been reduced in this section.

Measurement point 6
Petőfi Sándor sugárút 77.
This is an area built in unbroken rows from both sides. This is a busy main road of Szeged, with transit transport. Since in Szeged a new relief road was opened for the traffic directed to the State border between Kossuth L. avenue and Szabadkai street through Vásárhelyi Pál street in the past period, traffic has been reduced in this section.

Measurement point 7
Szeged, Szabadkai út 29.
The traffic directed to the border, coming from the relief road appears here already.

Measurement point 8
Kistelek, Rákóczi út 28.
Main noise source: by-road No. 5411.

Measurement point 9
Balástya, Móricz Zs. utca 1.
Main noise source. by-road No. 5422.

We carried out noise measurements and traffic count in July 1998.

**- Results of examination**

The current data of noise load are the following:

| Measurement point mark | settlement | LAM dB day | night |
|---|---|---|---|
| Z4 | Kistelek (main road No. 50) | 66.1 | 62.2 |
| Z5 | Szeged, Kossuth L. sugárút | 69.9 | 64.8 |
| Z6 | Szeged, Petőfi S. út | 64.2 | 58.2 |
| Z7 | Szeged, Szabadkai út | 66.3 | 60.3 |
| Z8 | Kistelek (by-road No. 5411) | 56.3 | 48.3 |
| Z9 | Balástya | 59.5 | 51.8 |

**- Evaluation of the results of examination**

If we compare the data above with the limit values relating to newly planned areas, published in Decree No. 4/1984 (I.23.) EüM, it can be stated that the noise load along main road No. 50 exceeds considerably the prescribed value limit (in daytime by 0 to 5 dB, at night by 3.2 to 10 dB).

Along the by-roads of lesser traffic we should not count with a noise load exceeding the limit value, however, at night a load exceeding the limit value may occur.

### 4.6.2.4. Noise load expectable in the future reference status and the evaluation thereof

We understand by reference status the situation developing in the year 2015, which would come into being if the motorway were not constructed. We define the noise load expectable for the future status for both the direct and indirect impact areas.

***A) Method of calculation***

We defined the noise load expectable in the future reference status taking into consideration the traffic data expectable in the future reference status (see the chapter on traffic), the construction features of existing roads (traffic lanes, pavement, etc.), speed limitations, measurement data of the features of building-in (noise, traffic), etc. according to the prescriptions of standard No. MSz 07-3720-191.

We have carried out our calculations relating to the points of examination, which have been made known for the characterisation of the current status.

***B) Results of examination***

**- Direct impact area**

In the direct impact area no essential change in the reference status is expectable, thus:

- in the environment of the detached farms located in the direct impact area a noise condition identical to the current one is expectable;
- we have to count with an increase of noise level to a negligible extent in Kiskundorozsma and the region of the holiday area.

Based on the aforementioned it can be stated that favourable noise conditions will remain, in the reference status, in the direct impact area.

**- Indirect impact area**

In the reference status of the indirect impact area a further considerable traffic increase should be reckoned with, which would lead to the further increase of noise level. The omission of the construction of M5 motorway would result, according to the calculations, in a noise load by 2 to 2.8 dB higher than the current one in the areas along main road No. 50 (both in daytime and at night).

**It can be stated from the aforementioned that if the motorway were not built, the noise load along main road No. 50, which is high even currently and exceeds considerably the limit value, would continue to increase, we should reckon with a considerable excess of noise level, which would mean a further important worsening of condition for those living along road No. 50.**

**Due to the aforementioned it is extremely justified and necessary, also from the aspect of noise protection, to construct the motorway as soon as possible.**

#### 4.6.2.5. Planned noise load expectable in the future status and evaluation thereof

We have examined the noise load expectable in the future status for the facilities to be protected in both the direct and indirect impact areas listed in Chapter 4.7.1.1.

***A) Method of examination***

We have defined the future noise load taking into consideration the future traffic data (see the chapter on traffic), the construction features of planned roads (traffic lanes, pavement, etc.), speed limitations, features of building in, corrections characteristic for site and transmission, etc., according to the prescriptions of standard No. MSz 07-3720-191. We have taken into account the planned speed with 120 km/h, according to the current prescriptions.

We have prepared the calculations for the year 2015 for the cases of a toll of HUF 10/km and HUF 20/km.

***B) Direct impact area***

**- Expectable noise load**

The data of the noise load expectable in the environment of certain facilities to be protected in the direct impact area are contained in table No. Z1.

Table Z1 **Expectable noise load affecting facilities to be protected, located in the direct impact area, in case of different tolls**

| serial No. | km chainage | side | facility to be protected | topogr. lot No. | distance from M5 (m) | LAM dB | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | HUF 10/ km | | HUF 20/km | |
| | | | | | | day | night | day | night |
| 113. | 162.3-164 | right | holiday area | Subasa | 80 | 60.8 | 55.8 | 60.6 | 55.6 |
| 114. | 164.3 | left | detached farm | 040/4 | 130 | 61 | 56 | 58.8 | 53.8 |
| 115. | 164.73 | left | detached farm | 040/8 | 70 | 65 | 60 | 62.8 | 57.8 |
| 116. | 165.0 | left | detached farm | 040/8 | 80 | 64.1 | 59.1 | 61.9 | 56.9 |
| 117. | 165.1 | left | detached farm | 040/10 | 140 | 60.6 | 55.6 | 58.4 | 53.4 |
| 118. | 165.13 | left | detached farm | 040/9 | 80 | 64.1 | 59.1 | 61.9 | 56.9 |
| 119. | 165.13 | left | detached farm | 040/2 | 30 | 71.5 | 66.5 | 69.3 | 64.3 |
| 120. | 165.05 | right | detached farm | 037/3 | 60 | 66 | 61 | 63.8 | 58.8 |
| 121. | 165.28 | right | detached farm | 032/9 | 130 | 61 | 56 | 58.8 | 53.8 |
| 122. | 165.2 | right | detached farm | 031/14 | 50 | 67.1 | 62.1 | 64.9 | 59.9 |
| 123. | 165.22 | right | detached farm | 031/13 | 100 | 62.7 | 57.7 | 60.5 | 55.5 |
| 124. | 165.2 | left | detached farm | 031/16 | 70 | 65 | 60 | 62.8 | 57.8 |
| 125. | 165.22 | left | detached farm | 031/17 | 110 | 62.1 | 57.1 | 59.9 | 54.9 |
| 126. | 165.6 | right | detached farm | 031/26 | 60 | 66 | 61 | 63.8 | 58.8 |
| 127. | 166.0 | right | detached farm | 031/30 | 90 | 63.4 | 58.4 | 61.2 | 56.2 |
| 128. | 166.3 | right | detached farm | 028/8 | 80 | 64.1 | 59.1 | 61.9 | 56.9 |
| 129. | 166.3 | left | detached farm | 031/32/33 | 30<br>and 80 | 71.5<br>64.1 | 66.5<br>59.1 | 69.3<br>61.9 | 64.3<br>56.9 |
| 130. | 166.5 | left | detached farm | 0145/11 | 40 | 68.6 | 63.6 | 66.4 | 61.4 |
| 131. | 166.9 | right | detached farm | 0175/7 | 60 | 66 | 61 | 63.8 | 58.8 |
| 132. | 167.0 | right | detached farm | 0145/6 | 40 | 68.6 | 63.6 | 66.4 | 61.4 |
| 133. | 167.25 | left | detached farm | 0141/2 | 80 | 64.1 | 59.1 | 61.9 | 56.9 |
| 134. | 167.55 | left | detached farm | 0159/5 | 70 | 65 | 60 | 62.8 | 57.8 |
| 135. | 167.7 | left | detached farm | 0159/2 | 110 | 62.1 | 57.1 | 59.9 | 54.9 |
| 136. | 167.6 | right | detached farm | 0159/16 | 80 | 64.1 | 59.1 | 61.9 | 56.9 |
| 137. | 167.65 | right | detached farm | 0159/15 | 40 | 68.6 | 63.6 | 66.4 | 61.4 |
| 138. | 167.8 | right | detached farm | 0159/30 | 80 | 64.1 | 59.1 | 61.9 | 56.9 |
| 139. | 167.9 | left | detached farm | 0150/8 | 80 | 64.1 | 59.1 | 61.9 | 56.9 |
| 140. | 168.3 | right | detached farm | 0150/1 | 80 | 64.1 | 59.1 | 61.9 | 56.9 |
| 141. | 168.3 | left | detached farm | 0150/1 | 40 | 68.6 | 63.6 | 66.4 | 61.4 |
| 142. | 168.58 | right | detached farm | 0148/87 | 130 | 61 | 56 | 58.8 | 53.8 |
| 143. | 168.75 | right | detached farm | 0148/ | 130 | 61 | 56 | 58.8 | 53.8 |
| 144. | 168.6 | left | detached farm | 0150/1 | 120 | 61.6 | 56.6 | 59.4 | 54.4 |
| 145. | 168.9 | right | detached farm | 0148/20 | 100 | 62.7 | 57.7 | 60.5 | 55.5 |
| 146. | 169.0 | right | detached farm | 0148/19 | 40 | 68.6 | 63.6 | 66.4 | 61.4 |
| 147. | 169.15 | left | detached farm | 048/12 | 60 | 66 | 61 | 63.8 | 58.8 |
| 148. | 169.5 | left | detached farm | 046/9 | 140 | 60.6 | 55.6 | 58.4 | 53.4 |
| 149. | 169.5 | right | detached farm | | 70 | 65 | 60 | 62.8 | 57.8 |

| serial No. | km chainage | side | facility to be protected | topogr. lot No. | distance from M5 (m) | LAM dB | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | HUF 10/ km | | HUF 20/km | |
| | | | | | | day | night | day | night |
| 150. | 169.65 | left | detached farm | 046/6 | 40 | 68.6 | 63.6 | 66.4 | 61.4 |
| 151. | 169.83 | right | detached farm | 050/5 | 110 | 62.1 | 57.1 | 59.9 | 54.9 |
| 152. | 170.02 | right | detached farm | 075/3 | 80 | 64.1 | 59.1 | 61.9 | 56.9 |
| 153. | 170.48 | left | detached farm | 039/11 | 90 | 63.4 | 58.4 | 61.2 | 56.2 |
| 154. | 170.65 | left | detached farm | 075/12 | 60 | 66 | 61 | 63.8 | 58.8 |
| 155. | 170.86 | left | detached farm | 075/13 | 90 | 63.4 | 58.4 | 61.2 | 56.2 |
| 156. | 171.0 | left | detached farm | 075/14 | 100 | 62.7 | 57.7 | 60.5 | 55.5 |
| 157. | 171.0 | left | detached farm | 075/15 | 70 | 65 | 60 | 62.8 | 57.8 |
| 158. | 171.0 | right | detached farm | 082/4 | 130 | 61 | 56 | 58.8 | 53.8 |
| 159. | 171.6 | right | detached farm | 082/5 | 150 | 60 | 55 | 57.8 | 52.8 |
| 160. | 171.35 | right | detached farm | 082/9 | 70 | 65 | 60 | 62.8 | 57.8 |
| 161. | 171.45 | left | detached farm | 082/10 | 110 | 62.1 | 57.1 | 59.9 | 54.9 |
| 162. | 171.58 | right | detached farm | 086/13 | 80 | 64.1 | 59.1 | 61.9 | 56.9 |
| 163. | 171.58 | right | detached farm | 086/12 | 40 | 68.6 | 63.6 | 66.4 | 61.4 |
| 164. | 171.6 | left | detached farm | 086/10 | 40 | 68.6 | 63.6 | 66.4 | 61.4 |
| 165. | 171.6 | left | detached farm | 086/5 | 80 | 64.1 | 59.1 | 61.9 | 56.9 |
| 166. | 171.75 | left | detached farm | 086/6 | 80 | 64.1 | 59.1 | 61.9 | 56.9 |
| 167. | 171.95 | left | detached farm | 086/4 | 90 | 63.4 | 58.4 | 61.2 | 56.2 |
| 168. | 172.1 | left | detached farm | 086/8 | 90 | 63.4 | 58.4 | 61.2 | 56.2 |
| 169. | 172.17 | left | detached farm | 086/9 | 150 | 60 | 55 | 57.8 | 52.8 |
| 170. | 172.1 | right | detached farm | 086/14 | 110 | 62.1 | 57.1 | 59.9 | 54.9 |
| 171. | 172.3 | left | detached farm | 088/4 | 100 | 62.7 | 57.7 | 60.5 | 55.5 |
| 172. | 172.37 | left | detached farm | 088/8 | 140 | 60.6 | 55.6 | 58.4 | 53.4 |
| 173. | 172.4 | left | detached farm | 088/9 | 130 | 61 | 56 | 58.8 | 53.8 |
| 174. | 172.5 | left | detached farm | 088/10 | 110 | 62.1 | 57.1 | 59.9 | 54.9 |
| 175. | 172.2 | right | detached farm | 088/4 | 50 | 67.1 | 62.1 | 64.9 | 59.9 |
| 176. | 172.4 | right | detached farm | 088/5 | 120 | 61.6 | 56.6 | 59.4 | 54.4 |
| 177. | 172.55 | left | detached farm | 088/11 | 70 | 61.7 | 56.7 | 61.5 | 56.5 |
| 178. | 173.12 | right | detached farm | 0114/11 | 120 | 61.6 | 56.6 | 59.4 | 54.4 |

From the aspect of noise protection we propose to demolish the following detached farms located in a district of 30 to 40 m of the motorway:

From among the farms on the left side:

at chainage 165.13 km (top.lot. No. 040/2) – distance from road 30 m
at chainage 166.3 km (top.lot. No. 031/32) – distance from road 30 m
at chainage 168.3 km (top.lot. No. 0150/1) – distance from road 40 m

From among the farms on the right side:

at chainage 167.65 km (top.lot.No. 0159/15) – distance from road 40 m
at chainage 171.58 km (top.lot.No. 086/12) – distance from road 40 m

**– Evaluation**

Examining the data of Table Z1 we can state that for the farms located within the protective distance the noise load exceeds by 0 to 6.5 dB the prescribed value in daytime, and by 0 to 11.5 dB at night, in case of a toll of HUF 10/km. In case of a toll of HUF 20/km the excess is a value less by 0.2 to 3.3 dB. Due to the aforementioned noise protection must be provided in the environment of the farms and the Subasa holiday area falling within the protective distance.

***C) Indirect impact area***

**– Expectable noise load**

In the indirect impact area the following situation of noise can be expected in the year 2015:

| Mark of measurement point | settlement | LAM dB | | | | | |
|---|---|---|---|---|---|---|---|
| | | HUF 10/ km | | HUF 20/ km | | without motorway | |
| | | day | night | day | night | day | night |
| Z5. | Szeged, Kossuth L. út | 69.2 | 64.1 | 69.5 | 64.3 | 71.6 | 66.5 |
| Z6. | Szeged, Petőfi S. út | 62.0 | 55.5 | 62.2 | 55.7 | 64.7 | 58.2 |
| Z7. | Szeged, Szabadkai út | 65.6 | 59.6 | 65.8 | 59.8 | 69.1 | 63.1 |

From this it can be stated, that:

- a considerable traffic reduction and in parallel therewith a material noise reduction are to be expected in the central area of Szeged. The extent of reduction compared to the reference status will be somewhat (by 1-2 dB) larger in case of a toll of HUF 10/km than in case of HUF 20/km. Therefore, the lowest possible toll is favourable from the aspect of the noise protection in the indirect impact area.

**– Evaluation**

If we compare the values above, we can state the following:

- We have to continue to reckon with a noise load exceeding the limit value at night in the central area of Szeged, but the magnitude of the excess of limit value will be much more favourable than without the construction of the motorway.
  The extent of maximum noise level excess will be
  0.5 to 9.1 dB in Szeged, in case of a toll of HUF 10/km.

#### 4.6.2.6. Summarising evaluation of the operation of the motorway from the aspect of noise protection

The planned track of M5 Motorway avoids the inhabited areas with city-like development, the facilities affected are detached farms, whose noise protection of due extent will be provided by the construction of a noise screening wall. (We have to remark that currently there are much less farms, as compared to the survey prepared in 1991, which means that the farms are gradually abandoned, therefore, it has to be precised before the preparation of the detailed drawings, which are the detached farms to be considered inhabited places.) From the aspect of the indirect impact area the noise situation will be more favourable in the neighbourhood of 255 pieces of buildings with 2 to 5 floors in Szeged, due to the effect of traffic distraction by the M5 Motorway.

#### 4.6.2.7. Proposals for noise protection

We have defined the required noise protection from the data of noise load relating to a toll of HUF 10/km. Upon the preparation of the detailed drawings (this phase of planning has a scale and geodesic survey, which allow exact dimensioning) the dimensioning of walls must be checked. We plan to provide the protection of farms by the noise screening wall built on the motorway's boundary of expropriation. The appropriate protection can be realised by the following noise screening walls (See Table No. Z2).

Table No. Z2 **Statement of dimensions of noise screening walls – Right side**

| starting point of wall | end point of wall | H (m) | I (m) | surface (m2) | place | type of wall |
|---|---|---|---|---|---|---|
| 162+100 | 164+200 | 5 | 2100 | 10,500 | 1.5 m from expr. bound. | reflecting |
| 164+970 | 165+170 | 3 | 200 | 600 | 1.5 m from expr. bound. | reflecting |
| 165+170 | 165+340 | 3.5 | 170 | 595 | 1.5 m from expr. bound. | absorbing |
| 165+310 | 165+400 | 3.0 | 90 | 270 | beside road | reflecting |
| 165+525 | 165+700 | 3.0 | 175 | 525 | 1.5 m from expr. bound. | reflecting |
| 166+800 | 167+120 | 3.5 | 320 | 1,120 | 1.5 m from expr. bound. | reflecting |
| 167+500 | 167+760 | 3.5 | 260 | 910 | 1.5 m from expr. bound. | reflecting |
| 167+760 | 168+000 | 2.5 | 240 | 600 | 1.5 m from expr. bound. | reflecting |
| 168+170 | 168+400 | 2.5 | 230 | 575 | 1.5 m from expr. bound. | reflecting |
| 168+930 | 169+100 | 3.5 | 170 | 595 | 1.5 m from expr. bound. | reflecting |
| 169+390 | 169+590 | 2.5 | 200 | 500 | 1.5 m from expr. bound. | reflecting |
| 169+950 | 170+160 | 2.5 | 210 | 525 | 1.5 m from expr. bound. | reflecting |
| 171+250 | 171+450 | 2.5 | 200 | 500 | 1.5 m from expr. bound. | reflecting |
| 171+450 | 171+650 | 3.5 | 200 | 700 | 1.5 m from expr. bound. | reflecting |
| 172+000 | 172+100 | 2.5 | 100 | 250 | 1.5 m from expr. bound. | reflecting |
| 172+100 | 172+330 | 3 | 230 | 690 | 1.5 m from expr. bound. | reflecting |
| | | | **Total** | **19,455** | | |

expr. bound. = expropriation boundary

Table Z2 **Statement of dimensions of noise screening walls – Left side**

| starting point of wall | end point of wall | H (m) | I (m) | surface (m2) | place | type of wall |
|---|---|---|---|---|---|---|
| 164+620 | 165+300 | 3 | 680 | 2,040 | 1.5 m from expr. bound. | reflecting |
| 167+140 | 168+000 | 2.5 | 860 | 2,150 | 1.5 m from expr. bound. | reflecting |
| 169+100 | 169+280 | 3 | 180 | 540 | 1.5 m from expr. bound. | reflecting |
| 169+540 | 169+770 | 3.5 | 230 | 805 | 1.5 m from expr. bound. | reflecting |
| 170+340 | 170+520 | 2.5 | 180 | 1,305 | 1.5 m from expr. bound. | reflecting |
| 170+520 | 170+760 | 3 | 240 | 720 | 1.5 m from expr. bound. | reflecting |
| 170+760 | 171+000 | 3 | 240 | 720 | 1.5 m from expr. bound. | reflecting |
| 171+460 | 171+700 | 3.5 | 240 | 840 | 1.5 m from expr. bound. | reflecting |
| 171+700 | 172+535 | 2.5 | 835 | 2,087.5 | 1.5 m from expr. bound. | reflecting |
| | | | **Total** | **11,207.5** | | |

In case of the construction of the prescribed walls the following loads can be expected in case of the facilities to be protected:

Table Z3 **Expectable noise load affecting the facilities to be protected, located in the direct impact area, in case of a toll of HUF 10/km, after the construction of the noise screening walls included in Table No. Z2.** (In case of a toll of HUF 20/km the values are less by 0.2 to 1.2 dB.)

| serial No. | km chainage | side | facility to be protected | topogr. lot No. | distance from M5 (m) | LAM dB HUF 10/km | |
|---|---|---|---|---|---|---|---|
| | | | | | | day | night |
| 113. | 162.3-164 | right | holiday area | Subasa | 80 | 54,5 | 49,5 |
| 114. | 164.3 | left | detached farm | 040/4 | 130 | 57,7 | 52,7 |
| 115. | 164.73 | left | detached farm | 040/8 | 70 | 59,4 | 54,4 |
| 116. | 165.0 | left | detached farm | 040/8 | 80 | 59,1 | 54,1 |
| 117. | 165.1 | left | detached farm | 040/10 | 140 | 57,3 | 52,3 |
| 118. | 165.13 | left | detached farm | 040/9 | 80 | 59,5 | 54,5 |
| 119. | 165.13 | left | detached farm | 040/2 | 30 | 59,8 | 54,8 |
| 120. | 165.05 | right | detached farm | 037/3 | 60 | 59,7 | 54,7 |
| 121. | 165.28 | right | detached farm | 032/9 | 130 | 57,7 | 52,7 |
| 122. | 165.2 | right | detached farm | 031/14 | 50 | 59,5 | 54,5 |
| 123. | 165.22 | right | detached farm | 031/13 | 100 | 59,4 | 54,4 |
| 124. | 165.2 | left | detached farm | 031/16 | 70 | 59,5 | 54,5 |
| 125. | 165.22 | left | detached farm | 031/17 | 110 | 58,8 | 53,8 |
| 126. | 165.6 | right | detached farm | 031/26 | 60 | 59,2 | 54,2 |
| 127. | 166.0 | right | detached farm | 031/30 | 90 | 59,7 | 54,7 |
| 128. | 166.3 | right | detached farm | 028/8 | 80 | 59.7 | 54,7 |
| 129. | 166.3 | left | detached farm | 031/32/33 | 30 and 80 | 60 and 59,4 | 55 and 54,4 |
| 130. | 166,5 | left | detached farm | 0145/11 | 40 | 59,5 | 54,5 |

| serial No. | km chainage | side | facility to be protected | topogr. lot No. | distance from M5 (m) | LAM dB HUF 10/km | |
|---|---|---|---|---|---|---|---|
| | | | | | | day | night |
| 131. | 166.9 | right | detached farm | 0175/7 | 60 | 59.5 | 54.5 |
| 132. | 167.0 | right | detached farm | 0145/6 | 40 | 59.8 | 54.8 |
| 133. | 167.25 | left | detached farm | 0141/2 | 80 | 59.6 | 54.6 |
| 134. | 167.55 | left | detached farm | 0159/5 | 70 | 59.2 | 54.2 |
| 135. | 167.7 | left | detached farm | 0159/2 | 110 | 58.8 | 53.8 |
| 136. | 167.6 | right | detached farm | 0159/16 | 80 | 59.4 | 54.4 |
| 137. | 167.65 | right | detached farm | 0159/15 | 40 | 59.6 | 54.6 |
| 138. | 167.8 | right | detached farm | 0159/30 | 80 | 59.5 | 54.5 |
| 139. | 167.9 | left | detached farm | 0150/8 | 80 | 59.5 | 54.5 |
| 140. | 168.3 | right | detached farm | 0150/1 | 80 | 59.5 | 54.5 |
| 141. | 168.3 | left | detached farm | 0150/1 | 40 | 59.6 | 54.6 |
| 142. | 168.58 | right | detached farm | 0148/87 | 130 | 57.7 | 52.7 |
| 143. | 168.75 | right | detached farm | 0148/ | 130 | 57.7 | 52.7 |
| 144. | 168.6 | left | detached farm | 0150/1 | 120 | 58.3 | 53.3 |
| 145. | 168.9 | right | detached farm | 0148/20 | 100 | 59.4 | 54.4 |
| 146. | 169.0 | right | detached farm | 0148/19 | 40 | 59.5 | 54.5 |
| 147. | 169.15 | left | detached farm | 048/12 | 60 | 59.7 | 54.7 |
| 148. | 169.5 | left | detached farm | 046/9 | 140 | 57.3 | 52.3 |
| 149. | 169.5 | right | detached farm | | 70 | 59.2 | 54.2 |
| 150. | 169.65 | left | detached farm | 046/6 | 40 | 59.9 | 54.9 |
| 151. | 169.83 | right | detached farm | 050/5 | 110 | 58.8 | 53.8 |
| 152. | 170.02 | right | detached farm | 075/3 | 80 | 59.6 | 54.6 |
| 153. | 170.48 | left | detached farm | 039/11 | 90 | 59.2 | 54.9 |
| 154. | 170.65 | left | detached farm | 075/12 | 60 | 59.2 | 54.9 |
| 155. | 170.86 | left | detached farm | 075/13 | 90 | 59.6 | 54.6 |
| 156. | 171.0 | left | detached farm | 075/14 | 100 | 59.4 | 54.4 |
| 157. | 171.0 | left | detached farm | 075/15 | 70 | 59.6 | 54.6 |
| 158. | 171.0 | right | detached farm | 082/4 | 130 | 57.7 | 52.7 |
| 159. | 171.6 | right | detached farm | 082/5 | 150 | 56.7 | 51.7 |
| 160. | 171.35 | right | detached farm | 082/9 | 70 | 59.7 | 54.7 |
| 161. | 171.45 | left | detached farm | 082/10 | 110 | 58.8 | 53.8 |
| 162. | 171.58 | right | detached farm | 086/13 | 80 | 59.2 | 54.2 |
| 163. | 171.58 | right | detached farm | 086/12 | 40 | 59.8 | 54.8 |
| 164. | 171.6 | left | detached farm | 086/10 | 40 | 59.9 | 54.9 |
| 165. | 171.6 | left | detached farm | 086/5 | 80 | 59.2 | 54.2 |
| 166. | 171.75 | left | detached farm | 086/6 | 80 | 59.2 | 54.2 |
| 167. | 171.95 | left | detached farm | 086/4 | 90 | 59.2 | 54.2 |
| 168. | 172.1 | left | detached farm | 086/8 | 90 | 59.2 | 54.2 |
| 169. | 172.17 | left | detached farm | 086/9 | 150 | 56.7 | 51.7 |
| 170. | 172.1 | right | detached farm | 086/14 | 110 | 58.8 | 53.8 |
| 171. | 172.3 | left | detached farm | 088/4 | 100 | 59.4 | 54.4 |
| 172. | 172.37 | left | detached farm | 088/8 | 140 | 57.3 | 52.3 |
| 173. | 172.4 | left | detached farm | 088/9 | 130 | 57.7 | 52.7 |

| serial No. | km chainage | side | facility to be protected | topogr. lot No. | distance from M5 (m) | LAM dB HUF 10/km | |
|---|---|---|---|---|---|---|---|
| | | | | | | day | night |
| 174. | 172.5 | left | detached farm | 088/10 | 110 | 58.8 | 53.8 |
| 175. | 172.2 | right | detached farm | 088/4 | 50 | 59.2 | 54.2 |
| 176. | 172.4 | right | detached farm | 088/5 | 120 | 58.3 | 53.3 |
| 177. | 172.55 | left | detached farm | 088/11 | 100 | 59.7 | 54.7 |
| 178. | 173.12 | right | detached farm | 0114/11 | 120 | 58.3 | 53.3 |

Acoustic requirements against the noise screening wall:

- Between chainages 165+310–165+400 km the noise screening wall shall be placed beside the motorway, while the other walls shall be placed inside the expropriation boundary, at a distance of 1.5 m. In case of these walls there is no requirement of sound absorption, thus a noise screening wall of reflecting type may also be used.
- Between chainages 165+170-165+340 km a wall of sound absorbing type shall be built.
- Sound inhibition: Rkö > 25 dB.
- Only noise screening walls proper from the acoustic viewpoint, qualified in a laboratory, which has been accredited based on standard No. MSZ 13-121-1-92 "Noise screening facilities. Acoustic qualifying test" and is meeting the above condition and having a suitability certificate by ÉMI may be built.

Upon the architectural, safety technology and static planning of the noise screening wall the prescriptions of either: German Bundesministerium für Verkehr: Zusätzliche Technische Vorschriften für Ausführung von Lärmschutzwänden an Strassen (German Federal Ministry of Transport: Additional Technical Prescriptions for the Execution of Noise Protection Walls) ZTV-Lsw 88 or those of the Technical Regulation of Roads entitled MAUT: Implementation and Maintenance of Noise Screening Walls along Public Roads (under publication) shall be taken into account.

### 4.6.2.8. Proposal for the placement of monitoring points

To record and monitor on a continuous basis the status of environment we propose to establish monitoring points at the following places:

- In the direct impact area, at the dwelling houses closest to M5 Motorway:
  Kiskundorozsma, Sziksósi út 97.
  Sziksós Subasu small gardens
  in the region of farms: chainage 167.65 km, right side, topogr. lot No. 0159/15

- Indirect impact area:
  Szeged, Szabadkai út

In the framework of this impact assessment the "0" status has been recorded at the points above, thus these data can also serve as basis for the monitoring system.

### 4.6.2.9. Noise protection issues of construction

Noise pollution is unavoidable in the course of the construction of a motorway and it affects unfavourably particularly the human being and the vertebrata.

The noise load derives from the movement of construction, transport and loading machines. The noise of work machines may only cause problems in case of buildings close to the road, but this is only of a provisional nature.

The materials are usually transported on the existing public roads and by railway, and no considerable noise increase has to be reckoned with in case of appropriate organisation, route selection, avoidance of transportation and construction at night.

The machines, the noise level thereof, the processes and phasing schedule of construction, the routes of transportation are not yet known, thus no exact calculation of noise load can yet be carried out.

The permissible equivalent "A" sound pressure levels of the noise derived from construction are contained in Schedule No. 2 to Decree No. 4/1984 (I. 23.) EüM. Prior to starting the construction a noise emission limit value has to be applied for from the Inspectorate of Environmental Protection.

Together with the construction plan a noise protection plan is to be prepared simultaneously. Compliance with the given emission values depends on

- the site conditions,
- the noise performance level of the machines and equipment required for the construction process,
- the area and period of operation of machines and equipment,
- technological sequence, etc.

To reduce the noise of construction there are the following possibilities:

- use of machines and equipment with a smaller noise performance,
- restriction of the spread of the noise coming into being,
- designation of the routes of transportation in such a manner that they should use the existing main road network and burden to the lowest possible extent the environment unburdened to-date,
- the mining sites will be designated highly probably in the neighbourhood of the planned track, thus the noise derived from transportation will burden the detached farms. We consider purposeful to install as soon as possible the noise screening walls planned for reducing the noise load, which will be derived from traffic, because then they will provide protection already against a part of the noise of the construction.
- selection of a construction technology and process with reduced noise level.

It is a characteristic feature of linear construction works that work is exacuted by sections, in a length of several hundred metres, on a work area with a width of 2 to 6 m. The total of mechanical work carried out on each section takes no longer than half a year.

In Table No. Z4 we collected the noise level data of several machines, used characteristically in construction works.

Table Z4 **Noise level data of certain machines of the construction industry**

| Types of machines | Level of noise emission | Reference distance | Sound performance y level |
|---|---|---|---|
| | $L_m$, dBA | (m) | $L_w$, dBA |
| Pile drivers | | | |
| drilled pile driver | 84.5 | 10 | - |
| pile driver with warhead | 108.2 | 10 | - |
| Vibrators (depending on performance and operation) | 68-83 | 7 | - |
| Cranes of various types (depending on performance) | 86-92 | 7 | - |
| Machines of transportation | | | |
| semi-trailer (depending on performance) | 82-96 | 7 | - |
| lorries (Diesel) | 82-90 | 7 | - |
| dumpers (depending on performance) | 56-83 | 7 | - |
| Universal digging machines | 79.5 | 10 | 99 |
| Excavators | 72.5 | 10 | - |
| Ditchers | 75-92 | 7 | - |
| Grade | 85 | 7 | - |
| Land packers, roller (depending on performance) | 84-102 | 7 | - |
| Machines of foundation | | | |
| Plunger pumps | 75-80 | 7 | - |
| Compressors | | | |
| DK 661 | 102.2 | 10 | 118 |
| Cyklon | 90.8 | 10 | 108.2 |
| Tátra DK 661 | 103.1 | 10 | 119.6 |
| Jenbacher (Sw 444) | 79.8 | 10 | 95.7 |
| Atlas Copco (PRA 425 DD) | 87.7 | 10 | 104.4 |
| concrete and cement injectors | 88 | 7 | - |
| piling equipment | 87 | 7 | - |
| earth borers | 80-89 | 7 | - |
| rock-boring machines | 10 | 7 | - |
| cable layers | 87 | 7 | - |
| drilling-splitting hammers | 97-105 | 7 | - |

Up to the start of the construction work a noise level by 3 to 5 dB more favourable than the data given in the table can be reckoned with, due to the future reduction of the noise emission limit values of machines. It can be stated from the data of the table that with regard to the large number of detached farms only compressors, rock-boring machines, etc. with a low noise level or provided with a noise protection casing [$L_m$(10 m) < 80 dB) may be used.

The noise load of construction activities is virtually **neutral** in the settlements, in the detached farms it causes a **supportable-burdening** effect, depending on the distance from the

construction site. However, the period of load related to each point is relatively short. We describe our proposals relating to the transport routes in the chapter on vibration protection.

### 4.6.3. ISSUES OF VIBRATION PROTECTION

#### 4.6.3.1. Period of operation

In the direct impact area there is currently no source causing vibration load. On the basis of the distance between the planned motorway and the buildings it can be stated that after the construction of the M5 Motorway we have to reckon with vibration load derived from public road traffic in the buildings to be protected. According to our calculations the weighted equivalent acceleration of **vibration will not exceed even later on the limit value** defined in Decree No. 4/1984 (I. 23.) EüM currently in force, i.e. the value of 20 mm/s$^2$ in daytime and 10 mm/s$^2$ at night.

The noise load causes problems even currently in the direct impact area, particularly in the buildings close to road No. 50, mainly due to the large number of heavy vehicles. However, according to examinations (in Alsónémedi, Lajosmizse, etc.) carried out in similar circumstances and conditions these vibrations do not exceed the limit values relating to the human feeling of comfort, which are currently in force. **In consequence of the effect of suction of traffic and mainly of heavy vehicles by M5 Motorway it is to be expected that the that the noise load affecting the buildings along road No. 5 will be reduced.**

#### 4.6.3.2. Period of construction

First of all during the period of construction it is necessary to take into consideration the vibration load, since damages resulting from vibration often occur in the course of construction works. These damages are usually connected to the use of traffic roads, by-roads, having not been dimensioned for a high traffic, as transportation routes. Starting from this experience we propose that the transportation routes should avoid the inhabited areas of the neighbourhood, and the motorway, the main road (No. 55) should be used for this purpose.

We propose that the construction routes should avoid the following settlements and settlement parts:

- Sziksós holiday area
- Kiskundorozsma central area.

In case of appropriate measures for noise and vibration protection the noise and vibration due to the construction can be qualified as **supportable**.

## 4.6.4. GENERAL QUALIFICATION OF COMMUNAL ENVIRONMENT

### 4.6.4.1. Description of basic status

***A) Characteristic features of settlements affected***

In the course of the further construction of the motorway the implementation of the planned track and the environmental impacts resulting from future operation will affect expectably the following settlements:

Domaszék
Kiskundorozsma (Szeged)
Röszke

When delimiting the affected settlements we have taken into consideration Szeged, crossed by main road No.5, Kiskundorozsma, located between main road No. 5 and the planned motorway track, as well as the settlements of the outer areas touched by the track (Domaszék, Röszke).

The settlements under examination are classified as villages, save for Kiskundorozsma, which is an external district of Szeged City of County Rank.

Based on geographical closeness and on the features of economic and traffic connections the settlements under examination (Domaszék, Röszke) belong to the area of gravitation of Szeged.

For the sake of simpler overview and handling we summarised the current features of the conditions of communal environment in the settlements under examination in a table. See Table No. T1.

From the data of the table it can be stated that the settlements located along the section under examination are not affected by any considerable environmental load due to traffic, a load originating in traffic can only be shown, on a continuous basis, in Szeged, which is touched by main road No.5. A minor load originating in traffic may be perceived in Kiskundorozsma, in the residential areas along roads Nos. 5408 and 5405. In Röszke a periodically stronger traffic load, and, consequently, noise and air pollution occur due to the border traffic.

It can be stated in general about the settlements that they are clean and well-arranged, and the provision with public utility and servicing infrastructure is appropriate. Like the circumstances in the country, the construction of sewers and the wastewater treatment, as well as the infrastructure system of communal solid waste disposal are in need of development or they are being developed. In all settlements, the provision with basic institutions (public administration, food trade, school, kindergarten) and health care may be qualified as appropriate.

Table T1

**Features of the status of communal environment**

| **Status features** | | **Röszke** | **Domaszék** | **Kiskundorozsma, district of Szeged** |
|---|---|---|---|---|
| Man | Population | 3250 people | 3900 people | Settlement data jointly with Szeged |
| Air quality | General status of air pollution, flying dust, dust pollution | As per measurements air pollution below limit value (in case of jam in road No. 5 traffic inundates the central area) | Pleasant communal environment, no air pollution | Medium traffic emission along roads Nos. 5405 and 5048 |
| | Ventilation conditions | Appropriate | Appropriate | Appropriate |
| Water | Proportion of flats provided with network water | 100% in central area | 100% | (Data are only |
| | Proportion of sewerage | Under construction, already 50% | 60% | available for the full area of Szeged |
| | Proportion of wastewater desiccation | Currently still 50%, drainage in the wastewater plant | 40% | |
| | Drainage of rainwater running from pavement | Into open ditch | Into open ditch, receptacle: Belsődomaszék channel | Into open ditch |
| Vegetation | Status of provision with green areas along roads | No coherent green area | Coherent green alleys along streets, nice parks | No coherent green zone, but nice, tended gardens with flowers |
| Landscape | Natural values to be protected in central areas touched by traffic | None | None | None |

| Status features | | Röszke | Domaszék | Kiskundorozsma, district of Szeged |
|---|---|---|---|---|
| Noise, vibration | Proportion of population burdened by noise | Main source of noise from industrial and agricultural activity appr. 50% | Point-like noise effect due to industrial activity | appr. 20% |
| | Daytime noise level in residential areas | reduced | reduced | medium strength along roads Nos. 5405 and 5408 |
| | Noise level at night | low, not characteristic | low, not characteristic | reduced |
| Cleanliness | Proportion of flats connected to the collection of solid waste | 100% | No organised collection, put individually to the dump | 100% |
| | Cleaning of settlement sections of national public roads | appropriate | appropriate | appropriate |
| | Standard of appearance of the cleanliness in settlement | appropriate | appropriate | appropriate |
| Built environment | Number of flats (pieces) | 1450 flats, from that 400 detached farms | 1625 flats, from that 800 detached farms | Settlement data jointly with Szeged |
| | Proportion of corrosion damage in buildings along road | not characteristic | not characteristic | not characteristic |
| | Number and condition of art monuments affected | none | none | none |
| | Objects endangered along planned motorway | residential area with detached farms | residential area with detached farms | residential area with detached farms |
| | Image, aesthetics of settlement | appropriate | appropriate, nice | appropriate |

| Status features | | Röszke | Domaszék | Kiskundorozsma, district of Szeged |
|---|---|---|---|---|
| Technical condition and formation of the settlement road sections under examination | Condition of pavement | Roads Nos. 5512 and 4301 are gravel-topped, in bad condition | appropriate | appropriate |
| | Formation of cross section, throughput capacity | appropriate width of road | drive-off and drive-on from and to road 55 is not technically dissolved | |
| | Water drainage | in open ditch | in open ditch | in open ditch |
| | Number and place of city nodes dangerous even currently, at the section under examination | Node of road No. 5 and roads Nos. 43302 and 5512 | The node of road No. 55 and of road No. 54123 (main collecting road of settlement) is dangerous; earlier passage of light railway | Crossing of roads Nos. 5405 and 5408 (beside church) |
| Characteristic features of local traffic | Bicycle traffic | No constructed bicycle path, lively bicycle traffic | No constructed bicycle path, lively bicycle traffic | lively bicycle traffic, constructed bicycle path at some places |
| | Safety of bicycle traffic | non-dangerous in the central area of settlement | non-dangerous in the central area of settlement | non-dangerous in the central area of settlement |
| | Safety of pedestrian traffic, passage | non-dangerous in the central area of settlement | non-dangerous in the central area of settlement | non-dangerous in the central area of settlement |
| Characteristic features of local public transport | local bus line | – | – | yes |
| | Intercity bus line (HKB) | good | good | yes |
| | Railway transport (MÁV) | yes | none | yes |
| | Proportion of commuters among employees | Small number of commuters due to good local employment opportunities | main direction of commuting: Szeged | not characteristic |

| Status features | | Röszke | Domaszék | Kiskundorozsma, district of Szeged |
|---|---|---|---|---|
| Provision with public utilities | Proportion of flats provided with network gas | 80% in the central area | 98% | 100% |
| | Electricity | 100% in the central area | 100% | 100% |
| | Communications (telephone) | in the central area: as per demand | in the central area: as per demand, in the farms at a small number of places | as per demand |
| Provision with basic institutions | Commerce, food retail | 43 shops, from that: 18 food shops, 13 restaurants | 34 retail shops, from that: 8 food shops, 3 restaurants | appropriate |
| | Primary school | 12 classrooms | 17 classrooms | appropriate |
| | Nursery-kindergarten | No nursery, 5 kindergartens, a new one is under construction | private nursery, kindergarten with 85 places | appropriate |
| | Family doctor, pharmacy | 2 family doctors, dentist, paediatrician, pharmacy | 2 family doctors, 1 paediatrician | appropriate |

***B) Function, utilisation of the area between the track and the area of city-like development***

It can be declared in general that the track of the planned motorway runs in the outskirts of settlements, touching area parts with inhabited detached farms and agricultural lands.

The motorway stretches at **Kiskundorozsma** (an administrative district of Szeged), west from the settlement part, at a distance of about 2 km. The "intermediate zone" is currently an agricultural area and ploughland. In the zone touched high-voltage electric lines run along the track of the planned M5 Motorway. Very close to the future motorway (at around 100 m) a food industry site currently operating (HÚSKER Kft.) is located.

At **Domaszék** the zone between the eastern boundary of the central area of the settlement and the planned motorway is densely built in with detached farms. The condition of the buildings is of a good quality, and certain area parts built in with groups of farms can even be considered central residential areas. These buildings need protection from the impacts of the motorway, since they will be located within 200 metres. According to the plans a drive-off node of motorway will be constructed at the crossing of roads Nos. 55 and 5431. In the neighbourhood of the node it will be required to expropriate farm properties and to demolish buildings. By the way, farm gardens and arable lands subject to intense agricultural cultivation (corn, vegetables) are located in the area part between the central area and the planned track.

At **Röszke** the motorway stretches northwest from the settlement, more remote from the current main road No. 5. Thus the current main road falls between the planned motorway and the boundary of the settlement's central area. Consequently, the traffic impact affecting the settlement will come more far away from the central area. A drive-off node is planned at the existing crossing of road No. 5512 and road No. 5, together with the establishment of a rest area and parking place. In the node a bus parking, a filling station and a shopping centre are to be found at present. The traffic of the node is very busy now, the Serb guest workers arriving from Germany often meet here their relatives, and the normal daily traffic of the border station has also an influence on the load of the parking place and rest area. In the zones between road No. 5 and the motorway and the boundary of the central area we find intense agricultural cultivation.

***C) Harmony of the planned motorway track with the settlement zoning plans***

According to our interviews made with the local governments the tracking of the planned M5 Motorway is basically in harmony with the zoning plans of the region's settlements and with the concepts of area utilisation, relating to the outskirts, of the local governments of the settlements.

***D) Intercity transport connections prior to the implementation of the motorway***

**Kiskundorozsma** belongs to the administrative area of Szeged, and it has very good traffic connections in northwest, north and east directions. The direct road connections of the settlement to west (Zákányszék) and south (Domaszék) are still missing. The transport of Kiskundorozsma's population by public railway is secured by the railway station of the Budapest-Szeged railway main line located at a distance of about 1.5 km from the settlement.

The direct road connection of **Domaszék** is provided by main road No. 55, stretching in east-west direction at the southern boundary of the settlement. The northwest connection can be provided at the crossing of road No. 55, falling east from the settlement, and of road marked 5431, on road marked 5431, driving in the northwest direction. The village has no direct or close road connection in north-south direction. Furthermore, Domaszék, has no railway either, thus it can be declared in summary that the village has not yet transport features satisfying the need for multi-direction transport.

The direct road transport connection of **Röszke** is provided in the direction of Szeged by main road No. 5 and by-road marked 4301. In the western direction (to Mórahalom) the road marked 5512 provides a traffic opportunity. The settlement has no direct transport connection in eastern direction. Röszke has a public railway transport connection. One of the country's busy border stations towards Serbia is to be fount at the settlement.

It can be declared in summary that the transport opportunities of the settlement may be qualified as appropriate even currently, although it is an everyday problem that Domaszék, located at a short air distance from the settlement, can only be accessed on a roundabout way of 20 to 25 km. The road transport possibilities of the farm region between Röszke and Domaszék need development too as soon as possible.

#### 4.6.4.2. Impacts of communal environment, occurring expectably due to the implementation of the motorway

***A) Modification of intercity transport connections, change in the driving time***

The good transport connections of **Kiskundorozsma** remain unchanged.

The construction of the motorway will considerably improve the transport possibilities in north-south direction (currently inappropriate) of **Domaszék** through the formation of the drive-off node Szeged-west (Domaszék). Thus a more direct connection will be made possible between Domaszék and Röszke, as well as between Domaszék and Kiskundorozsma, without driving into Szeged. The creation of a really direct connection with Kiskundorozsma would be allowed by the connection of roads marked 5431 and 5408 at the Széktó-dűlő holiday area on a section of about 3 km. This would promote the carriage of the produces of the Domaszék agricultural producers to the Kiskundorozsma marketplace.

The improvement of **Röszke's** current intercity relations is to be expected through the implementation of the M5 Motorway, in the direction of Domaszék, Kiskundorozsma and Kiskunmajsa. At Röszke the planned motorway track is the track of the existing main road No. 5, and at the crossing of road marked 5512 a node is planned with rest area and parking. The access time will be considerably reduced in the transport directions north, northwest of the settlement under the influence of the commissioning of the motorway.

***B) Change in (improvement of) traffic safety in the central areas of the region's settlements under examination, under the influence of the commissioning of the M5 Motorway***

In **Kiskundorozsma** no direct change (improvement) in the safety of traffic of the internal area is to be expected under the influence of the implementation of the motorway, since main road No. 5 does not traverse the settlement, and the traffic will be diverted from such main road to the motorway. The transit traffic load of roads marked 5405 and 5408, crossing Dorozsma and running farther in the direction of Szeged, will not probably change under the influence of the commissioning of the motorway.

The transit traffic touching the central area of **Domaszék** and thereby the traffic safety of the central area of the southern part of the settlement are determined by the traffic conditions of main road No. 55. The traffic on main road No. 55 will not decrease under the effect of the implementation of the motorway, rather some increase is to be expected, since the route will cross the motorway with drive-off node. Thus the traffic safety will not improve under the influence of the commissioning of the motorway.

The traffic safety of the central area of **Röszke** will not be materially changed by the commissioning of the motorway, since main road No. 5 has been running outside the central area even so far.

***C) Reduction of noise and air polluting impacts derived from the central traffic of settlements under the influence of the commissioning of the motorway***

The change, under the effect of the implementation of the motorway, in the noise and air polluting impacts due to the central traffic load of the settlements is in a direct correlation with the traffic changes in the central areas detailed in the previous chapter. Starting therefrom it can thus be stated that in parallel with the reduction of the transit traffic of main road No. 5 in the city of Szeged the noise and air pollution in the city will also show a declining trend.

In the other settlements no change in the current status of noise and air pollution is to be expected in the central areas under the influence of the commissioning of the motorway.

***D) Impacts, causing changes in the local and intercity transport, due to the separating effect developing in the course of the implementation of the motorway***

The separating effect of the track of the motorway will cause local problems to each settlement concerned of the region under examination, in the traffic between the farm area of the outskirts and the central area. Furthermore, it will be a problem for each settlement that the time of access to the cultivation of the agricultural lands will increase, since the motorway will be constructed, in many cases, between the residence of land owners and the area to be cultivated. It is a specific problem that between **Domaszék** and Röszke a large farm region has been developed in the outskirts of the settlements, which will be cut off from the Röszke central area, if the planned four passages will not be built. It would be good to construct a node with rest area in the nature of "Counry Gate" at the road marked 55125.

### 4.6.4.3. Expectable features of affectedness in the "intermediate zone" between the motorway track and the central area

***A) Expectable changes in the area utilisation of the "intermediate areas"and of the direct impact area of the motorway***

The functional utilisation of the areas between the planned track of the motorway and the central area consists of the alternation of agricultural areas, detached farm properties, farm gardens, as well as smaller afforested areas and pasturelands. Under the effect of the construction of the track the expropriation of several farm properties and the demolition of the buildings will become necessary in the outskirts of each settlement under examination. This is to be expected primarily in the environment of the implementation of major drive-off nodes and passage structures, although it may occur that the tracking requires in itself the liquidation of farm properties.

In **Kiskundorozsma** a meet industry site is to be found within the impact area of the track line, at around 100 m from the track. This will be affected by the environmental emissions of the motorway. Otherwise, the continuation of agricultural cultivation is to be expected in the "intermediate' zone in the course of the utilisation of lands.

At **Domaszék**, a provisional dump for animal carrions (carrion well) is to be found at about 50 m from the planned drive-off node, in the direct impact zone of the planned motorway track. From here, animal carrions are transported to ATEV, Hódmezővásárhely, twice a week. If the dump must be liquidated, the local government will demand a support for this purpose.

At **Röszke**, in the crossing of main road No. 5 and road marked 5512 there is a plan for the further enlargement of the area of the existing filling station and bus parking, since the drive-off node and rest area of the motorway are projected here. It is probable that this further development of the existing site of type "Country Gate" will involve minor modifications of the area use, as compared to the current agricultural cultivation.

In relation to the modification of the area utilisation in the outskirts of the settlements under examination it can be stated in general that it may only occur in case of farm properties

required to be demolished and in case of any potential area development for entrepreneurs, otherwise, the current agricultural cultivation will remain unchanged in the direct impact area of the motorway.

***B) Noise load and air pollution features of the zone between the central area and the motorway track, under the influence of the commissioning of the motorway***

Since a large number of residential farms is to be found in the outskirts of each settlement in the "intermediate zone", it is necessary to take into consideration also the environmental load of the residences of those living in the outskirts. Special sectoral chapters will deal with the examination of the air and noise loads. Their summarising findings relating to the harmful impacts are as follows:

In case of air pollution:

- According to the calculations of air immission the concentrations of harmful substances are, beyond 10 metres, below the limit value in an average of 24 hours, i.e. a considerable air pollution will only occur within the boundary of expropriation.
- In case of the facilities to be protected the effect of air pollution can also be reduced by the construction of noise screening walls.

In case of noise load:

- In the direct impact area of the planned motorway 66 farm properties are to be found, the majority of which is inhabited, thus they must be treated as objects to be protected.
- The environmental noise assessment study takes into consideration, furthermore, the central areas closest to the motorway of Kiskundorozsma, Sziksós holiday area, as a direct impact area.
- It is proposed to establish noise protection walls along the objects and internal area parts to be protected.

***C) Impacts of communal waste load on the areas between the central area and the motorway under the influence of the commissioning of the motorway***

The coming into being and need for treatment of communal waste (primarily communal solid waste) are to be expected at the rest areas to be constructed and at the drive-on nodes provided with gates. On the basis thereof the planned nodes and rest areas to be taken potentially into consideration from the aspect of the origination of waste are the following:

Nodes:

- Szeged Node West (Domaszék)
- Szeged Node South (Röszke)

Rest area:

- at Röszke

It is necessary to organise the gathering in containers of the communal solid waste and the periodical transportation thereof, the wastes can be disposed at the planned district dump in Kistelek and in the Szeged dump. We have to reckon with the origination of a considerable quantity of waste in the Röszke rest, shopping and parking area, due to the traffic of the State border.

The treatment of communal liquid waste (sewage water) will only become necessary after the installation of water closets. This must be calculated with primarily in the Röszke node and at the motorway gates. After having been collected in closed containers sewage can be transported in sniffing cars to a wastewater treatment plant or to a permitted evacuation point.

#### 4.6.4.4. Effects influencing social and economic life of the settlements under examination in consequence of the implementation of the motorway

***A) Reduction of driving times***

When elaborating the plans of development of the expressway network the shortening of driving times has also been taken into account. We present this in Figure No. T1. The figure presents the driving times on the shortest routes on the current network and in the status after the development of the expressway network. The detail characterising best the change in the driving time due to the construction of the M5 Motorway is that while we can reach, on the present road network, from Budapest approximately Kiskunfélegyháza in 120 minutes (i.e. two hours) (upon the preparation of the survey M5 Motorway had only been constructed up to a point before Kecskemét), after the final construction of M5 even Szeged will be capable to be reached during the same period of time.

***B) Economic effects, innovation***

The favourable changes relating to the economic situation of the settlements under examination can be shown primarily in case of the settlements, at which a node allowing drive-on and/or drive-off will be built on the motorway. Here the effect revitalising the economy will namely appear in a more direct way, than in case of settlements without node. Namely, entrepreneurs prefer the neighbourhood of such nodes and the areas along the drive-on roads, when selecting their premises.

Figure No. T1

[Maps in the original]

From Budapest

**Driving times counted from Budapest on the shortest route (on the current road network, with expressway network developments) in 2007**

Such settlements having planned nodes with drive-on and drive-off are the following:

- Szeged
- Domaszék
- Röszke

From among the settlements having potential possibilities, in the cases of Domaszék and Röszke already concrete ideas have been outlined for the entrepreneurial utilisation of the traffic relations provided by the motorway.

In **Domaszék**, the local government supports in principle that a filling station with parking and shopping should be implemented in the drive-off node planned in the crossing of road No. 55 and the M5 Motorway.

In **Röszke** the spirit of undertaking is animated already in our days, there is 100% employment in the settlement. The plants settled down recently took already into consideration the favourable traffic conditions offered by the M5 Motorway to be implemented and the good infrastructure of the village. The following well-known companies have branch premises in the village:

- BEST FOOD Rt. (Knorr)
- EURO CHIKKEN Kft.
- Szegedi Paprikamalom Kft.
- MOL-TECH alkatrészgyártó Kft.
- POLIMER Kft.

In **Szeged** it can be conceived in principle that the turnover of certain catering and commercial undertakings will perceive a minor and provisional recession due to the diminution of the transit traffic on main road No. 5, but later on this will surely be compensated, the effect requires no special examination in detail.

***C) Social effects***

A direct improvement in the employment conditions of the small region including the motorway is to be expected in the period of construction (foreseeably the majority of the construction workers will be recruited from the settlements along the track). However, a minor progress is to be expected later on too, in the indirect sense of the word, namely the innovative effect of the road, which revitalises the economy, will cause a favourable change in the conditions of employment too.

The better traffic conditions resulting from driving on the motorway and the reduction of the driving time may, in principle, result in the improvement of the opportunities of education, culture and servicing for the population of the settlements concerned. The educational, cultural, servicing and health centres of the region under examination are to be found in Szeged, therefore any improvement is only to be expected to an extent corresponding to the betterment of driving times.

***D) Impacts connected to the separating effect of the motorway***

As explained hereinabove, the separating effect will be unfavourable primarily for those living in the detached farms in the outskirts. The access time for reaching the agricultural lands under cultivation will increase, in certain cases it will become very difficult to approach the shops which have been able to be reached by bicycle or on foot to-date, to go to school, to use medical care, i.e. to maintain contacts with the central areas. The development of a road network parallel with the motorway strives to improve this situation.

### 4.6.4.5. Environmental evaluation of the development project at the national level

Examining the road section under discussion at the national or regional level we can declare that it belongs to the motorway sections to be judged rather favourably from the aspect of environmental protection. This means practically that, in general, it is not the need for the section that may be problematic from the viewpoint of environmental protection, but the method of implementation. Thus we have to strive, as to the details, consistently to environment-friendly solutions. To prove this it is worth while to provide several citations from the materials prepared in the early '90s for the purpose of environmental protection, which were prepared under a commission by the Ministry of Transport for the sake of an environmental-friendly concept of transport. In connection with the international standard of the transport network:

> "One of the means thereof is the planning of a **corridor to be formed in a minimum length of road**, which connects the main transit gates of the country, while it avoids the most sensitive areas (towns, holiday areas, areas of nature conservation).
>
> Another aspect of development shall be that the transit route should operate as an **intermodal channel**, it should **create,** as an overlapping element of "overlay" type, **a new spatial structure** and it should not follow the structural defects of the Budapest-focused main network of railways and roads".

Due to the aforementioned the literature accepted, in general, the existence of the section under examination, a discussion was mainly directed to the level of construction (a motorway of four lanes will not be sufficient). In parallel therewith the materials would have deemed to be important to construct a road No. 81 between Győr and Kecskemét, included in the 1992 concept of transport policy and the then-time plan for an expressway network, since in this way the transit traffic between Vienna and Beograd would have avoided the region of the Budapest agglomeration. Another material asked the question, whether it was possible to realise traffic with a "zero solution", with no motorway at all.

Now we had to add the question, whether there is a realistic alternative to the minimum simple construction of the motorway network up to the end-points at the State border?

The alternatives in principle to transport, namely better telecommunications and a better local supply may decrease, but not terminate the traffic. (A better supply means less travel, but more carriage.) The problem is, however, much more practical. Namely, even if we accept the detrimental nature of traffic from the environmental aspect, we may not force ***at all costs*** other people to believe this. In the middle of Central Europe we can delay the construction,

we can play for time, but we cannot close down totally the borders, if motorways approach our borders on the basis of treaties concluded with us. It is a highly ***expensive*** method, involving human sacrifice, of the reduction of traffic, if the traffic jam is the obstacle of progress. Thus the lack of capacity is a dangerous weapon.

But is it necessary to construct motorways? Is it not possible to replace the motorways with lots of border stations and a dense road network? The answer is that if the motorway "had not yet been invented", then it could be replaced perhaps. But as we have made already reference to this fact in the introduction, the motorway, developed for the purpose to increase capacity, created at once a "new quality", the massive long-distance travel, the demand for such travel. Should we have any opinion whatsoever on this fact as a phenomenon, it remains true, and it is presumable that we would not have the possibility to stop each trend, even it nobody wished to participate in such travel in Hungary.

Thus currently we do not deem feasible the "zero solution", even the reduction of travels is only conceivable in a system, where the expenditures required to be paid for exert a retarding force. Thus in our opinion it is feasible from the environmental and social aspects to realise a traffic, which is allowed on roads constructed in a civilised manner, being at the same time expensive and strictly checked according to technical parameters too. Our own interest is to dissolve this on a possibly short term, by the construction of a relatively small number of expensive motorway sections and through a network, whose structure takes into consideration the improvement of our domestic circumstances.

**The aforementioned illustrate well that the essential moments of environmental protection are, as to the motorway sections under examination, the nature and quality of construction and not the necessity thereof.**

**When judging the development of road network from the environmental aspect, we have always to reckon with the issue of replacement by railway.** In our case this means no real conflict, since the motorway runs between two railway lines, whose development has always been a part of the concepts of transport development.

The railway line Budapest-Cegléd-Szeged, running closer to the motorway, provides an access in 2:20 to 2:30 hours in relation of Budapest - Szeged. The plans for railway development wish to reduce this below 2 hours, by the millenary. In Szeged a RO-LA terminal is operating, from where trucks are transported towards Hegyeshalom, with a good exploitation of capacities.

In connection with the line, international development ideas have also arisen:

- Repeated creation, revitalisation of the railway connection between Szeged and Arad, where a part of the carriage of cargo could be re-loaded to the railway (see e.g. the RO-LA terminals).

- Formation and development of the line connection Budapest-Szeged-Kikinda-Timisoara, which would cross the border at Kübekháza; here only a section of 9 km is missing.

As regards the line Budapest-Kelebija, considerable railway development plans can be counted with, since this line is a part of the European basic network. The Long-Term Development Programme of Hungarian Railways calculates as follows:

> "The planned high-speed (160 to 200 km/h) two-track line will be constructed on the line Budapest-Kelebija, between Budapest-Kunszentmiklós and Kiskunhalas-Kelebija, but in case of a favourable foreign credit scheme modernisation may take place between Kunszentmiklós-Kiskunhalas too. As a result of the execution of the required works of maintenance, refurbishment and track modernisation a reduction of 24 minutes in the running-time can be achieved on the line Budapest-Kelebija.

**It can be perceived on the basis of the aforementioned that, in parallel with the motorway development, the development of railway has also its possibilities, and there is a real possibility of opting for one of the two ways of transport in respect of the carriage of both cargo and passengers.** This will not mean that the system remains operable in the absence of the development of any one of the sub-branches of transport, since it is obvious that selections too have their limits.

It can be said that the international transit routes connecting northern and Western Europe with the Balkan and Turkey can only be operated through the joint functioning and harmonisation of the public road and railway systems.

#### 4.6.4.6. Summary, proposals for intervention

As a brief summary of the communal environmental impact analysis of the motorway to be implemented the following material impacts may be highlighted:

- **In Szeged, the reduction of the traffic load caused by the transit transport on main road No. 5 and of the resulting harmful environmental impacts is to be expected. At the same place the traffic safety in the central area will increase.**
- **A considerable improvement of the transport connections in north-south direction, the reduction of driving times are to be expected.** (This means a gain of almost one hour in the relation Budapest-Szeged.)
- **The separating effect of the motorway will unfavourably affect a part of the population of the region of detached farms located in the outskirts of the area under examination**, due to the change in their traffic connections with the central areas, in the cultivation of agricultural lands.
- **66 farm properties are to be found within the direct impact area of the motorway, which require the construction of noise protection facilities.** (Upon the preparation of the detailed drawings the actual status, inhabited or abandoned, of the detached farms has to be taken into consideration.)

Proposals for intervention:

- To eliminate the separating effect a newer passage opportunity over and above the ones planned already should be examined and implemented
  - ⇒ at the section between Domaszék and Röszke
- Construction of a newer opportunity for connection / drive-off:
  - ⇒ at Domaszék, the connection on about 3 km of roads marked 5431 and 5408 would allow the direct traffic contact of the Domaszék producers with

Kiskundorozsma, and thus the use of the motorway would become avoidable through the delivery of goods to the Dorozsma marketplace.

## 4.7. LANDSCAPE PROTECTION

Landscape is a complex territorial unit developing in the interaction of nature and society, which reflects the natural features, the social and economic relations, and it is at the same time the carrier of high-standard visual and aesthetic values. (See standard MSZ-13-195:1990. General Landscape Protection, Definitions of Terms.)

Section III in Csongrád County of M5 Motorway runs through the plain of Duna-Tisza köze, the Dorozsma-Majsa sand ridge and the South-Tisza Valley of the Lower Tisza Region.

### 4.7.1. EXAMINATION

The features, the landscape characteristics of the impact area can be summarised as follows:

#### 4.7.1.1. Physiography

- Topography and features of soil. The landscape touched by the track is a plain, the track leads at an altitude between 81 an 94 m. The area is characterised by a slight articulation, consequently the surface is articulated by longer flats and minor elevations. The plain with alluvial cones is slightly rolling in the direction northwest – southeast. The soils are for the most part sand soils. In a smaller percentage soils similar to chernozyom, meadow, marshy and sodic soils occur as well. The groundwater level is high, it is 2 to 3 m below the ground level, but in minor spots it is even higher.

- Climate: The region's climate is continental. The annual average temperature is 10.5 to 10.7 $^{o}$C. The annual precipitation is only 500 to 550 mm. The annual number of sunshine hours is above 2000, there is an extremely big annual fluctuation of temperature. The dominant wind direction is northwest.

- Vegetation. In respect of phytogeography the landscape belongs to the phytoregion of Duna-Tisza köze (Praematricum) of the Plain's vegetation sector (Eupannonicum) of the Hungarian vegetation domain (Pannonicum). The motorway will touch for the most part lands under agricultural cultivation, it will only cross one or two minor spots of afforestation or forest belts. Originally, the area was characterised by gallery-forest / forest communities, which were later transformed into areas under agricultural cultivation. The original communities (desert oak forests, oak forests with lilies-of-the-valley and sodic oak forests, sandy desert meadows and marshy meadows, sodic lawns) survived only in small spots, which are nowadays areas subject to nature conservation (e.g. Dorozsma Nagy-szék Nature conservation Area, Pusztaszer Landscape Protection District, Lake Péteri Nature conservation Area). (The detailed analysis of the natural or quasi-natural communities is to be found in the chapter on wildlife protection.)

- Fauna: Roe deers, small game (rabbits, pheasants) are living in a larger number in the region, and red deers and wild-hogs occur too as more seldom game. The fauna of amphibia is considerable in the humid habitats. The community of insects is rich in the

lawns. In consequence of the lakes and other areas providing nourishment in the impact area, here there is a rich world of birds, lots of protected species are living in the region.

#### 4.7.1.2. Area utilisation, landscape features

The impact area of the track consists mainly of producing areas, within that of agricultural producing areas. Private detached farms are characteristic in the whole region, there is practically no large-scale cultivation in large plots. The population of the region earns its living on ploughland and orchard cultivation, the production of fruits and animal husbandry. The lands are nicely cultivated, the suction effect of a big city is only to be perceived in the proximity of Szeged. The impact area touches also a residential region (small settlements and Szeged).

In the areas with favourable features, located close to the settlements the recreational holiday areas (e.g. Lake Subasa, as fishing pond) appeared too in the region.

The landscape is a civilised landscape, the traces of human activity are visible everywhere, except for some natural or quasi-natural mosaic spots (e.g. Dorozsma Nagy-Szék, sodic meadows, lawns, marshy spots).

The big lot of archeological sites discovered in the track of M5 Motorway proves too that man has been present here for a very long time with his activity and culture.

The landscape concerned has a rich network of by-roads (which are paved, but very narrow) in a density of about 10 km, which increases to 2 to 5 km in the neighbourhood of Szeged.

Due to both the method of cultivation and the farm structure the region is quite densely provided with dirt roads.

The presence of disarranged surfaces is negligible in the landscape.

It is a luck that the electric aerial lines (mainly high-voltage), which disturb so much the landscape, appear only in the proximity of Szeged.

The cultivation made here is accompanied by lots of foil tents, which are unfavourable from the aspect of the image of the landscape.

The view of detached farms, the courtyards with trees and groves of the farms, the orchards, the lands cultivated as gardens and ploughlands in a mosaic-like arrangement, the people working there, the willow groves, the forest belts and spots, the lawns and the peacefully grazing animals is pleasant, versatile and varied.

It is to be regretted that the forests and forest belts of the region do not consist of indigenous plants, but of foreign species, among them aggressive weeds (Elaeagnus, Robinia). The old flora of trees, which was partially characteristic here earlier, is only represented by several spots of willows and silver poplars.

Currently, the system of national and international public road contacts of the region is not too much favourable. The region is developing, and more potential possibilities could be exploited better, which would make the region even more attractive (e.g. the Ópusztaszer

National Memorial Park, the folklore relics in Kiskunhalas, the Pusztaszer Landscape Protection District, the sights of Szeged, village tourism, etc.).

From the visual and aesthetic viewpoint the region is articulated, usually only a minor landscape detail can be seen, there are lots of so-called skirts. The environment of chainages 140 km and 159 km is a larger open transparent space.

#### 4.7.1.3. Individual landscape values

Individual landscape values are the material elements constituting the landscape, created by man's social activity, which come into being in connection with production, transport, historical events, activities of cultural history, as well as considerable natural formations, which are not subject to nature conservation, but are material from the aspect of the character of the landscape (standard MSZ-13-195:1990).

Several beautiful old crucifixes are to be seen along the roads in the immediate proximity of the planned M5 Motorway. Some particularly nice farms with their buildings and arranged, high-standard cultivation can be considered individual landscape values.

In this region of the Southern Plain the natural or quasi-natural spots of habitats, appearing in a mosaic-like arrangement, sodic lawns, groves, fresh pasturelands and lakes are also prevailing elements.

### 4.7.2. LANDSCAPE INFLUENCING FACTORS OF THE MOTORWAY AND THE CONNECTED FACILITIES

From the aspect of landscape protection the impacts lasting a short time and causing no remanent change are negligible (e.g. activities connected to the construction of the motorway), however, we have to overview the ones causing considerable and permanent changes in the landscape, both in the life and sight of the landscape.

- Area use
  Reduces the biologically active area and the area that can be cultivated. Expropriations have social and economic implications.

- Mining sites
  It is purposeful to develop them in the proximity of the track. With regard to the fact that a plain region is given here, the effect of exploitation of materials can be considerable.

- Formation of earth structures, landscaping, de-watering
  Formation of a new linear infrastructure, which is separating an area coherent so far, but which creates the most important connections through parallel roads and road passages, technical solutions (e.g. culverts, game passages). The watercourse and groundwater conditions may change (vegetation!). In the present case the track runs on a low embankment, due to the flat ground. In case of an appropriate technical solution the de-watering will cause no pollution.

- Formation of nodes and engineering structures
  They secure the regional connections, however, in visual terms they have a very considerable impact (~ 9 m high embankments!), mainly in a plain region.

- Connected facilities (e.g. engineering premises, rest areas, filling stations, catering)
  They result in new constructions in the area, they are new elements in the landscape. They are partially required for the operation of the new project, partially they contribute to the development of the area.

- Public utility provision of the track and connected facilities
  In new tracks new ducts must be built from a shorter or longer distance, which have an impact on cultivation – servitudes, expropriations, restrictions on cultivation –, and often on the sight too (e.g. a new aerial cable).

- Facilities of environmental protection
  They are prepared in order to reduce unfavourable impacts (e.g. game passages, noise screening walls – a noise protection embankment can also be conceived as an alternative – , game fence, and the meteorological measurement station can also classified here). All these are visually new elements of the landscape.

- Plantation of vegetation
  The plantations made for the safety of traffic, serving environmental protection and required for integration into the landscape and for aesthetic demands, as well as gardening belong here (e.g. separating lane, forest belt protecting the purity of air and reducing noise, covering afforestation, gardening of the rest areas and engineering premises, etc., slope protection, etc.).

- Traffic on the motorway and the maintenance connected thereto
  The loads resulting from traffic influence the landscape through their various dimensions (air pollution, noise, etc.), restrictions on area use (e.g. prohibition of construction within 100 to 150 m, transformation of the structure of production, etc.). However, the new network of infrastructure is revitalising the development (commerce, infrastructure, tourism, etc.).

- Change in the traffic of the region
  The motorway will relieve the current main road No. 5, which is traversing settlements, it will divert the bigger part of traffic therefrom.

### 4.7.3. IMPACT PROCESSES CAUSED BY THE MOTORWAY, PROPOSALS FOR LANDSCAPE PROTECTION

Landscape protection is a system of legal, organisational, economic, technological, biological, informative and promotional measures, directed to the provision of regional conditions for the basic methods of landscape utilisation and to that of social and economic activity, to the preservation and restoration of landscape values (standard MSZ-13-195:1990).

We explain our proposals for landscape protection according to the landscape assessment relating to the construction of the motorway and to the expectable impacts of the motorway (in the sequence of the landscape influencing factors).

At the level of landscape the region is affected from the aspects of area use, area development and visual impression in the impact area of the motorway.

a) In the course of planning, efforts were made that the motorway should only occupy the area absolutely necessary for implementation and operation. In the course of implementation attention shall be paid to the point that the least possible area of natural or quasi-natural habitats and vegetation affected should be destroyed. The individual values to be relocated (e.g. stone crucifix) are to be relocated in reconciliation with the competent local authorities and their surroundings must be arranged.

The protection of the vegetation existing and remaining along the track shall be secured.

b) The planned mining sites may not touch any valuable habitats. Therefore, the points described in the annex belonging to the chapter on wildlife protection shall be complied with, and the areas, which have not been proposed therein as mining sites, must be left out of account. The mining sites are to be recultivated after the completion of the works. It has to be considered, whether the landscape can be potentially enriched by them, e.g. a water surface comes into being, but the required landscape arrangement is to be carried out.

c) Within the opportunities provided by he technical parameters efforts shall be made for the least possible intervention in the existing ground, and the smallest possible earthworks should be constructed: thus the separating effect of the track will be reduced both physically and visually. The connection of the areas coherent so far, isolated by the track (migration of wildlife, watercourses, area use, regional connections) has to be dissolved through road passages and parallel drive-on roads, game passages and culverts. The de-watering of the track should not cause any pollution in the region.

The unchanged running-down of water and groundwater conditions must be stressed in the sensitive areas (e.g. humid habitat).

d) The nodes and the larger engineering structures (bridges) cause one of the most material interventions into the original landscape, but the regional connections can only be secured in this way.

Their integration into the landscape must be highlighted (formation of earthworks, plantation of rich vegetation). The connected facilities – e.g. the informative boards – should not increase the unfavourable impacts. The visual duality is separated here the most sharply: the road as a landscape element and the view of the landscape disclosed from the road. The viewpoints of the region and of those living in the region are more accentuated.

e) In the course of construction the local architectural traditions are to be followed, thus we can enrich the landscape concerned. These facilities contribute to the development of the region (creation of jobs, tourism: e.g. in case of a famous restaurant or inn).

The operation of the motorway is important also from the aspect of landscape protection, since the image of an arranged and tended motorway is more favourable and its effect is lesser too (e.g. think about a road section with rubbish, a road edge with weeds).

f) In case of the provision with public utilities efforts shall be made for selecting the shortest tracks (this is an economic interest too), so that it should not, if possible, influence the spatial structure. The use of aerial cables should be avoided.

g) In case of conflicts of landscape use, facilities of environmental protection are required in order to reduce or stop them. Their integration into the landscape is an emphasised part of the integration of the whole motorway (e.g. which are the materials and forms to appear). They are indispensable in wildlife protection too, which is so important from the aspect of the character of the landscape.

h) The plantation of vegetation, forest belts, forest spots are extremely important tools of landscape protection and of the integration of the motorway into the landscape, similarly to the gardening of the connected facilities.

   The plantation of vegetation along the motorway should be made for the most part with species indigenous in the region. In the neighbourhood of natural or quasi-natural habitats only indigenous species may be planted, in conformity with the viewpoint of habitat protection.

i) The motorway will integrate organically the region concerned into the international, national and regional network. This will favourably influence the regional development. The traffic thus generated will burden also the environment, in addition to the appearance of the motorway in a landscape, which has been homogeneous so far. However, the drainage of the traffic through a safer, fast and short way will also allow the optimisation of the loads. The change in the landscape structure is the resultant of all effects, both functionally and visually. Its extent depends also on the loadability of the landscape.

j) The M5 Motorway will distract a considerable traffic from the current main road No. 5, making more favourable the life of the residential areas. The distraction of traffic may also involve the relocation or termination of certain activities (e.g. local commerce), while the conditions of other ones (e.g. transportation, tourism) will considerably improve.

   In the region of Szeged the increase of the city towards the motorway is to be expected.

### 4.7.4. SUMMARY FROM THE ASPECT OF LANDSCAPE PROTECTION

In summary it can be stated that the section in Csongrád County of M5 Motorway will not cause any unmanageable conflict from the aspect of landscape protection. The character of the landscape, the existing use of area, the region's sensitivity from the aspect of landscape ecology secure that the cumulative effects will not exceed the local dimensions.

In the course of further planning the points of view of landscape protection have to be enforced, the route must be adjusted to the landscape according to the character of landscape and efforts are to be made in order to stop or mitigate the conflicts.

Regarding the totality of the landscape concerned the motorway will create new opportunities for regional development, which are to be handled according to a unified concept in the planning and in the life of the settlements.

The photo documentation belonging to our work part on landscape protection as well as layout plan No. T1 are contained in Annex No. 8.

# 5. SUMMARY

The aim of this chapter is to give a summarising qualification presenting, how the impact processes indicated above will touch the human being, as final impact carrier. In the course thereof we have to take collectively into consideration both the influencing factors and the changes caused by them in the individual environmental elements and systems, and, at last resort, in man's quality of life. In the course of this synthesis the most important points of view are the degree of affectedness of man, as a biological and social being, and the direction (positive or negative) thereof. In case of the impacts reaching the man we have to take into consideration the strength and progress in time of the influencing factor, the extent of the impact area concerned, the number of elements affected by the process and the nature and extent of the change. The joint result of all of these factors is really expressing the impacts affecting the human being.

At the beginning of the chapter we deem important to summarise the qualifications in the concise form of tables. Namely, this can serve as basis for the final value judgment. A big part of the aspects listed above – timeliness, affectedness – is included in the summarising table.

Overviewing the table and the impact processes according to the indicated viewpoints we will find that the appearance of the new infrastructure and the ensuing changes in traffic and emission are the most important influencing factors of the planned motorway section.

All of the other impact processes or influencing factors do not mean any serious problems, they do not materially affect the human being due to their transitional nature and/or inconsiderable extent and/or their favourable process of dilution and/or the possibility of their technical prevention or considerable mitigation and/or their minor impact area.

**People living in the proximity experience the implementation of the motorway as follows:**

The construction of the track, as part of the construction activity will be perceived first by the people living in the detached farms, since the track avoids the settlements relatively well.

Therefore, people living in the nearby settlements (mainly along main road No. 5) will only perceive the inconvenience of the cargo transit, increasing due to the transportation of building materials. (The surplus load resulting therefrom on the environment is unimportant, it is well dispersed along the track and lasts only a short time in respect of each residential area.) The damaging of the pavement may cause potential problems. It is a positive feature, on the other hand, that the construction works will create employment opportunities.

In the course of the operation the population burdened by air pollution and noise (those living in the detached farms along the track and people living along the drive-on roads) will conceive the motorway as a permanently disturbing unpleasant factor. This can be compensated for them to some extent, if their conditions of life will improve in the course of implementation. The impacts of air pollution and noise emission can be considerably reduced by the technical solutions included in the plans, thus we have not to count, along the track,

with loads exceeding the limit values and thus with injury to health due to the implementation of the motorway.

Table of qualification

## Summarising table of qualification for the impact assessment of M5 motorway

| Environm. element / system affected | | Influencing factor | Direct impact | Period of impact | Impact carrier affected | Qualification per impact carrier | Remark |
|---|---|---|---|---|---|---|---|
| Air | 1 | Construction works | Worsening of air quality along the track and the transport routes | Short, transitional effect on each point | people living in farms along track,<br>people living along transport routes,<br>wildlife | supportable<br>supportable<br>supportable | appropriate regulation of the works of construction and transport (see e.g. reduction of dust emission) |
| | 2 | Traffic | Worsening of air quality along motorway | permanent – continuous | people living in farms along track<br>wildlife | supportable – burdening<br>supportable – burdening | limit value is performed within 50 m, within that farms will be presumably demolished (aspect of noise prot. too)<br>according to individual sensitivity |
| | 3 | Effect of traffic distraction | Improvement of air quality along parallel roads | permanent – continuous | people living along parallel roads | improving | mainly in relation to Kistelek, Balástya, Szeged |
| | 4 | Average | Deteriorating air quality | short, transitional | people living in farms along track | supportable extent of risk | no settlements belong to the impact area of averages |
| Surface and sub-surface waters | 5 | Placement of hydraulic engineering facilities | Changes of hydrodynamics in surface waters | permanent – continuous | places of channel correction<br>other channels | supportable<br>neutral | no living watercourses in the area, channels are artificial facilities from the very beginning |
| | 6 | Formation and/or operation of mining sites | Changes of hydrodynamics in sub-surface water | permanent or transitional | soil, groundwater<br>surrounding wildlife<br>neighbouring settlements | may only be qualified for concrete sites | if an existing site is used, no change is expected, in other cases the activity is subject to special impact assessment |
| | 7 | Existence of road structure, embankments, gullies, rainwater drains | Change in the running conditions of surface or sub-surface waters, deterioration of quality | permanent – continuous | soil, groundwater<br>wildlife of the neighbourhood | supportable<br>supportable (perhaps burdening) | increased attention is to be paid to the areas with high groundwater level and to areas highlighted from the aspect of wildlife protection |
| | 8 | Average | Transitional worsening of the quality of sub-surface waters | short, transitional | use of waters | disturbing | no living waters, thus there is no other impact carrier |
| Earth | 9 | Occupation of area | Quantitative decrease | permanent – continuous | groundwater<br>land use | neutral<br>stopping | the area to be used is the required minimum, thus change is admissible |
| | 10 | Formation of mining sites | Quantitative decrease | permanent – transitional | wildlife<br>land use | supportable<br>stopping - restricting | if an existing site is used, no change is expected, in other cases the activity is subject to special impact assessment |
| | 11 | Winter defrosting, emission of other pollutants | Soil contamination | permanent – continuous | soil, groundwater<br>wildlife<br>land use | supportable<br>supportable – burdening<br>restricting | practically limited to the area of expropriation |

| Environm. element / system affected | | Influencing factor | Direct impact | Period of impact | Impact carrier affected | Qualification per impact carrier | Remark |
|---|---|---|---|---|---|---|---|
| | 12 | Average | Soil contamination | short, transitional | soil, groundwater | the extent of risk is supportable | the engineering structures established at the channels transporting water to protected areas must provide full protection in case of average against the penetration of pollutant |
| | 13 | Waste treatment in the phase of construction and then in that of operation | Soil contamination | permanent – continuous | soil | supportable | but only in case of appropriate treatment |
| **Wildlife –** | 14 | Occupation of area | Decrease of habitat, destruction of individual beings and populations | one-off | wildlife | from stopping to neutral | depending on the value of nature conservation of occupied area |
| **ecosystems** | 15 | Road and embankments, traffic | Isolating effects, disturbance | permanent – continuous | wildlife | supportable – burdening | depending on the sensitivity of populations living near the track |
| | 15 | Running over | Destruction of individual beings | permanent – continuous | individual beings<br>wildlife | stopping – burdening | |
| | 16 | Disturbing stimuli of traffic (optical, noise, heat, etc.) | Disturbance of habitat | permanent – continuous | wildlife | burdening | involve continuous disturbance |
| | 17 | Plantation of vegetation | Reduction of unfavourable impacts | permanent – continuous | wildlife<br><br>human beings (travellers) | makes supportable,<br><br>improves | through the plantation of appropriate plant species<br>important for accident protection too |
| **Artificial elements** | 18 | Appearance of a new artificial element | Change in value | permanent – continuous | farms to be demolished<br>users | stopping<br>value creating | |
| **Communal environment** | 19 | Construction works | Transitional increase of noise level | short, transitional on each point | settlements<br>nearby farms | neutral<br>supportable – burdening | |
| | 20 | Traffic | Increased noise level along motorway | permanent – continuous | nearby farms | supportable – burdening | value limits can everywhere be complied with through the technical solutions and demolition defined in the chapter of noise protection |
| | 21 | Effect of traffic distraction | Reduced noise level elsewhere | permanent – continuous | settlements | improving | through reduced traffic noise level will also be reduced (primarily Kistelek, Balástya, Szeged) |
| | 22 | Appearance of a new element of infrastructure | Reduced traffic elsewhere | permanent – continuous | settlements | improving | in relation to general condition, accident situation etc. in the settlements mentioned above |
| | 23 | Appearance of a new element of infrastructure | Change in intercity relations, innovation effects | permanent – continuous | settlements | improving | |
| Landscape | 16 | Appearance of a new linear infrastructure | Change in landscape | permanent – continuous | totality of landscape and environment | supportable | appropriate solutions to integration into landscape |

The improving air quality and general quality of life resulting from the reduction of traffic on main road No. 5, which is currently overloaded, in consequence of the new infrastructure, will be excellent positive effects as to their dimensions. The development of infrastructure is a favourable phenomenon from the aspect of the whole region, it may promote the revitalisation of economy and thereby the betterment of the conditions of life. The effect is unambiguously that of improvement, people will also experience the improvement of the quality of environment.

The users of the motorway come from a wider sphere, the new motorway will have a national or even international importance. The implementation of the route will involve a considerable ease, a more comfortable and shorter journey and a smaller specific consumption for the travellers.

Any further unfavourable processes occurring potentially, indicated in the impact process chart, will be realised by the people living there generally as the worsening features of area use. E.g. it will become more difficult to approach certain agricultural lands, or the possibilities of cultivation will be more restricted due to soil contamination, etc.

Here we list the environmental processes, which can be predicted with an uncertainty higher than the average or which cannot be estimated at all:

- Consequences of averages,
- Consequences of the drainage of rainwater (level and quality of groundwater, impact on the surrounding wildlife),
- Strength of the effect of traffic distraction (depending very strongly on the existence and amount of the motorway toll).

**It can be declared in summary that the construction of the new motorway will result in more environmentally positive features, primarily within the settlements located along main road No. 5 currently highly burdened, than the quantity of unfavourable consequences caused in the immediate neighbourhood of the track.**

The unfavourable environmental consequences are due to two features of the region under examination:

- on the one hand the track of M5 motorway leads in a region with dense detached farms;
- on the other hand, there are lots of quasi-natural habitats in the areas touched by the track.

Through the technical solutions integrated in the plans:

- in case of the detached farms affected, mainly through the construction of noise protection walls;
- in case of the affected quasi-natural life communities, through the formation of ecological passages, the provision of groundwater course, minimisation of the drying effect of the track, etc.

the development of a status appropriate from the aspect of environmental protection can be secured, and the unfavourable effects presumably appearing in the impact area can be prevented.

The track is presented in detail in Annex No. 9, in a scale 1:10,000.

Project No.: 50 630/503/501
Designation of plan documentation: Environmental impact assessment in detail of the M5 Motorway Csongrád Couty section marked III (between chainages 161.0-174.5 km)

Designed branch: Environmental protection

## PLANNER'S DECLARATION

According to the contents of Decree No. 46/1997 (XII.29.) KTM we make the following declaration:

The plan documentation of the designed branch indicated in the subject-matter has been reconciled with the relevant specialised authorities in the course of planning, and the planned technical solutions are in conformity with the relevant legal rules and the prescriptions of the authorities.

The minutes and confirmations of the reconciliation with the specialised authorities form annexes to the technical description.

The responsible planner of the plan documentation in the designed branch is in possession of the appropriate planner's authority.

Budapest, 1 March 1999

illegible signature
Mrs BÖRZSÖNYI Péterné
responsible planner
Planner's registration No.: 01-3648