

KfW, Bank Austria, HSH Nordbank, HVB

# **Zagreb –Macelj Motorway, Croatia**

## **Technical Adviser's Environmental Report**

**May 2004**

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## 1 INTRODUCTION

### 1.1 Project Brief

This Report has been commissioned by “the Banks” comprising KfW, Bank Austria Creditanstalt, HSH Nordbank and HVB, who has requested ATKINS to produce an summary Environmental Report for EULER HERMES, to accompany the technical and commercial review of the proposed Zagreb-Macelj Talled Motorway Project in the north-west of Croatia. This work is prior to financial close of the “design, finance, build, operation and maintenance” project to be let over a 28 year concession agreement between the Croatian Government and Autocesta Zagreb – Macelj d.o.o.

The report follows the preparation of an environmental section of the Technical Advisors Services Report, the final version of which was produced in April 2004. The opinions expressed in this Report are based on our understanding of the Project arrangements gained from due diligence work that has already been undertaken. It is also based upon discussions with locally based environmental personnel who have had the responsibility for developing and reviewing environmental issues for the various elements of overall scheme, during the extended period of the highways development.

The report’s objective is to provide an environmental overview of the project proposals. It is based upon existing information from and discussions with the locally based personnel, notably Ms Franka Odak (See Section 4.1). However it does not purport to represent a formal environmental impact assessment (EIA) under either European or Croatian legislation.

### 1.2 Project Overview

Historically the “Pyhrn Corridor” has been one of the most congested links between Western Europe, leading through the Alps and on to Turkey and Iran. This corridor passes through Austria, Slovenia and then Croatia as part of this route and forms part of Crete Corridor X of the European Commission. The Government of the Republic of Croatia is keen to improve the transportation links along the section of the “Pyhrn Corridor” in its territory. This includes the Zagreb-Macelj Motorway which extends from the Slovenia-Croatia border down to Zagreb, the capital city of Croatia.

At present the highway is mostly dual carriageway along much of the flat land between Zagreb and the town of Krapina, but between Krapina and the border it is a winding single carriageway highway with a series of small tunnels.

Since the 1980’s the Government of Croatia has been keen to improve this route and to pay for the work through the collection of toll revenue.

The Government of Croatia and Walter Bau AG have been involved in the development of this scheme for at least 8 years and this process has now included the signing of a Concession Agreement between the two parties.

The project location is between Jankomir, on the western side of Zagreb, and Macelj some 59.2 km to the north of Zagreb at the border with Slovenia. See Fig.1.



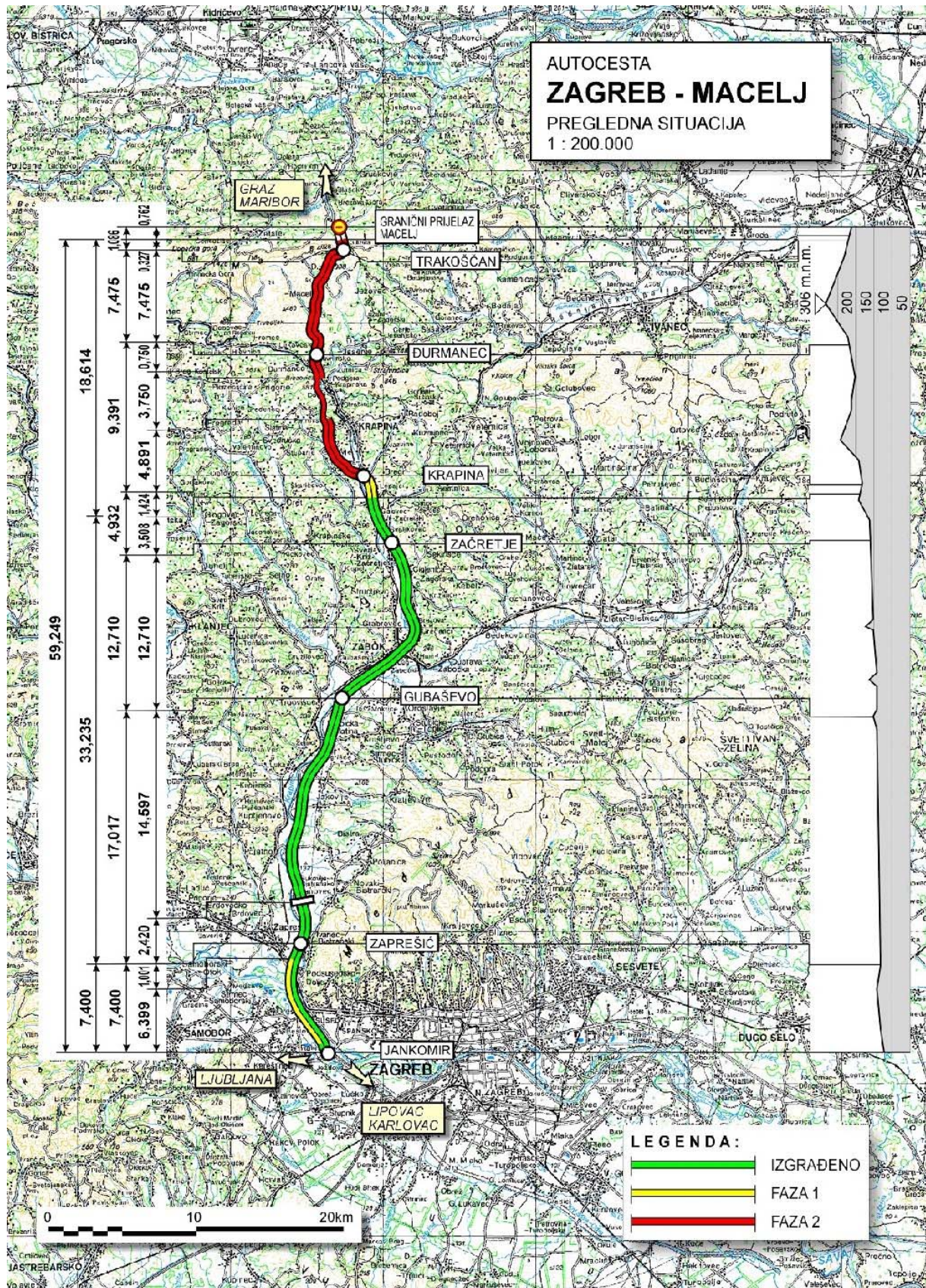


Figure 1



The initial 7.4 km of highway from Zagreb (Section A) comprises a single 2-way carriageway. The project will construct a second carriageway, including structures over the Save River and railway, to full motorway standard. Section B (comprising Sections B1 and B2) of the project is an existing 33.2 km of tolled motorway

The remaining 18.6 km (Section C; comprising Sections C1, C2, C3) will be new construction involving extensive tunnelling, slope stabilisation and viaduct works. Included in Section C is a 3.7 km section of single carriageway, together with preparatory works for the second carriageway (formation, drainage etc). However, initially only single carriageway tunnels (with associated escape tunnels where required) and viaducts are to be constructed to minimise expenditure. The second carriageway will be fully constructed when traffic figures justify. Extensive permanent diversions of the adjacent single carriageway National Road are also planned, to accommodate the new motorway alignment.

Three new interchanges are to be constructed along with two service areas, rest areas, an Operation and Maintenance Centre and new toll stations.

At the northern end of the motorway, a connection back onto the existing National Highway and Customs area will be made (this section is the responsibility of the Finance Ministry and not Hrvatske AutoCeste, the Croatian Road Authority). However, the Concession Agreement charges the Concession Grantor to make reasonable endeavours to procure the construction of this section by the Completion Deadline.

Lighting is to be provided to interchanges, tunnels, service areas, toll areas. Ventilation, sound system, fire hydrant and CCTV equipment is to be provided in tunnels as appropriate. Road markings, guardrails, SOS system, signage and variable message signage (on all Sections) are to be installed.

Noise attenuation barriers are to be provided on Section C at selected locations and limited landscape planting will be undertaken.

An existing "illegal" access on Section B is to be closed by the Grantor.

The entire length of highway will thus become a closed tolled motorway.

Over the concession period the Concessionaire will appoint an Operator to be responsible for the overall operation of the motorway including toll collection and routine maintenance etc. The Concessionaire remains responsible for extraordinary maintenance e.g. resurfacing of carriageways (estimated at every 8-9 years) and repairs to structures. The Concession Grantor retains certain responsibilities for maintenance of side road bridges under or over the motorway.

## 2 DOCUMENTATION REVIEW

### 2.1 Introduction

A review of the main contract and agreement documentation has been carried out in order to assess any gaps in the contracts, items that should be of concern to the Client and any major risks.

The review was conducted on the following principal documents as listed below:

- ◆ The Concession Agreement dated 11 July 2003 between the Republic of Croatia and Autocesta Zagreb-Macelj d.o.o.
- ◆ The Construction Agreement between Autocesta Zagreb-Macelj d.o.o and Walter Motorway GmbH.
- ◆ Operation & Maintenance Contract between Autocesta Zagreb-Macelj d.o.o and EGIS Projects S.A.

From review of these contracts a Risk Allocation assessment was produced for the Technical Adviser's Final Report (Atkins, April 2004).

For the purpose of this environmental review, a number of reports have formed the basis for the assessment, based upon works that have been completed during the development of the highway design and including works that have already been constructed since 1980. The reports include:

- Hrvatske Autoceste (September 2003) Zagreb – Macelj Motorway: Environmental Impact and Protection Report
- Odak, F (December 2003) 'Expert opinion on the EIA carried out in the scope of the administrative procedure for delivery of the building permit for: Zagreb – Macelj Motorway: Krapina – Macelj Section and Jankomir – Zapre\_i\_ Section'.
- Oikon d.o.o. (October 2002) Selective environmental impact study for the Zagreb – Macelj Motorway Section from Zapre\_i\_ to Jankomir (right-sided pavement)

In addition, reference has been made to the Equator Principles (See Appendix A), a document adopted by a number of development banks, which governs the appropriate management of large scale infrastructure projects in a sustainable and environmentally and socially responsible manner. Reference has also been made to IFC Guidelines on Pollution Prevention and Abatement Guidelines for Roads and Highways.

### 2.2 Design Information

The "Glavni" (Main Design) has been completed by IPZ Consultants (Zagreb). The designs have been checked (by Zagreb University) and approved in accordance with Croatian procedures.

The Consultant was given the opportunity to view the design dossiers containing design calculations and drawings and to interview representatives of IPZ, Zagreb University and IGH (Geotechnical Consultants).

From our viewing the designs appear to have been undertaken in a considered and professional manner and design drawings are to a good standard.

The designs have been undertaken as directed by Croatian General Standard Procedures (Ref General Technical Conditions for Roads Construction, Vols I - VI (Institut gradjevinarstva Hrvatske, Zagreb 2001) with reference to Croatian and appropriate internationally accepted Specifications.

### 3 TECHNICAL REVIEW

The review of a range of technical issues has formed an important part of the engineering assessment which has taken place. As such it is relevant to the environmental appraisal, especially for the construction of the 18km of the route leading to the border where 11No viaducts and 6No tunnels are proposed. This is the section in which construction is most expensive and time consuming and therefore constitutes the critical path elements to the completion of the whole scheme within Croatia. Of the tunnels, the 1725m long “Sveta Tri Kralja” (“Three Holy Kings Tunnel”) is the largest single element on the critical path.

The technical issues considered focused on:

- The status of the ground investigation,
- The status of the designs for the viaducts and tunnels,
- The status of the designs for the earthwork cut and fill slopes.

#### 3.1 Engineering Design

The scheme designs are currently at the “Main Design” stage of the Croatian Regulations. This stage is necessary in order to get the “Construction Permit” without which work cannot commence. The Main Design requires all principal elements to have been dimensioned, all foundations designed and generic stabilisation measures detailed.

#### 3.2 Tunnel Design

A review of the tunnel designs with particular emphasis on their safe operation has been undertaken.

The six project tunnels are:

Tunel Leva_ica	km 36+309	Length 365m
Tunel Vidovici	km 38+136	Length 265m
Tunel Sveta Tri Kralja	km 40+425	Length 1735m
Tunel Brezovica	km 42+233	Length 605m



Tunel Durmanec	km 45+016	Length 204m
Tunel Frukov Kr_	km 49+459	Length 343m

The two longest tunnels (Sveta Tri Kralja and Brezovica) and an intervening section of road and viaduct are the most expensive to construct. Since the traffic forecasts do not warrant the capacity afforded by twin bore tunnels, at this stage it is proposed that this 3.7km section of the route is constructed as a single carriageway, with each single bore of both tunnels carrying bi-directional traffic. It should also be noted that the longest tunnel (Sveta Tri Kralja) is to have a parallel Escape Gallery accessed by cross passages (transverse galleries) from the main bore, at less than 500m centres. Whilst this will result in an overall reduced spoil disposal requirements, the proposed operational change to bi-directional traffic flow will impact upon the requirements for mechanical ventilation for pollution control and fire smoke management, as well as the lighting installation in these two tunnels.

Ventilation design will also need to meet appropriate environmental protection legislation (noise and emissions) as the portals, especially if there are any residential properties in close proximity. Re-design of the ventilation currently in progress for application for a new Construction Permit.

Longitudinal profiles of the tunnels are designed for gravity drainage of any groundwater inflows towards one or both portals. This avoids the costly infrastructure associated with pumped drainage installations.

### **3.3 Earthworks**

#### **3.3.1 Slope Design**

There is a standard cross section design for all of the cut slopes and approach cuts of 1:2 (v:h) slopes near the crest above slopes at 1:1.5 beside the road. This appears to be based on a single design assumption of nearly worst-case conditions everywhere, which may not be appropriate in most locations. Walter Bau have indicated that they intend the cut slope design to be thoroughly reviewed by their Geotechnical Consultant who should identify a range of slope designs according to anticipated ground conditions.

In general the Ministry of the Environment require hydro-seeding for aesthetic reasons and to protect all slopes wherever practicable. This should help to limit erosion of the slopes which may otherwise create a significant maintenance issue. Protection of the steep cut slopes into which tunnel headwalls themselves are located often needs a different design approach which we did not identify during our appraisal. We were told masonry facing may be used on these slopes. This will form part of the Geotechnical Review.

### **3.3.2 Material Availability and Suitability**

Some of the weak rocks will break down readily during handling. We note that inappropriate methods of excavation, spoil handling and placement could result in large volumes being rendered unsuitable, thereby entailing both new sources of fill and a larger disposal problem. Walter Bau's Geotechnical Consultant will advise them on this and their construction supervisors will need to ensure that material re-use is maximised.

Tunnel spoil, if re-usable, will be produced throughout the winter months and, to avoid stock-piling and double-handling, may have to be placed and lightly compacted immediately according to a method specification. Such restrictions should become less severe as the rocky spoil quality improves. There is likely to be some shortfall in the availability of spoil and investigations for borrow pits is under way.

### **3.4 Viaduct Design**

The generic viaduct design is a uniform, multi-span, design which incorporates pre-cast deck support elements of standard 30m length and cantilevered crossheads where the span needs to be increased to approximately 38m.

The two main viaducts are 'Viadukt Tkalci' (span 273 m) and Viaduct Mimarje (Span 197m).

All the viaducts have been designed and approved in accordance with Croatian Standards.

### **3.5 Archaeology**

It is noted that the route of the motorway was adjusted previously from the east side of Krapina (Section C2), to the west to avoid some archaeological finds including prehistoric artefacts and caves. Approval from the Ministry of Culture is required before issue of the Construction Permit and this has been obtained.

### **3.6 Contaminated Land**

From our discussions in Zagreb with representatives of the designers, it is believed that there is minimal likelihood of the existence of contaminated land and explosives along the proposed route.

## **4 ENVIRONMENTAL EVALUATION**

### **4.1 National Environmental Legislation**

All the environmental work that has been associated with this project, since the preliminary design stages in the 1980's has been subject to review at one stage or other by an Expert Committee on EIA, as required under Croatian legislation. This has involved to large part Ms Franka Odak, a landscape architect who has produced a

number of reports on the issue of environmental evaluation of the scheme options. Various environmental studies have been carried out, although some of these have not taken the form of official EIAs, as discussed below.

The review by Franka Odak (December 2003) identified the following pieces of relevant legislation:

- Law on Physical Planning and Spatial Development (Official Gazette No. 54/80) – Art. 55 requiring obligatory EIA procedures to be applied to certain categories of projects, of which major highways are included;
- By-law on the Preparation of Environmental Impact Studies (Official Gazette No. 31/84) – identifying in details the structure, contents, consultative procedures and financing of EIAs, plus the appointment of an Expert Committee for the evaluation of EIS documents;
- Environmental Protection Law (Official Gazette No. 82/94) – Art. 25-32 regulating some additional provisions relating to EIA procedures;
- By-law on Environmental Impact Assessment (Official Gazette No. 34/97) – which effectively harmonised Croatian EIA legislation with that of the EU, namely Directives 85/337/EEC, as amended by Directive 97/11/EC. This also has measures affecting the timing and duration of EIAs and reduction in the time taken for the Expert EIA Committee to provide a decision on EIS reports.

The most significant observation is that under the various elements of Croatian laws on EIA that have been in force during the preparation of the different stages of the present project design, all environmental reports produced have been of a standard which satisfies all requirements of the Croatian legislation.

It has further been established from Franka Odak that the latest EIA legislation (Official Gazette No. 34/97) cannot be applied retrospectively. Consequently any scheme designs which were approved prior to the implementation of 34/97 will not need to be the subject of further environmental evaluation. This is particularly relevant for Option C, as discussed below.

## **4.2 International Environmental Requirements**

With respect to international environmental measures, the Equator Principles (EPs – see Appendix A) have been adopted by the HBV Group along with a number of other major lending banks, to provide for good governance and sustainable development of a range of major projects. The EPs have been developed to be largely applicable to major industrial developments, but the principles are the same for any major infrastructure development project. The main objectives which form the basis to the Principles are therefore still applicable. These include appropriate socio-economic development and community based social factors, as well as the more 'natural' environmental issues. This requires that noise, air quality and health, recreational amenity and community severance, plus job creation and sustainable transportation policies are all covered by an assessment of environmental factors.

The Zagreb-Macelj motorway is considered to fall into a Category B project under the EPs, which requires an environmental assessment to be undertaken for the project. A treatise of this is given in Appendix A, with discussion on the relevant issues given below. Reference also needs to be made to the appropriate IFC Pollution Prevention and Abatement Guidelines, which in this case are IFC Guideline 20, Roads and Highways.

As the environmental statements and/or assessment reports produced in connection with this infrastructure development project have met all extant Croatia laws relating to EIA and have been given positive decisions by the Expert Committee on EIA, a fundamental element of the Principles is met under items 3a) and 3b). These require that a range of issues are covered, including:

- a) *“assessment of the baseline environmental and social conditions”*
- b) *“requirements under host country laws and regulations, applicable international treaties and agreements”.*

Item 3a) is addressed by way of the range of environmental reports that have been produced for the various elements of the Zagreb-Macelj highway, including the revision of the Krapina Spatial Plan. Item 3b) has been met as evidenced by the approval of the various environmental reports by the Expert Committee on EIA.

From item 3b), it is assumed that the remaining relevant elements of the principles for providing loans, namely 3c) to 3l) (see Appendix A) are also met, given the acceptable nature of the EIAs for the project. However, the level of detail of some of the reports, due to the time the work was originally undertaken, means that some issues such as those relating to efficient use of energy (during construction) may not have been fully considered.

It should be noted, however, that a significant element [*“o) consideration of environmentally and socially preferable alternatives”*] has been fully addressed, since the original eastern alignment around Krapina has been rejected in favour of a more environmentally acceptable alternative to the west of Krapina. In making this decision, considerable public consultation had to take place, as well as formal approval being issued by the full range of environmental ministerial authorities. We therefore believe that the Lenders can be confident that the motorway will not contravene any of the main items identified in Section 3 of the EPs.

The review by Franka Odak (December 2003) indicated that the EIA for Section A has more detail than necessary. Section B was not deemed to require an EIA, since it is more a rehabilitation activity than new build. It is understood that a formal EIA has not been undertaken for the proposed alignment of Section C passing to the west of Krapina (See section 4.6 below). However, as part of the modifications to the Spatial Plan for Krapina, which was required in order to modify the alignment of Section C2 around Krapina, full and thorough consideration was given to the environmental



implications of the routing. In addition, the engineering design was subject to sustainability review, together with social and economic effects of the route option and a public consultation exercise involved with the redrafting of the Plan.

Due to the absence of a formal EIA, whilst it meets Croatian environmental legislative requirements, we cannot verify that the environmental assessments meet the requirements of the IFC Guideline No. 20 Roads and Highways. Nevertheless, the range of issues covered during the modifications to the Krapina Spatial Plan indicates that all the main elements of IFC Guideline No. 20 will have been sufficiently addressed, in a similar fashion to the Equator Principles issue.

### **4.3 Environmental Management Plan**

The main elements of the Equator Principles are considered to have been met, as discussed above, although there is still the need to fully develop the basis for an Environmental Management Plan (EMP) which has been agreed to be implemented upon commencement of the Works.

Under the EPs there is a requirement for some Category B projects, as appropriate, to have prepared an EMP to accompany the project development. It is usual best practice in such large scale projects highway projects (and others) to prepare an EMP and utilise the plan to control the environmental management, design and operation of the project. From the literature that has been reviewed, there appears to be no mention of the preparation of an EMP, nor a requirement to provide such a Plan, under Croatian law.

Good practice dictates that the design engineer prepares an EMP or has one prepared on their behalf, at the earliest stage of design. In addition, tendering sub-contractors should be required to prepare an Outline EMP as part of their tender submissions, with the provision of the agreed completed Plan within one month of the successful tenderer commencing the project works.

There is scheduled to be a programme of monitoring of environmental factors, including:

- Water quality in major water courses;
- Animal populations and the implications on hunting;
- Noise emissions.

The data collected from this monitoring can be fed into the proposed EMP, so that the overall environmental performance of the project can be regularly and systematically monitored.

#### 4.4 Section A

A detailed report on the environmental impact for Section A (Zapresic to Jankomir) near Zagreb has been produced (Oikon d.o.o, October 2002). In this section, where a second, parallel carriageway is to be constructed, the area of the future works has already been fenced off. Beyond this there are extensive flooded gravel pits to the west of the motorway which crosses the broad flood plain of the Sava River. There is quite widespread scrub vegetation and a mix of arable and pasture land which may support a wide range of habitats. The Environmental Impact Statement lists a wide range of fauna but includes no discussion of the significance of species mentioned. It does not refer to the significance of various habitats encountered, whether they are designated areas which will be affected by the alignments, nor to floral species encountered.

The Review report by Franka Odak (December 2003) indicates that the level of detail provided by the Section A environmental report provides too much empirical data. Whilst this may be true, it is not thorough in the interpretation of such data, a point which is noted by the author. Nevertheless, in spite of this potentially shortcoming, the Expert EIA Committee provided a positive decision for the report and therefore it is likely not to cause a problem with the local authorities in Croatia.

The Oikon report identified some 21 sites of possible archaeological interest which lie within 500m of the Section A carriageway. The detailed reports have not been inspected in detail, nor have interviews taken place with the authors of this report or the officials in the Ministry of Culture as to the significance of these locations, some of which are chance finds of stone axes, armour, etc. Chance finds must be expected in the footprint of the new carriageway but there is no known evidence to suggest major features are likely to be encountered. A watching brief needs to be established.

#### 4.5 Section B

Section B requires some rehabilitation of the existing motorway carriageways. Here there are wide areas of adjacent open pasture lying mostly within the flood plain of the Sava River. It is believed that no protection by noise barriers or mitigation of potential atmospheric pollution or visual intrusion is planned for Section B. No EIA documentation has been produced for Section B, given that no significant earthworks are proposed. Also, there is no requirement for a retrospective EIA under Croatian environmental legislation.

In addition and more significantly, the detailed design work has been completed and approved by all relevant authorities, including those with environmental remits. It is therefore assumed, following review of the Hrvtske Autoceste report (September 2003), that any mitigation measures required for environmental protection have been included within the present design work and that suitable monitoring programmes will be instigated to ensure that mitigation is successful.

## 4.6 Section C

The Krapina – Macelj section (Section C) was conceived as a project in 1988, with preliminary designs for a route to the east Krapina. This alignment was adopted into the local Krapina Spatial Plan, in spite of the fact that it would have had adverse effects on biodiversity (100 year old Macelj Forest), cultural heritage sites and potable aquifers supplying Krapina. This largely arose from the proposal for a 4 km tunnel and destruction of major areas of the forest.

German and Austrian bi-lateral funders were sought and one such engineering group was able to identify a cheaper, less environmentally adverse alignment to the west of Krapina. The routing to the west was not part of the Spatial Plan, so there was a need to review this new proposal, with concomitant consideration of the full range of environmental issues. As part of this exercise, there was extensive public consultation to facilitate comments from local stakeholders and statutory authority approval. The revised Plan was published in April 1991.

At the time of the Spatial Plan review, an Expert Committee for EIA carried out an overall evaluation of the routing options from an environmental viewpoint and identified a western routing as a clearly preferred alignment. Following the review, modifications were made to the Spatial Plan to incorporate the changes to route alignment and the western route was adopted. The review also included guidelines for conditions to be attached to the scheme design. This was all before the war, which caused the project to go on hold until 1996.

Following resumption of development in Croatia, the preliminary designs for the highways, followed by the detailed design, have been subject to approval of all the relevant statutory authorities relating to nature conservation, cultural heritage, pollution control, water supply, forestry and local government. The final design has also received authorisation from the local Spatial Planning Authority in Krapina.

It is known that there were archaeological finds in Section C from Krapina northwards, comparable to those in Section A. Krapina itself lies where the narrow Maceljica Valley opens onto the broad flood plain contiguous with that of the Sava River. It is probable that this part of the route from 42.5km to the Slovenian border, where the route follows the natural line of historical communication, may be more likely to have both isolated chance archaeological finds and the possibility of ancient structures.

Due to the fact that the Section C2 element of the motorway was adjusted previously from the east side of Krapina (Section C2), to the west to avoid some prehistoric finds and caves, the likelihood of major finds has been reduced to as large a degree as possible, given the ground investigations that have taken place to date.

However, some delay to construction may be incurred in this area therefore, and it may be prudent for the Contractor to undertake as much of the soil strip in this area as early as possible in order to minimise any delays it may also be prudent to keep an archaeologist on a watching brief during this process so that any features can be

identified early and any rescue archaeology completed with minimum delay to the construction process.

A comparative analysis of environmental impact of two alternative solutions to the route, prepared in 1991, has been reviewed, but none of the subsequent reports. For a review of these, we have relied upon the evaluation of Franka Odak, the assurances that approvals have been given by the Expert EIA Committee and the confirmation from the Ministry of Sea, Tourism, Transport and Development that all relevant permits have been obtained and design details agreed by all relevant environmentally related authorities. This also takes account of the findings and approval of the Krapina Spatial Planning Committee for the western Krapina option.

During a site visit by geotechnical engineering staff (December 2003), it was noted that most of the houses appeared to be modern blockwork or brickwork, while many of the older ones were of timber construction on stone bases or wholly of masonry.

Throughout the length of the western route, the hills are covered with a mixture of deciduous and coniferous forest with a quite open forest floor without much understorey vegetation. Most of the trees appeared young (<30 years) which suggested the areas have been felled and replanted on a managed basis in the past. Grazing animals were all stabled at the time of the site visit.

Due to seasonal winter conditions, there was no clear indication of habitat diversity, with most plant life being dormant and only a few birds were observed. There were few signs of “road mortality” suggesting the amount of active wildlife at this time of year is small. However, the information arising from the Krapina Spatial Plan revision and Hrvatske Autoceste Report (September 2003) indicates that the area is important from a faunal the point of view. Consequently, there will be a need for care during construction and protection (for animals and road users alike) during highway operation.

Fencing proposed to keep (larger) animals off the future motorway will take the form of post and wire mesh extending up for 1.2m from ground level, although deer would be able to clear such a barrier. Apparently there is no Croatian standard which requires the foot of the fence to be buried for the exclusion of rabbits, badgers, foxes etc which burrow, nor provision of crossing routes for badgers, toads, etc. which tend to perpetually use traditional routes, even when new highways have been constructed across their migration or territorial routings.

It is understood that sections of the new motorway in Section C are to be provided with noise screens. It was interesting to note during the site survey that much of the route was already pegged in Section C, giving the local population an indication of alignment and the potential to develop a sense for the physical consequences of the motorway construction. The service diversions were already under construction. The tunnel and cutting spoil is all to be incorporated into the adjacent embankments (if suitable – see Material Availability and Suitability, Section 3.1). Additional fill will have to be won, but the locations for this are not yet determined.



We did not inspect the hydraulic design aspects for stream diversions though local standard details looked reasonable. The treatment of streams at or close to cut slopes may need further design work. Means of treatment or separation of pollutants in the runoff from the motorway are understood to be incorporated into the Construction Design. We did not observe whether light pollution from illumination at tunnels and intersections was to be appropriately shaded.

#### **4.7 Permits**

All environmentally related permits that are needed have been obtained from the relevant regulatory authorities.

Construction Permits are required for all main engineering components prior to the commencement of construction activities.

The issue of a Construction Permit requires the approval of the Main Design by the Croatian Roads Ministry and the granting of all other approvals (Specified Consents) by affected authorities e.g. Ministry of Environment, Ministry of Culture, and Forestry Ministry, etc. We understand that a total number of 22 different consents are required.

All construction permits (approx. 30 in total) have been obtained with the exception of those specifically related to the tunnels for the single carriageway section.

#### **4.8 Construction Issues**

Possibly the largest issue will be the amount of spoil that is generated and the amount of fill material required. Some of the tunnel spoil will may not be suitable for re-use and it is considered that there will be a net requirement for borrow material, in spite of the fact that several elements of Section C will be built on viaduct, rather than embankment. In addition to the required fill, there will also be a need for appropriate disposal of unusable spoil.

The appointed sub-contractors will be responsible for obtaining any required fill and disposing of excess spoil material. As such, their operations can best be managed and monitored through the operation of the proposed EMP. Although no final locations have been identified at this stage of the project, there are several quarries within 12 km of the proposed motorway alignment which should prove suitable.

To minimise potential impacts on local communities, the major issues will be selection of the least impacting haul-routes, timing of operation, control of vehicle speed and maintaining the vehicle fleet in sound, clean and efficient condition to meet safety, amenity and energy efficiency objectives. Routing, timing and good-housekeeping, such as wheel-washing prior to leaving site and road sweeping, should help to minimise potentially adverse effects.

There will be requirements for construction compounds for the storage and maintenance of equipment and materials. Pollution control from such sites in terms of fuel storage, runoff of suspended materials, etc will have to be controlled through good

housekeeping, but should not constitute any major requirements, over and above standards which should be applied as a matter of course.

Hours of working should be agreed between the contractors and local planning authorities, so that implications of noise in particular, are reduced.

All the above issues can be identified in the proposed EMP, together with methods to monitor their implications and evaluate the efficacy of mitigation measures and pollution control requirements.

#### **4.9 Impact Mitigation and Maintenance Issues**

It is understood that facilities will be installed for the control and treatment of highway runoff, notably in the form of oil separators/interceptors and associated collection facilities, prior to the outfall of each major drainage system. These will be maintained on a regular basis by the operator so as to avoid potential contamination of adjacent water courses and major rivers.

Biodiversity issues are to be covered, as far as possible, by the installation of safety fences in sensitive locations, although there does not appear to be proposals for the installation of underpasses for animals with traditional routes through their territories.

Archaeological issues will be addressed through provision of a watching brief, where appropriate, to supervise any excavations that may be necessary for sensitive locations during highway construction.

Noise barriers will be erected where necessary along Section C to minimise the impact of traffic generated noise emissions.

All the above measures should lead to effective environmental operation of the proposed highway scheme, the performance of which can be monitored through the implementation of a proposed EMP.

## **5 REFERENCES**

Atkins (April 2004) Zagreb - Macelj Tolled Motorway, Croatia. Technical Advisers Services – Draft Final Report

Oikon d.o.o. (October 2002) Selective environmental impact study for the Zagreb – Macelj Motorway Section from Zapre\_i\_ to Jankomir (right-sided pavement)

Odak, F (December 2003) 'Expert opinion on the EIA carried out in the scope of the administrative procedure for delivery of the building permit for: Zagreb – Macelj Motorway: Krapina – Macelj Section and Jankomir – Zapre\_i\_ Section'.

Hrvatske Autoceste (September 2003) Zagreb – Macelj Motorway: Environmental Impact and Protection Report

**Appendix A**

**“Equator Principles”**

**and other Environmental Issues**

## APPENDIX A: “EQUATOR PRINCIPLES” AND OTHER ENVIRONMENTAL ISSUES

### A1 Introduction

- A1.1 The “Equator Principles”, to which the HBV Group are a signatory, are intended to serve as a common baseline and framework for the implementation of environmental and social procedures and standards for project financing activities across all industry sectors globally. It is believed by the international banking system that adoption and adherence to these principles offers significant benefits to the banks, their customers and stakeholders alike.
- A1.2 The aim of the Principles is to facilitate the banks’ ability to document and manage the inherent risk exposures to environmental and social matters associated with the projects being financed, thereby allowing proactive engagement with stakeholders on environmental and social policy issues.
- A1.3 Implementation of the Principles is supported by the Guidelines and Categorisations of projects as drawn up by the IFC and World Bank for the full range of developments covered by these documents. This includes IFC Environmental, Health and Safety Guideline #20 ‘Roads and Highways’, dated 1 July 1998, which is relevant for the purpose of the Zagreb – Macelj Tolloed Motorway.

### A2 Categorisation

- A2.1 In considering the Zagreb – Macelj motorway proposals, the project is being considered as a single entity for the purpose of the interpretation of the Principles, in spite of the fact that it is split into three sections. From an environmental point of view, this will avoid any potential criticism of ‘salami slicing’ of the project into separate entities and thereby trying to minimise the possible adverse effects of the overall scheme.
- A2.2 In reviewing the categorisation of the project, it appears most appropriate to classify it as a **Category B** project, namely that it has a potential to have an adverse environmental impact on human populations or environmentally important areas – including wetlands, woodland and other natural habitats – but of a lesser effect than major Category A projects. The main features distinguishing a Category B project from an ‘A’ project are that the impacts are site-specific, few if any are irreversible and in most cases migratory measures can be designed more readily than for an ‘A’ project.
- A2.3 Although there is a considerable length of new motorway required in addition to the upgrading and widening of existing highway, the type of development, its relatively narrow corridor of effects and the recommended mitigation measures which have been proposed, indicates that there should not be any significant adverse environmental impact on sensitive areas. “Sensitive” factors are taken to mean irreversible effects on important habitats, affecting vulnerable groups of ethnic



minorities or affecting major cultural heritage sites. To the best of our knowledge and based upon the review of reports that have been available at the time of preparing this report, there are not believed to be such 'sensitive' areas associated with the project proposals, which cannot be protected or whose impact cannot be mitigated.

### **A3 Environmental Assessment Requirements**

A3.1 Under the aegis of the Equator Principles, the scope of any environmental assessment carried out for a Category B project must examine the project's potential negative and positive environmental impacts and recommend any measures to prevent, minimise, mitigate or compensate for adverse impacts and improve environmental performance.

A3.2 The details of the Principles require that a range of issues are covered, including:

- a) assessment of the baseline environmental and social conditions;
- b) requirements under host country laws and regulations, applicable international treaties and agreements;
- c) sustainable use of natural resources;
- d) protection of human health, cultural properties and biodiversity, including endangered species and sensitive ecosystems;
- e) use of dangerous substances;
- f) major hazards;
- g) occupational health and safety
- h) fire prevention and life safety;
- l) socioeconomic impacts;
- j) land acquisition and land use;
- k) involuntary resettlement;
- l) impacts on indigenous people and communities;
- m) cumulative impacts of existing projects, the proposed project and anticipated future projects;
- n) participation of affected parties in the design, review and implementation of the project;
- o) consideration of environmentally and socially preferable alternatives;
- p) efficient production, delivery and use of energy;
- q) pollution prevention and waste minimization, pollution controls (liquid effluents and air emissions) and solid waste and chemical waste management.

A3.3 With respect to the above listing, we have evidence that the relevant issues for the Zagreb – Macelj motorway have been adequately addressed. As indicated in the main Report, items a) and b) have been provided for in the form of a number of Environmental Statements. These have been reviewed by an Expert Committee on EIA and found to be satisfactory. It must be noted that the EIA addressing the western route around Krapina has not been viewed by the consultants at the time of preparing this report. It has however, been reported on in a review report by a qualified Croatian landscape architect Franka Odak experienced in undertaking

EIAs, so that for the purposes of this report, her views are taken as positive evidence that Croatian legislative and procedural requirements have been satisfied.

- A3.4 With respect to the remainder of the issues identified in E3.2 above, there are no details in the environmental reports to clearly identify the proposed sustainable use of resources, (item c) although there is clear assumption in the Geotechnical section of the main report that all suitable spoil material will be reused for construction of embankments and in-fill, wherever possible. There is no discussion about the sourcing of materials such as cement, steel or timber required in the construction process, but it would be somewhat unusual to provide details of such issues in an EIA of this nature. Such matters are best given consideration within the Environmental Management Plan (EMP). (See Report Section 4.3).
- A3.5 Item d), together with j), m), n) and o) are covered largely in the various environmental statements that have been produced since 1990. The most significant of the measures taken to ensure minimisation of damage to biodiversity, natural resources (aquifers) and cultural facilities has been assured by the selection of the least impacting alignment around Krapina. The original proposals were for a route to the east of the town, which was noted in the Spatial Plan of the Municipality of Krapina.
- A3.6 The eastern route would have potentially had adverse effects on the Macelj forests, local underground aquifers which provide water to the region and known cultural heritage sites. As the newly proposed alignment was not included in the Spatial Plan, it was necessary for the Plan to be revised to take account of the modification. In order to do that, there had to be public consultation, discussions with stakeholders and approval from a number of statutory authorities, including environmental bodies. It is understood from the Franka Odak report and Croatian authorities that this exercise was successfully completed and that revised Spatial Plan has been accepted by the Assembly of the Municipality of Krapina, so now includes the western alignment. Given that the report indicates clear and thorough consultation exercises have been carried out, it is assumed that open and fair discussions have taken place and that the public has had adequate opportunity to comment upon the proposals.
- A3.7 With respect to socio-economic impacts [(i), k) and l)], it is understood that a number of properties will need to be demolished to make way for the new motorway. Croatian officials have indicated that no social issues require to be dealt with, given that all compensation for lost property is covered by the Expropriation Act (O.G. 9/94, 35/94, 112/00, 114/01). Through this the Government makes suitable compensation provision for housing and land plots. The details of the various elements of the scheme proposals have been the subject of discussion with local planning authorities and communities during consultations on highway routing and Spatial Plan modifications. These issues again have not been highlighted or identified by the Expert Committee on EIA, so it must be assumed that this issue is not considered to constitute a major problem for the project.
- A3.8 With respect to all other issues, namely e), f), g), h) and p), it is assumed that road safety will cover some of these issues and that there are formal procedures for accident and emergency situations. These items are therefore considered to be covered by existing road and health and safety legislation in force within Croatia.

A3.9 The final issue of pollution prevention and waste minimisation [q)] is considered to be dealt with adequately, by reference to the engineering design requirement to provide facilities (gulleys, oil separators etc) to be integrated into the scheme, together with control of highway runoff and discharges to water courses. Waste minimisation will be effected during construction through the reuse of suitable spoil excavated from tunnels, although it must be borne in mind that some of this material may be unsuitable for construction purposes, due to the effects of tunnelling the sandstone rock, as discussed in the Geotechnical Section 3.1 ‘*Material Availability and Suitability*’ of the main report.

A3.10 From the above, it is considered that the main conditions of the Principles’ requirements for completing a suitable environmental assessment have been met. Certain elements will require clarification however, possibly prior to implementation and notably associated with use of materials and energy during construction. This can be addressed in the proposed EMP.

#### **A4 Conditions Applied to Western Krapina Motorway Alignment**

A4.1 In reviewing the proposals for the route to the west of Krapina and the Spatial Plan modification, the Expert Committee on EIA indicated that the design and construction of the Krapina – Macelj section of the motorway should be carried out in an environmentally sensitive manner. These should be considered as guidelines to the design of the alignment and adhered to wherever possible, as detailed below:

- *during its construction and use the motorway must not, directly or indirectly, put in jeopardy the life, health and work of people living in the town, nor be detrimental to environmental resources,*
- *attempts must be made during motorway cross-section design to take up as little as possible of the usable land, as a measure fostering rational use of land, and in accordance with applicable aesthetic criteria,*
- *when defining the motorway route, designers should take into account the value of the surrounding landscape and, in this respect, a special attention should be paid to aesthetic shaping of elements of the future motorway, as the motorway is a new facility introduced in the existing landscape (view of the motorway from the surrounding area), but also as is a facility from which the view opens onto the surrounding areas,*
- *the motorway route should preferably be placed on mild slopes to prevent occurrence of erosion processes,*
- *In case of bigger hill-side cuts the route should be placed at different levels, i.e. pavement lanes should be placed at different elevations so as to trim down the quantity of earthworks and to reduce negative effects on surrounding landscape,*
- *when the route traverses the forest land, pavement lanes should be separated in the horizontal sense, so as to preserve forest belt between two pavement lanes,*
- *viaducts should be built instead of high embankments (i.e. instead of embankments of more than 15 m in height),*
- *tunnels should be built instead of high cuttings (i.e. instead of cuttings of more than 25 m in height on the higher side),*

- *embankments, cuttings and hill-side cuts should be shaped in such a way to harmonize them, as much as practicable, with the surrounding terrain,*
- *as considerable earth works (cuttings, embankments and hill-side cuts) and structures (viaducts and tunnels) are planned in the conceptual design for the motorway, design documents must be prepared, prior to delivery of building permit, for :*
- *landscaping of all embankments, cuttings and hill-side cuts,*
- *landscaping of zones in contact with watercourses (particularly along the Macelj\_ica in the town of \_urmanec and on the entire stretch to the north of \_urmanec, and also along the Krapin\_ica at the Krapina interchange,*
- *viaduct shaping,*
- *shaping tunnel openings and approaches to tunnels,*
- *in the Krapin\_ica valley, immediately after the Krapina interchange, the motorway crossing over the valley and the river must be solved by means of a viaduct,*
- *all excess material must be transported to the previously approved stockpiles,*
- *topsoil should be removed prior to construction and saved for reuse on embankment slopes for vegetation planting,*
- *during planting operations, care must be taken to use autochthonous and highly resistant species only,*
- *evergreen trees may be planted on the east side, while deciduous trees should be planted on the west side so as to allow passage of sun in winter time,*
- *plant species consumed by people or animals should not be planted along the road,*
- *in general terms, care should be taken to compensate for the loss of biologic mass of trees cut for the road by plating trees in the wider surroundings of the road,*
- *appropriate construction measures should be provided as protection in portions of the route that will be passing close to urban communities (19 settlements and hamlets exist along the road),*
- *effective control of any type of pollution that may occur on motorway after it is opened to traffic, including pollution control in accidental situations,*
- *all rainwater and water evacuated from the road and the surrounding terrain (slopes) should be collected and purified to the specified quality level.*

A4.2 The latest information from the Croatian authorities indicates that the final highway design has been prepared and that wherever possible, the above conditions have been included. No further design modifications are anticipated given that the designs have been approved by all relevant authorities and that all land acquisition for the proposed alignment has been completed.

## **A5 IFC Guidelines**

A5.1 The terms of the IFC Guideline No 20 'Roads and Highways' appear to have been satisfied through the preparation of the various environmental reports and reviews

that have been completed, plus the public consultation exercises which are reported to have been carried out.

## **A6 Environmental Management Plan**

- A6.1 Under the “Equator Principles”, there is a requirement for some Category B projects, as appropriate, to have prepared an Environmental Management Plan (EMP) to accompany the project development. It is usual best practice in such large scale projects highway projects (and others) to prepare an EMP and utilise the plan to control the environmental management and design of the project. From the literature that has been reviewed, there appears to be no mention of the preparation of an EMP, nor a requirement to provide such a Plan, under Croatian law.
- A6.2 It has been accepted by the Contractor that an EMP is to be prepared for the project, especially given the sectoral nature of the proposals. Good practice dictates that the design engineer prepares an EMP or has one prepared on their behalf, at the earliest stage of design. In addition, the tendering sub-contractors should be required to prepare an Outline EMP as part of their tender submissions, with the provision of the agreed completed Plan within one month of the successful tenderer commencing the project works.
- A6.3 Given the above, the implementation of the EMP will ensure that all facets of the Equator Principles have been met.