ENVIRONMENTALLY FRIENDLY SYSTEMS TO RENOVATE SECONDARY ROADS.
LIFE-ENVIRONMENT PROJECT: KUKKIA CIRCLET

LIFE02 ENV/FIN/000329

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Contents:

Background

- inferior quality and frost damage of the gravel roads
- high costs of conventional renovation
- dangerous narrow road sides for the cyclists and pedestrians in the rural and sparsely populated areas (and high costs of conventional light traffic lane construction)
- environmental and increasing availability problems in connection with the non-renewable natural aggregates for the conventional road maintenance and renovation
- availability of large amounts of industrial by-products, feasible alternatives to the natural aggregates

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Figure 1

A gravel road in Luopioinen in 2002.

Note the bad frost damage

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Objectives

- Kukkia Circlet combines the know-how that has been obtained earlier during many different types of R&D projects on the use of industrial by-products in road construction.
- The project wishes to show that there are available new, controlled, sustainable and efficient road construction processes that will help the different European societies to maintain and renovate secondary roads.
- The project also wishes to help the elimination of the major restrictions to the utilisation of certain industrial by-products in the soil construction.
- The outcome will be the new sustainable methods and processes for the improvement of the secondary road network in Europe.
- In the long term the exploitation of the project results will significantly reduce the exploitation of non-renewable natural resources, the amount of waste and the need for deposit sites in Europe.
- The results can also be used in the work of European standardisation and legislation concerning the use of industrial by-products in construction.

Organisation

- The leading partner and co-ordinator of Kukkia Circlet is the Finnish Road Enterprise in Häme, Western Finland
- The main financiers are: EC Life-Environment and Finnish Road Administration, Häme Region (Finnra)
- Other partners and financiers are
  - Luopioinen Municipality
  - Council of Tampere Region
  - Finncao Oy
  - Georgia-Pacific Finland Oy
  - Kemira Oyj

- The main part of testing and follow-up as well as the planning of the new structures for the pilots have been subcontracted from Ramboll Finland Oy in Luopioinen (former: SCC Viatek, R&D-laboratory SGT)

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Project activities

- Kukkia Circlet project is testing the innovative processes to renovate gravel roads, and to construct groundwater protection and light traffic lane structures on the sides of the gravel roads.
- The special focus will be on the logistics, mixing and other work methods.
- The project will also assess the long-term properties, environmental impact and costs of the new applications in comparison with the conventional road structures.
- The focus of activities involve several tasks and pilot constructions that have been carried out during 2002 and 2003.
- Information about the progress of the project and the project results has been spread through the information media and with help of web-pages for the project: www.tieliikelaitos.fi/5_4.asp
- The final technical report on Impact Assessment and the Guide publication (available in 2005) will summarise all the know-how about the new renovation process and the special structures.

PILOT 2002

- Stabilisation of existing old structural courses with help of binder admixtures based on fly ash.
- This will improve the bearing capacity of the gravel road.
- This application has been implemented during the summer 2002

Figure 2: Mixing station for binder admixtures

Figure 3: Spreading of binder admixtures

Figure 4: Stabilisation with a milling cutter

Figure 5: Compaction

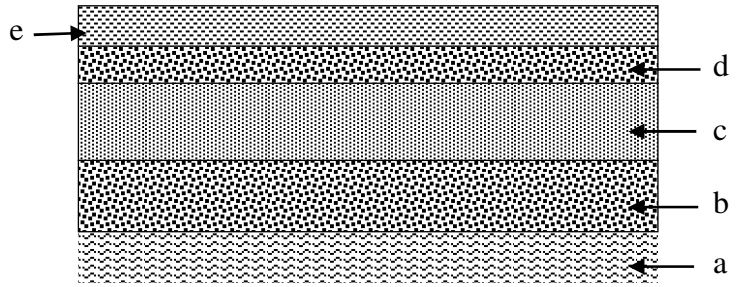
Figure 6: Covering course with filtercake-stabilised crushed stone

PILOT 2003 / 1

Renovation of a frost damaged road with help of fibre-ash structural road courses.

Implemented in Luopioinen in the summer 2003

TIEN PERUSKORJAUS KUITUTUHKARAKENTEELLA. PERIAATEKUVA
The principle of the road reconstruction with fibre-ash structural course



a. Pohjamaa / *Subsoil*
b. Vanha tierakenne / *Existing old road structure*
c. Kuitutuhka, 200 mm / *Fibre-ash, 200 mm*
d. Murske, 50 mm / *Crushed rock, 50 mm*
e. Suotokakkumurske, 50 mm / *Crushed rock with filtercake, 50 mm*

Figure 7: Principle of the structure

PILOT 2003 / 1

Renovation of a frost damaged road with help of fibre-ash structural road courses.

Implemented in Luopioinen in the summer 2003

Figure 8: Stack mixing of the fibre-ashes

PILOT 2003 / 1

Renovation of a frost damaged road with help of fibre-ash structural road courses.

Implemented in Luopioinen in the summer 2003

Figure 9: Planing and forming of supporting edges for the fibre-ash course

PILOT 2003 / 1

Renovation of a frost damaged road with help of fibre-ash structural road courses.

Implemented in Luopioinen in the summer 2003

Figure 10: Fibre-ash course is being compacted with a roller

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PILOT 2003 / 1

Renovation of a frost damaged road with help of fibre-ash structural road courses.

Implemented in Luopioinen in the summer 2003

Figure 11: The renovated section is covered with a filtercake-crushed aggregate mixture, and compacted

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PILOT 2003 / 2

Construction of a groundwater protection structure using fibreclay for the hydraulic barrier.

Implemented in Luopioinen in the summer 2003

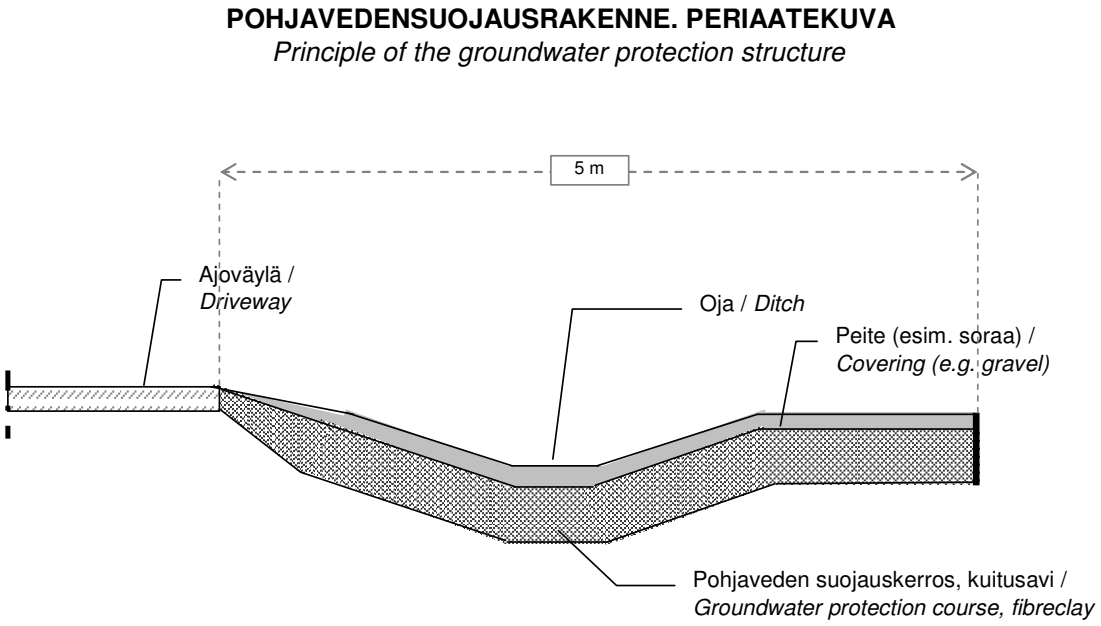

Figure 12: Principle of the gw-protection

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PILOT 2003 / 2

Construction of a groundwater protection structure using fibreclay for the hydraulic barrier.

Implemented in Luopioinen in the summer 2003

Figure 13: After removing of the soil the fibreclay is being spread to construct the hydraulic barrier

PILOT 2003 / 2

Construction of a groundwater protection structure using fibreclay for the hydraulic barrier.

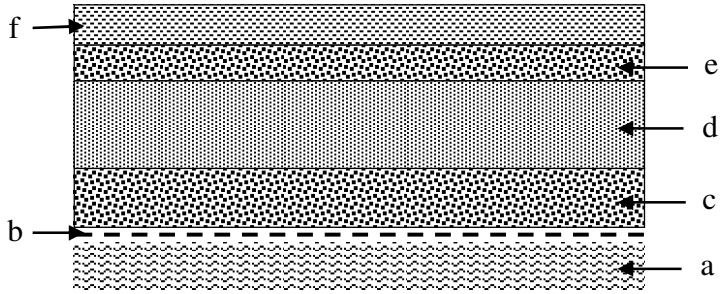
Implemented in Luopioinen in the summer 2003

Figure 14: The hydraulic barrier course is covered with the original soil material from the site

PILOT 2003 / 3

Construction of light-traffic lanes with fibre-ash structural courses

Implemented in Luopioinen in the summer 2003



a. Pohjamaa, turve / *Subsoil, peat*
b. Vahvistekangas / *Geotextile, reinforcement*
c. Murske, 100 mm / *Crushed rock, 100 mm*
d. Kuitutuhka, 150 - 200 mm / *Fibre-ash, 150 - 200 mm*
e. Murske, 50 mm / *Crushed rock, 50 mm*
f. Suotokakkumurske, 50 - 70 mm / *Crushed rock with filtercake, 50 - 70 mm*

Figure 15: Principle of the structure for light-traffic lanes

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PILOT 2003 / 3

Construction of light-traffic lanes with fibre-ash structural courses

Implemented in Luopioinen in the summer 2003

Figure 16: One of the lanes was constructed on soft (peat) soil; therefore the first tasks were to preload the site some months before the construction

PILOT 2003 / 3

Construction of light-traffic lanes with fibre-ash structural courses

Implemented in Luopioinen in the summer 2003

Figure 17: The light-traffic lane with edge supports and the fibre-ash course after compaction

PILOT 2003 / 3

Construction of light-traffic lanes with fibre-ash structural courses

Implemented in Luopioinen in the summer 2003

Figure 18: The light-traffic lane (and the fibre-ash course) covered with crushed aggregate mixed with filter cake

PILOT 2003 / 4

Construction of safety lanes for the light traffic with fibre-ash structural courses and geo-reinforce-ment.

Implemented in Luopioinen in the summer 2003

PIENNARLEVENNYS. PERIAATEKUVA
The principle of the Safety Lane's structure

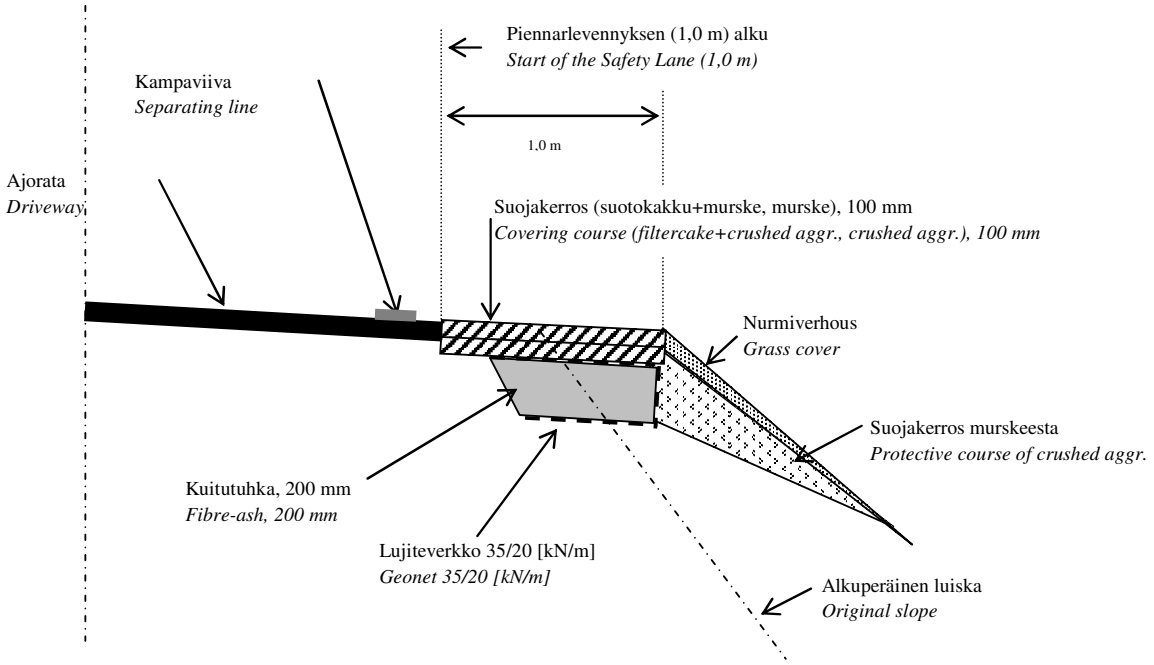

Figure 19: Principle of the safety lane structure

PILOT 2003 / 4

Construction of safety lanes for the light traffic with fibre-ash structural courses and geo-reinforce-ment.

Implemented in Luopioinen in the summer 2003

Figure 20: For smaller quantities the scoop mixing is adequate

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PILOT 2003 / 4

Construction of safety lanes for the light traffic with fibre-ash structural courses and geo-reinforce-ment.

Implemented in Luopioinen in the summer 2003

Figure 21: The road sides have been opened and planed for the geonet and fibre-ash course

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PILOT 2003 / 4

Construction of safety lanes for the light traffic with fibre-ash structural courses and geo-reinforce-ment.

Implemented in Luopioinen in the summer 2003

Figure 22: Fibre-ash is being spread over the geonet. Note the metal plate support for a steep road edge.

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PILOT 2003 / 4

Construction of safety lanes for the light traffic with fibre-ash structural courses and geo-reinforce-ment.

Implemented in Luopioinen in the summer 2003

Figure 23: The fibre-ash course is covered thinly with crushed aggregate, and the safety lane can be compacted

KUKKIA CIRCLET / LIFE02 ENV/FIN/000329 (30)

PILOT 2003 / 4

Construction of safety lanes for the light traffic with fibre-ash structural courses and geo-reinforcement.

Implemented in Luopioinen in the summer 2003

Figure 24: Finally the safety lane is covered with filtercake-stabilised crushed aggregate and compacted for the finish. The final touch will be given with separating marks in the summer 2004

Finnish Road Enterprise