

## **COST**

Domain Committee "Transport and Urban Development"

### **COST Action (351)**

*Water Movement in Road Pavements and  
Embankments*

## **MONITORING PROGRESS REPORT**

*Period: from (Dec 2003)  
to (Dec 2006)*

This Report is presented to the relevant Domain Committee and contains two parts:

- I. **Management Report** prepared by the COST Office*
- II. **Scientific Report** prepared by the Chair of the Management Committee of the Action*

The report is a "cumulative" report, i.e. it is updated annually and covers the entire period of the Action.

Confidentiality: the documents will be made available to the public via the COST Action web page except for chapter *II.C. Self evaluation*.

Based on the monitoring results, the COST Office will decide on the following year's budget allocation.

## I. Management Report prepared by the COST Office



### I.A. COST Action Fact Sheet

- **COST Action** 351 - Water Movement in Road Pavements and Embankments
- **Domain** Transport and Urban Development

- **Action details:**

**CSO Approval:** (04/07/2002)

**End date:** (18/12/2006)

**Entry into force:** (12/06/2003)

**Extension:** (30/04/2007)

- **Objectives** This Action aims to increase the knowledge required for improving the highway performance and minimising the leaching of contaminants from roads and traffic.

- **Signatories:** list of countries and date of signature

<a href="#">Belgium</a>	11/06/2003
<a href="#">Croatia</a>	12/06/2003
<a href="#">Czech Republic</a>	21/04/2004
<a href="#">Denmark</a>	29/01/2004
<a href="#">Finland</a>	11/06/2003
<a href="#">France</a>	11/06/2003
<a href="#">Greece</a>	02/06/2004
<a href="#">Iceland</a>	01/07/2004
<a href="#">Norway</a>	29/01/2004
<a href="#">Poland</a>	29/01/2004
<a href="#">Portugal</a>	31/03/2004
<a href="#">Romania</a>	15/12/2004
<a href="#">Serbia and Montenegro</a>	21/04/2004
<a href="#">Slovenia</a>	11/06/2003
<a href="#">Spain</a>	08/10/2004
<a href="#">Sweden</a>	29/01/2004
<a href="#">Switzerland</a>	10/09/2003
<a href="#">United Kingdom</a>	29/01/2001

- **Intentions to sign:** none

- **Participating Institutes of non-COST countries:** none

**Chair: Mr. Andrew DAWSON**

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- **Action Web site:** <http://www.watmove.org>
- **Working Groups** (*list of WGs and name*)

- WG1 State-of-the-art, literature review.
- WG2 Modelling and monitoring of water flow and moisture within pavements and subgrades
- WG3 Environmental aspects of water in roads
- WG4 Performance related properties
- WG5 Final report and dissemination



### ***I.B. Management Committee member list***

Belgium	<a href="#">Mr. Eric VAN DEN KERKHOF</a> (retired from Committee)
Belgium	<a href="#">Professor Robert CHARLIER</a>
Croatia	<a href="#">Dr. Mate SRSEN</a>
Czech Republic	<a href="#">Dr. Karel POSPISIL</a> (replaced firstly by Mr Martin Vojtesek then by Roman LICBINSKY)
Denmark	<a href="#">Ms. Susanne BALTZER</a>
Finland	<a href="#">Mr. Antero NOUSTAINEN</a>
Finland	<a href="#">Mr. Rainer LAAKSONEN</a>
France	<a href="#">Mr. Pierre HORNYCH</a>
France	<a href="#">Mr. Denis FRANCOIS</a>
Greece	<a href="#">Professor Prodromos BEKIAROGLOU</a>
Greece	<a href="#">Mr. Antonios KALTSOUNIS</a> / Mr Nicholaos MICHAS
Iceland	<a href="#">Professor Sigurdur ERLINGSSON</a>
Iceland	<a href="#">Mr. Gunnar BJARNASON</a>
Norway	<a href="#">Mr. Torleif BAEKKEN</a>
Norway	<a href="#">Dr. Jostein AKSNES</a>
Poland	<a href="#">Mr. Cezary KRASZEWSKI</a>
Poland	<a href="#">Ms. Beata GAJEWSKA</a>
Portugal	<a href="#">Mr. Ricardo LACERDA</a> replaced by Mr Jose SANTINHO FAISCA
Portugal	<a href="#">Dr. Teresa LEITÃO</a>
Romania	<a href="#">Professor Virgil BREABAN</a>
Romania	<a href="#">Mrs. Paulica RAILEANU</a>
Serbia and Montenegro	<a href="#">Mr. Goran MLADENOVIC</a>
Serbia and Montenegro	<a href="#">Mr. Aleksandar KOSTADINOVIC</a>
Slovenia	<a href="#">Mr. PRIMOZ PAVSIC</a>
Slovenia	<a href="#">Mr. Mihael BRENCIC</a>
Spain	<a href="#">Mr. JOSE MIGUEL BAENA RANGEL</a> replaced by Angel MATEUS MORENO
Sweden	<a href="#">Professor Lennart FOLKESON</a>
Sweden	<a href="#">Dr. Åke HERMANSSON</a>
Switzerland	<a href="#">Mr. Cane CEKEREVAC</a>
Switzerland	<a href="#">Dr. Lyesse LALOUJ</a>
United Kingdom	<a href="#">Mr. Andrew DAWSON</a>
United Kingdom	<a href="#">Mr. Wyn LLOYD</a>



**I.C. Overview activities and expenditures  
2006 Budget**

**Total Action Budget**  
**Remaining Action**  
**Committment**

79000

23208

**Meetings**

Meeting Type	Date	Place	Cost	Total
Working Group	17/02/2006	Lausanne (CH)	1436	
Working Groups	20/04/2006	Brno (CZ)	11645	
Working Group	29/06/2006	London (GB)	3051	
Working Group	1/09/2006	London (GB)	2748	
Joint MC/WG	13/09/2006	Constanta (RO)	28071	
Working Group	10/11/2006	Brussels (BE)	3840	
				<b>50792</b>

**STSM**

Beneficiary	Date	From	Cost	Total
Mr Bertrand FRANCOIS	16/01/2006	Lausanne (CH)	1950	
Pr Robert CHARLIER	16/02/2006	B-4000 Liège 1 (BE)	1050	
Mr Jože Ratej	8/05/2006	Ljubljana (SI)	2000	
				<b>5000</b>

**Workshops**

Title	Date	Place	Cost	Total

**General Support Grants**

Title	Date		Cost	Total
				<b>0</b>

**Schools**

Title	Date	Place	Cost	Total
				<b>0</b>

55792

## ***II. Scientific Report prepared by the Chair of the Management Committee of the Action***

### ***II.A. Results achieved during 2006***

The decision had earlier been taken to prepare the work suitable for commercial publication as a kind of reference text leading from basic (and well-known) theory, analysis and technology to the most advanced activity in the topic area. Therefore the results achieved in 2006 are steps on the way to this final goal. In fact, late drafts of most of the chapters of the book were completed, with only one chapter in the early stages of drafting by the end of the year.

However, the reduction of funding in the first part of the year meant that the stage reached by December was that which we had hoped to reach by the early Autumn, thus concluding the writing of the text was not achievable and we asked for and were granted a 4 month extension. The original programme envisaged WG1 working throughout the 1<sup>st</sup> year and then completing its work with WGs 2, 3 & 4 completing their work about 6 months before the end of the project. In fact we have largely subsumed the work of WG1 into that of WGs 2, 3 and 4 as it proved easier for each of those teams to do their own literature survey work. This left WG1 only to deal with the questionnaire work, so this was delegated to the chair of WG1 and WG1 has hardly met as an independent WG but has largely been an ad-hoc grouping of the MC and the relevant WG chair to facilitate transfer of the questionnaire results to the relevant WG. WGs 2, 3 & 4 have largely worked according to the original timetable (except as already noted), with WG4 complete a little early in the revised time-scale and WG 2 & 3 will finish a little later than originally planned. However, their progress is satisfactory and will not prevent the work being completed on time.

A key scientific and technical outcome has been to bring together in one place, with appropriate linkages, descriptions of advanced analysis techniques with recent understanding of in-situ conditions obtained

- from the participating countries
- from one or two of the guest contributors to our earlier meetings and
- from the workshop held last year in Madrid under the auspices of COST.

The papers presented at the Madrid workshop have become a valuable resource for us to draw on allowing us to access the latest research findings from both those participating in the Action and from those from outside who attended.

Two surveys of practice (one on drainage of water and one on environmental aspects of water in the road environment) were completed by the WG1 chair with input from almost all of the MC members and

others and made available through the web-site ([www.watmove.org](http://www.watmove.org)). The content of these surveys of the state-of-practice is being inserted at various points into the book to be published, rather than as a stand-alone summary, so that they serve to illustrate the concepts being described.

We have continued to keep the original MoU goals under review. To ensure that they are met to the best of the team's ability, we have expanded the scope a little as reported last year. Another reason to do this is to allow the major final output, the new book on the subject, to be reasonably complete. Close adherence only to the original MoU's scope would not have permitted this. With this caveat we believe that all the objectives of the original MoU will be met either through the questionnaires available on the web-site, via the published book or via the final report to the COST Office.

## ***II.B. Dissemination of results***

- *Action related Publications and Reports* – due to the funding uncertainty in the first half of the year, it was not possible to publish a newsletter in 2006. No other publications had been planned by the Action. However, several of the members published (or are publishing) on behalf of the Action at national or international level (see Annex). In addition, work has continued on the editing and updating of the papers presented at the 2005 WIP workshop organized by the Action in Madrid. These are expected to be published in 2007 in the International Journal of Road Materials and Pavement Design.
- *Conferences and Workshops* – It was possible to hold a Workshop on the Action's findings to date at the Ovidius University of Constantza, in Romania. This was the first ever workshop held by a Transport domain Action in Romania and was attended by about 50 students and engineers. The programme is attached as an Annex.
- *Web site* – A web-site continues to operate at [www.watmove.org](http://www.watmove.org) and this has been advertised via Newsletters, notes on presentations, etc.
- *Scientific and Technical Cooperation*  
The Action continues to engage with the institutions represented by the members of the MC. In addition it has established links with some key international research centres in its field through past invitations of experts to address its MC meetings. Thus, in addition to University, Government Road Administration, National Research Centre and Geological Survey laboratories (for example) there are links with the Polytechnic University in Catalonia and with the University of New Hampshire in the US

(Home to the US Federal Highways Administration's Centre of Excellence in Recycled Materials Resources)

- *Transfer of results*

The transfer of results to practice is likely to become more noticeable once the outputs and recommendations are complete. However there have been presentations to at least five national road administration bodies by MC members and to other national road owner / researcher groupings (probably more). Notable amongst these is the one made to the Estradas de Portugal which will probably change the design of drainage systems in Portugal as a result of the Action's work.

The final dissemination is planned to include:

- A bulk purchase of the final book by the COST office for dissemination to Highway Chief Engineers (or equivalent) within the COST member states and to other key persons.
- Wide circulation of a key findings summary to many engineers and also to Professors of Highway Engineering to encourage purchase and use of the book.
- Seeking to publish the Final Summary Report in an easy-to-read fashion and to circulate widely at National level and via electronic means. The web-site is already collecting e-mail addresses of interested parties from across the world.

- *Contacts in the ERA*

The chairman is a member of the ROADEX project (an Interreg Research programme).

### ***II.C. Self evaluation***

The work of the team has been largely successful except for the delays that were primarily due to funding profile (as described in the previous section). The team has made excellent progress and produced some quality chapters for the chief output. Despite the uncertainty of funding we were able to arrange a workshop in an accession country which was very much appreciated by the COST country representative. The decision to aim for a commercial publication has 'skewed' the work a little from that originally envisaged, partly by supplementing the original work with additional coverage and partly because of the choice made of primary dissemination route. However, the MC is strongly of the opinion that this will substantially increase the accessibility of the findings of the Action (especially in the light of the rather poor experience some members of the MC had had in previous COST Actions). The counter argument that the necessity to purchase the book will, in fact, reduce the accessibility is to be addressed by publishing a brief, but attractive, final report that can be disseminated separately without breaking the terms of the publishing agreement made with the selected publishers.

## Annex 1 Programme of Constantza Workshop – 12<sup>th</sup> September 2006

Introduction to COST351, WATMOVE, A. Dawson  
COST Action 351: Water movement in Road Pavements and Embankments, M Zisenis  
Water Flow Theory, Measurement and Application to Highway Engineering, S Erlingsson  
Water Impact on Pavement Granular Materials' Behaviour (Constitutive modelling of unsaturated granular materials) C. Cekerevac & L. Laloui  
Contaminants in the Highway Sub-Surface – Principles, Experiences and Monitoring, M Brenčič  
Practical Design of Highway Drainage, J. Santinho Faisca  
Application of COST 351 work to Romanian situation, Prof. Radu Andrei  
Concluding comments, A. Dawson

*Presentations are visible at the Action's web-site*

## Annex 2 Publications of work by Action members

Dawson, A., Hill, A. & Boothroyd, P., "The Hydraulic and Geo-Environmental Behavior of the Sub-Pavement Environment", Geotech. Special Publ'n., No, 154, Am. Soc. Civil Eng'rs., Ed. by Huang, B., Meier, R., Prozzi, J. & Tutumluer, E., 2006, pp 287-295.

Guthrie, W.S., Hermansson, Å. & Woffinden, K.H., "Saturation of Granular Base Material Due to Water Vapor Flow during Freezing: Laboratory Experimentation and Numerical Modeling", Cold Regions Engineering 2006 — Current Practices in Cold Regions Engineering, American Soc. Civil Engineers, 2006.

Leitao, T., Internet publication at <http://www.dha.lnec.pt/nas>

Leitao, T., Brenčič, M. & Oliveira, M., "Evaluation of the efficiency of minimization methods in the protection of groundwater from road pollution negative impacts", abstract submitted to AIH Seminar, Lisboa, 2007.

Uthus, L., Hermansson, Å., Horvli, I. & Hoff, I., "A Study on the Influence of Water and Fines on the Deformation Properties and Frost Heave of Unbound Aggregates", Cold Regions Engineering 2006 — Current Practices in Cold Regions Engineering, American Soc. Civil Engineers, 2006.