

## Upgrading of a pond sewage system of a rural village with a constructed wetland.

The goal was to upgrade and extent an existing pond sewage system for 600 inhabitants to a state-of-the-art sewage plant for 1000 inhabitants, without external energy and with low operational costs.

The cleaning efficiency for COD and Ammonia is from 90-95 % degradation.



### Aerial view:

After having passed sedimentation and oxydation ponds, the effluent is led to a collecting pond within the reed bed and distributed from here evenly on top of the reed bed, by means of specially designed valves.

After treatment in the filter, the water is collected by drainpipes at the bottom of the soil filter and led to the receiving stream, and from there into a lake.



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### Modernization of KA Goosefeld in 2001:

After thorough planning and preparation in May 2001 the earthworks for the constructed wetland were started.

In September 2001, after 4 months of construction time, the facility was put into operation.

One of the biggest systems of this kind in Germany is working since then with high efficiency and very low operational costs.



### A lot of biology

As there is no electrical energy involved, the filter works after the rhythm of the hydraulic-mechanical feeding system.

As a by-product, the diversity of the landscape has been enhanced greatly, and the reed bed acts as biotope for waterfowl and amphibian animals.

## **Extension of a pond sewage plant by a constructed wetland using natural slope gradient at Goosefeld (Germany)**

### General information:

Goosefeld and other rural villages lie within the watershed of the Wittensee, a formerly mesotrophic lake, that has gradually turned into an eutrophic lake.

In order to stop this process the water authorities put up a program to minimize inputs of municipal and private sewage effluents into the lake.

The project of extending the Goosefeld sewage plant with a constructed wetland is part of this program and was financially supported by the EU.

For the local decision makers important aspects were to maintain a system that was simple, efficient, easy to handle, and moderate in costs. It was explicitly wished to have a system that would work without external energy, using natural slope gradient.

The system was put in operation in September 2001, and has been working successfully since then.

### Client:

Gemeinde Goosefeld

### Planning and supervision:

N.A.T. Ingenieurökologisches Planungsbüro, Langebrückstr. 24, D 24340 Eckernförde

### Period of planning:

September 1999 – Dezember 2000

### Period of construction:

2. 5. 2001 – 26. 9. 2001

### Main characteristics:

Designed for 1000 p. e.;

Combined sewage system

Pretreatment: 1 sedimentation pond, and 3 Oxy-ponds

Area of constructed wetland: 2 750 m<sup>2</sup>

Area per p.e.: 2,75 m<sup>2</sup>

Type of system: vertical flow system

Depth of filter: 85 cm

Volume of filterbody: 2337,5 m<sup>3</sup>

Substrat: mainly washed sand 0-4 mm

Permeability (K<sub>f</sub>-Value): 6 x 10<sup>-4</sup>

Plants: 8000 *Phragmites australis*

Intermittent feeding on filter surface by means of a hydraulic-mechanical feeding pipe system

### Pipes:

Materials used: exclusively PE-HD

Manifolds: diameters 300 and 100

Drainpipes: diameter 100

### Wells:

1 effluent distribution building concrete  
3 control wells concrete  
6 control wells PE-HD

### Diversa:

Sealing of constructed wetland and ponds with PE-liner 1,0 mm  
Segmentation of different compartments of reed bed with liner PE 2,0 mm  
Flow meter nivus pcm 3  
Access road: 280 m length  
Crossing (culvert) of a stream  
Planting of hedges and trees

### Costs:

250.000.- EUR  
(250.- EUR per person equivalent).

### Performance data since implementation in Sept. 2001

(ca. 100 datasets; measured in mg/l)

	CSB	Total-P	NH <sub>4</sub> -N	NO <sub>3</sub> -N	Total-N
Average Influent	200	3,4	17,8	3,5	21
Average Effluent	20	0,7	1,7	5,5	7,2

### Hygienics:

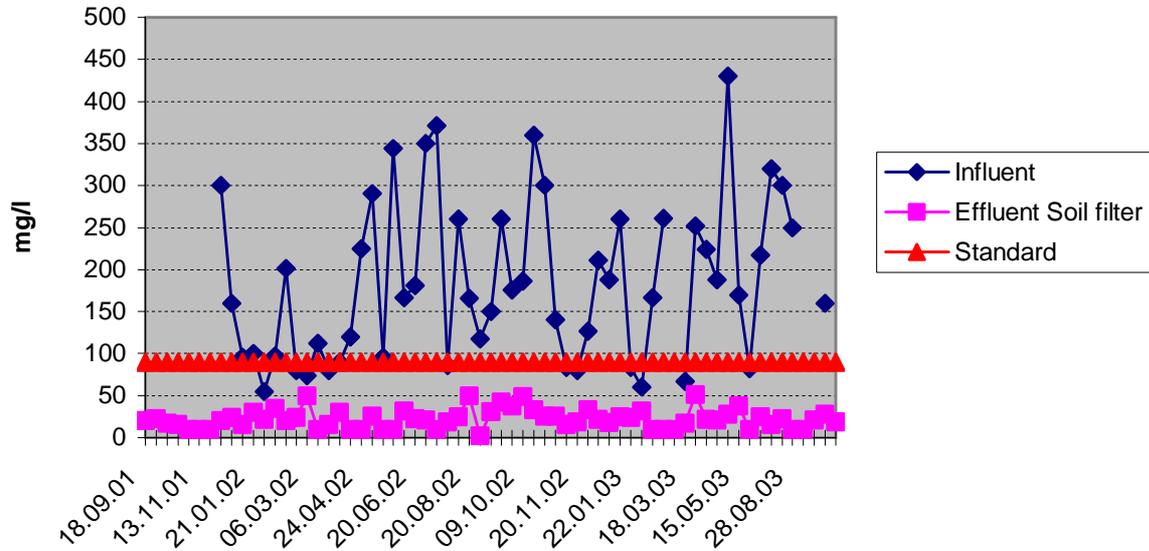
In 2007 Colibacteria and Enterococca concentration of the Goosefeld reed bed system were tested, as all water runs to a lake, that is used for recreational purposes.

Results: There were no significant concentrations of faecal bacteria found in the effluent and the water has been classified as "swimming water quality".

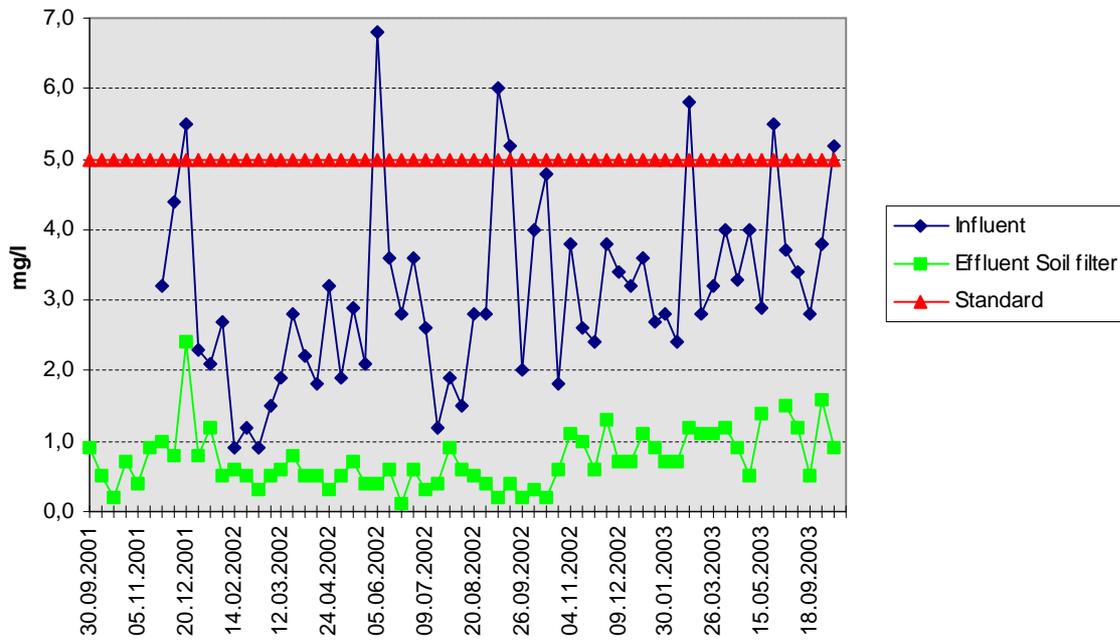
### Amount of wastewater treated:

Average amount: 495 m<sup>3</sup>/day, ranging from 50 m<sup>3</sup>/day to 1500 m<sup>3</sup>/day.  
This is an average hydraulic loading of 175 l per m<sup>2</sup> reed bed per day.

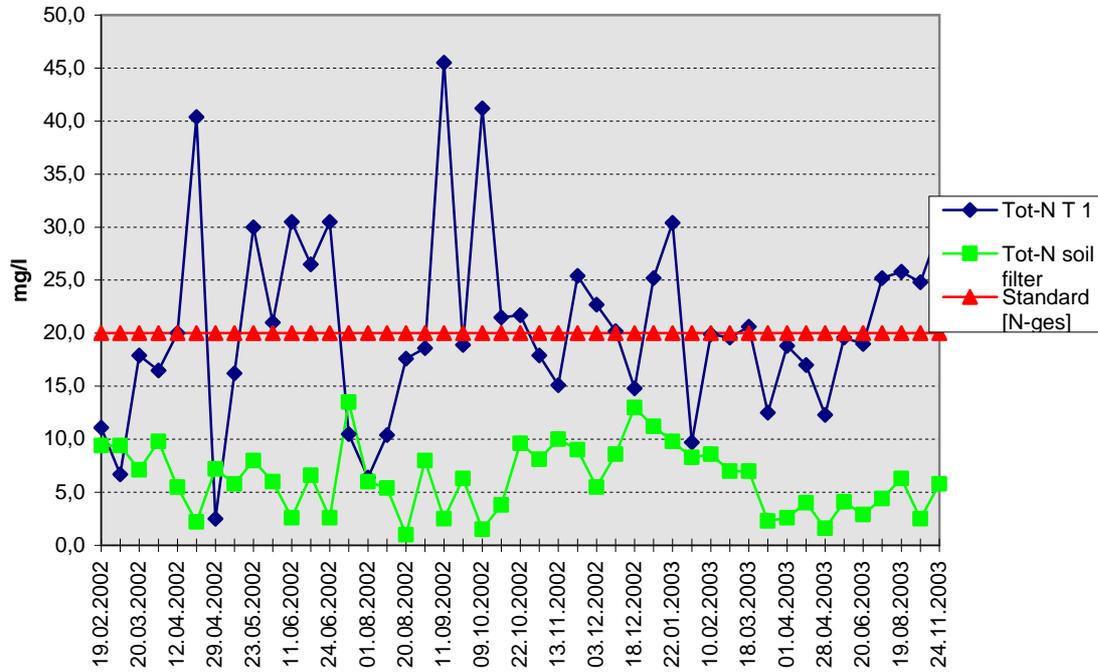
### COD KA Goosefeld



### KA Goosefeld P Ges.



### KA Goosefeld Tot-N



### KA GOOSEFELD NH4-N

