PROTECTION PAR GÉOMEMBRANE BITUMINEUSE DE CHAMPS CAPTANTS

WELLFIELD PROTECTION BY BITUMINOUS GEOMEMBRANE SYSTEM

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RÉSUMÉ

L'eau potable pour alimenter la ville de Metz vient en grande partie de puits pompant cette eau dans les alluvions de la Moselle. Dans cette zone de captage, des ruisseaux collectent les eaux pluviales sur des terres agricoles ou des surfaces étanches de routes et places polluées par la circulation routière. L'imperméabilisation de ces ruisseaux par une géomembrane bitumineuse a permis de protéger de la pollution des ruisseaux la nappe exploitée.

ABSTRACT

A large proportion of the water supply to the city of Metz comes from wells in the Moselle alluvium, where drainage ditches collect runoff from agricultural land, impervious road surfaces and other places contaminated by road traffic. The application in these ditches of a bituminous geomembrane has permetted to isolate these polluted ditches from the water table.

Vue d'ensemble d'un des ruisseaux étanché par une géomembrane bitumineuse / *General view of one of the ditches waterproofed with a bituminous geomembrane*

1 SITUATION

A large proportion of the water supply to the city of Metz comes from wells in the Moselle alluvium, north of the city, where drainage ditches discharging eastwards into the Moselle river collect runoff from agricultural land, impervious road surfaces and other places contaminated by road traffic. It was therefore important to isolate these ditches from the water table.
The Metz Water Department invited Burgeap to report. Their recommendation was to render the channels watertight within a certain radius from the wellfield.
DDAF provided the tendering procedure and works supervision services. It was decided to use a bituminous membrane manufactured under the name Coletanche by Brunet, a subsidiary of Colas-Est.

2 JOB

The FFr4.7 million budget for the project was split equally between improving old ditches and digging new ones, aggregating 2.8km over five ditches.
Weeds, shrubs, soil and mud were cleaned out by shovel before regrading the channels and laying a total of 30,000 m^2 impervious bituminous geomembrane, overlain in places by hollow concrete slabs (14,000 m^2 total). The work took six months, to early June 1994.

3 TYPICAL CROSS SECTION

The cross section in Figure 1 illustrates the simplicity of the design. The channel is 1.50m deep with sides sloping 1/1. At the top, there are plastic drains on both sides to prevent uplift pressures, with vents at 30m intervals, screened to prevent ingress of rodents.
In poor bearing ground, the channel is deepened 40cm to take a bed of limestone gravel, and a 290 g/m^2 geotextile is laid under the geomembrane. The bituminous geomembrane is laid on the graded ground and turned into 50cm by 50cm chases at the top, dug by a small shovel. Finally, a 1.50m plastic warning mesh is laid.
Joints with concrete are welded, with stainless steel clamp bar over.
10cm thick, 50cm square hollow concrete slabs weighing 30kg each are laid over the geomembrane for protection in many places (Photo 2).

4 BITUMINOUS GEOMEMBRANE

On straight sections, the 4m-wide roll of Coletanche NTP1 membrane was unwound from a dispenser carried by a mechanical shovel and run along the channel bottom, extending 1.25m outwards on each side.
Transverse panels cover the membrane at the bottom of the slope to provide a continuous seal. The geomembrane was laid in transverse panels on curves.
In both cases, the geomembrane was laid with the polyester facing uppermost to prevent penetration by plant roots. Seaming had to be with done Shell Tixophalte cement rather than by hot seaming in wet conditions.

5 SPECIAL ITEMS

An inverted siphon had to be built where the horizontal cast iron pipeline from the wellfield crossed a ditch.

6 GEOMEMBRANE PROTECTION

The concrete slabs protect the geomembrane (i) by their dead weight, preventing heave from changes in the water table, and (ii) by enabling plants growing in the hollows to be cut without damaging the membrane.

7 MUD AND SOIL

The mud and soil originally removed was analysed and spread on the banks of the renovated ditches in 30cm layers, 6m wide. They are expected to fertilise the soil, enabling plants to re-establish more quickly.

8 CONCLUSION

This example of protecting a wellfield supplying domestic water to the city of Metz by means of bituminous geomembrane, by isolating drainage ditches exposed to the usual chronic pollution offers many useful lessons. The salient points are:

- the simplicity of the waterproofing system, the geomembrane being laid directly (i.e. without a geotextile underlay) on the ground, with hollow concrete slabs laid directly on top,
- the ease with which the work was conducted, including the provision of good joins with the concrete structures,
- the excellent impermeability of the ditches, which completely protects the water table,
- ease of successfully repairing any future damage,
- low cost,
- intrinsic qualities of the hollow slabs, which besides being easy to lay and providing good protection to the waterproofing system, allow grass and other plants to grow, improving appearance and promoting wastewater biodregradation.

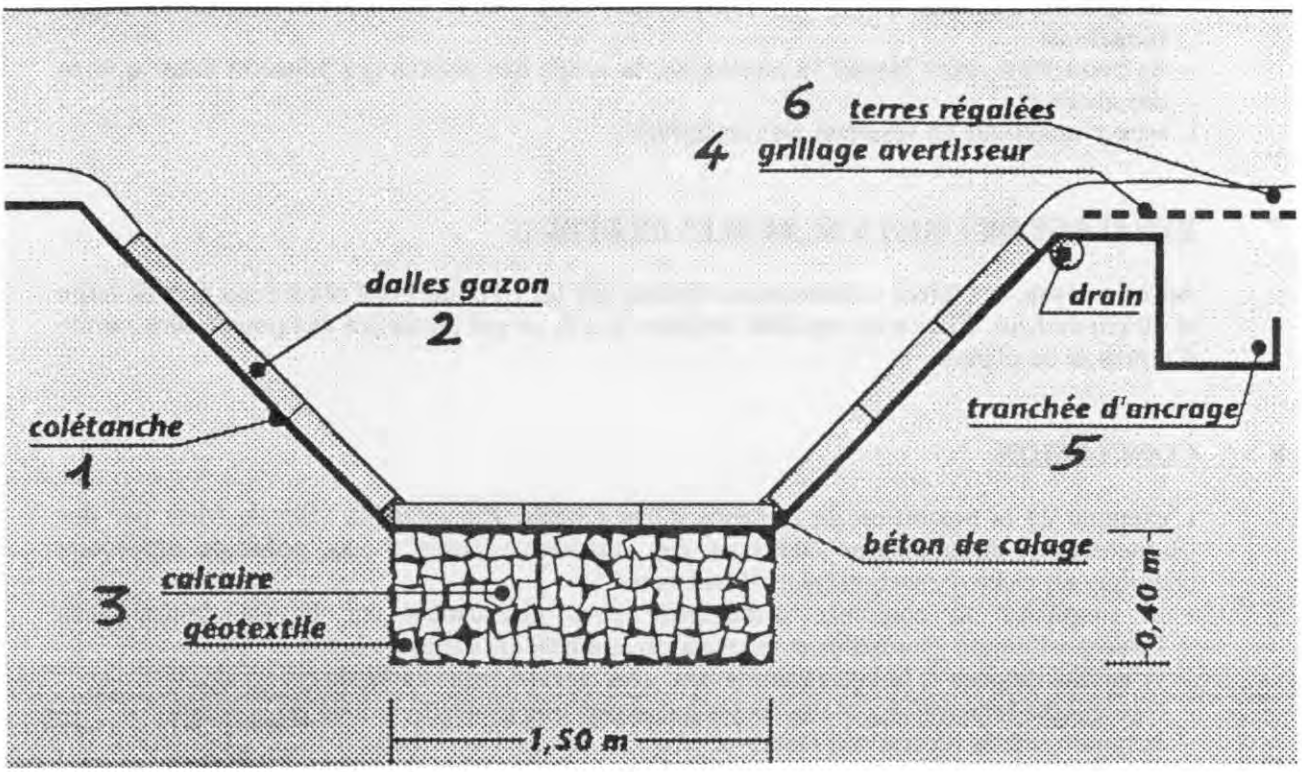

FIGURE 1

TYPICAL CROSS SECTION

1 - Bituminous geomembrane
2 - Hollow slabs
3 - Limestone gravels
4 - Warning mesh
5 - Anchoring trench
6 - Removed soil spred on banks

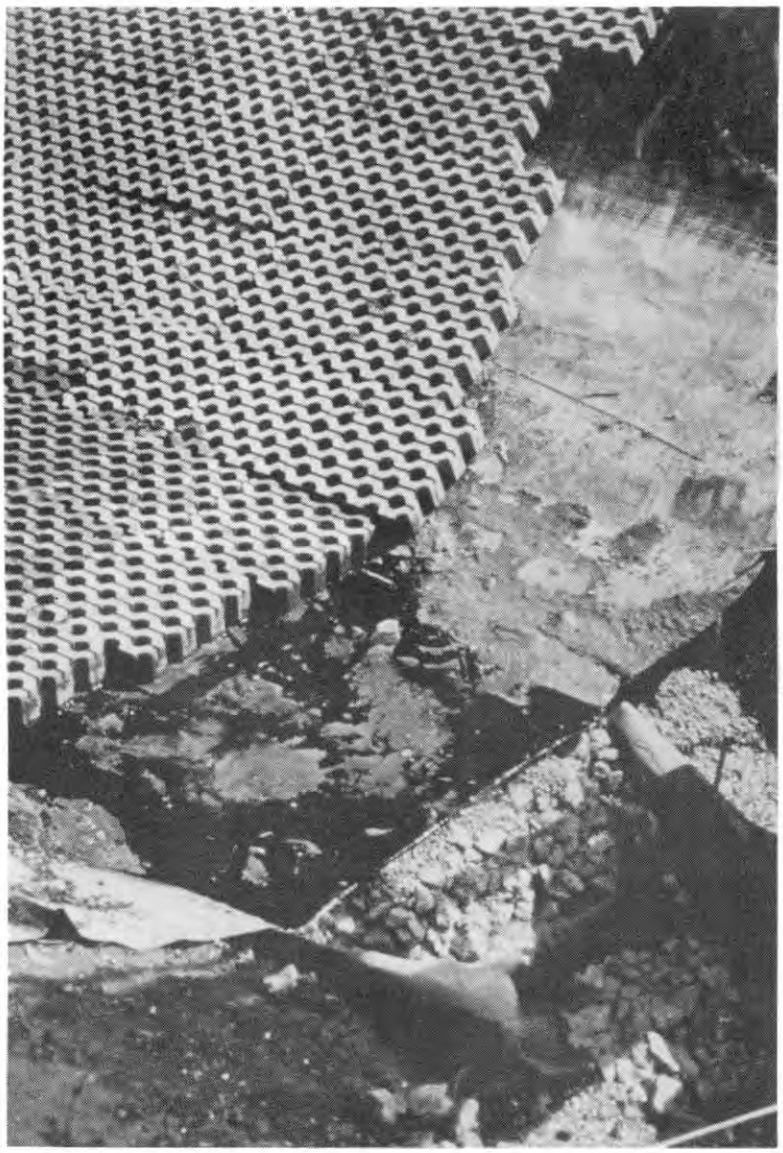

Photo 1
Coupe d'une section courante
Typical section

Photo 2

Vue d'ensemble d'un des ruisseaux avec géomembrane, drain, grillage avertisseur et dalles alvéolées

General view showing ditches, geomembrane, drain, warning mesh and hollow slabs