

May 18, 2004

2004 National Monitoring Conference

Water Quality Data Management

Monitoring, evaluating, analyzing
and presenting data
using WISKI-WQM



EU - WFD

Main objectives:

- water protection of all waters
- good status within 16 years
- water management based on river basins
- combined approach
- sustainable water resources management



EU - WFD

Complex management tasks:

- water quality data **management**
- **monitoring** of all water bodies
- combined water quality and quantity data **analysis**
- **assessment** of current water body status
- **presentation** of results

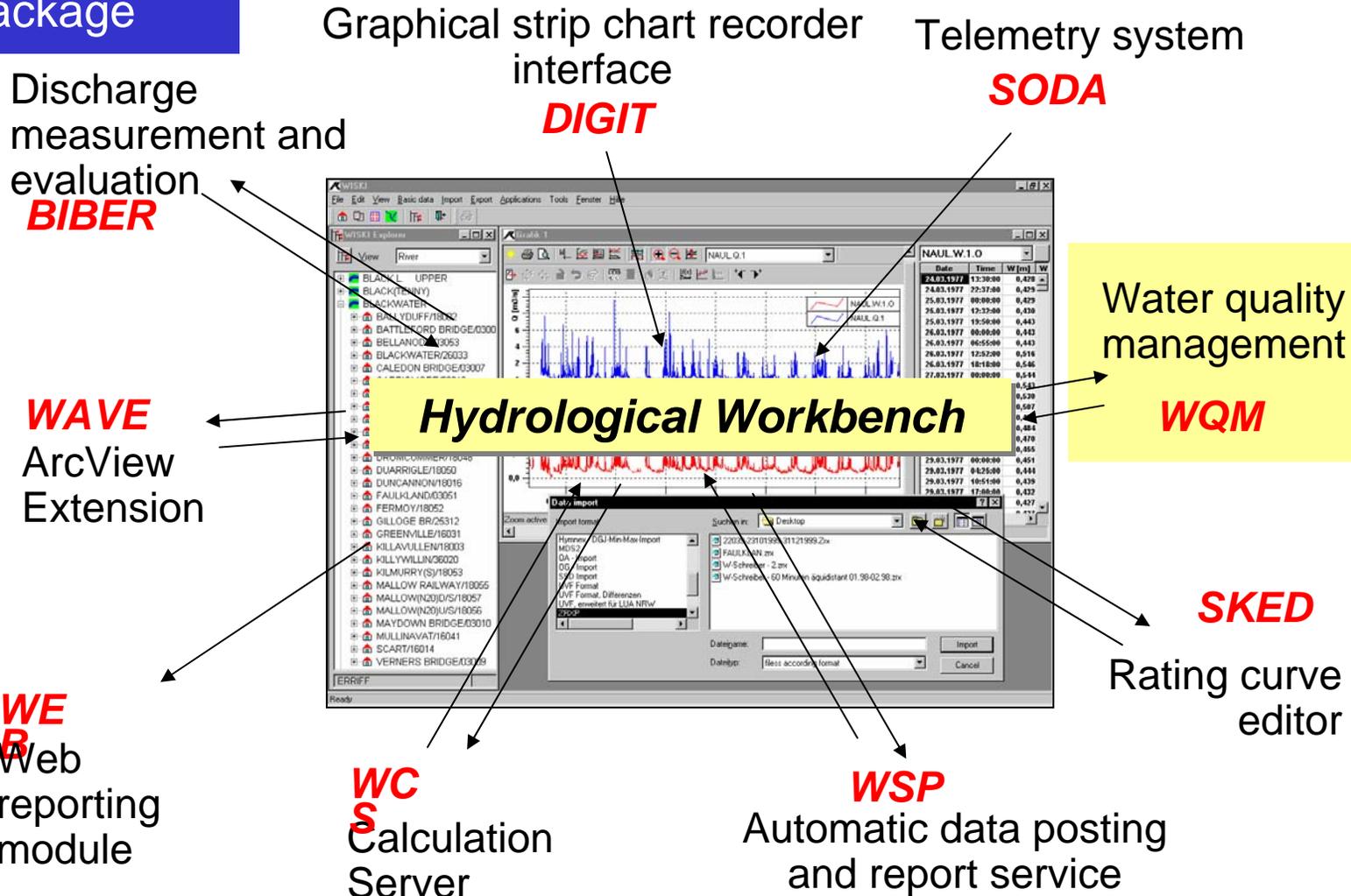
Idea

- Supporting all tasks by advanced software
- Combining software for water quality and quantity management
- **W**ater management **I**nformation **S**ystem **K**ISTERS for water quantity management
- Extending by water quality module
- R&D project in cooperation with a German environment agency and a river agency

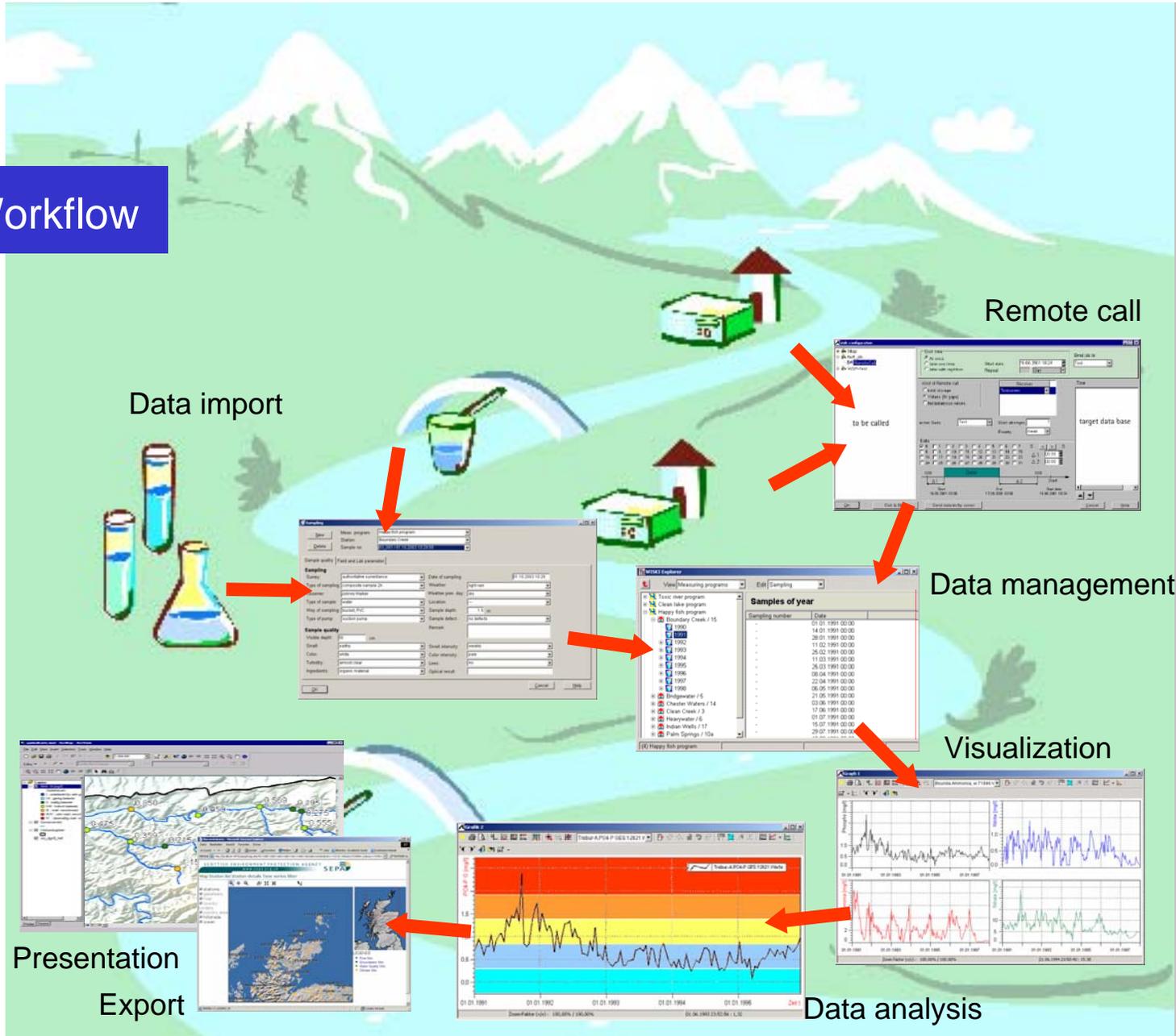
WISKI-Key features

- Continuous dataflow from data acquisition and import to report generation and data dissemination in one system
- Hydrological data are managed in intelligent time series
- Analysis tools based on international standards
- Automatic processing tools
- Client-Server-Architecture
- Complete Windows 32-bit application
- Integration possible within existing database environment

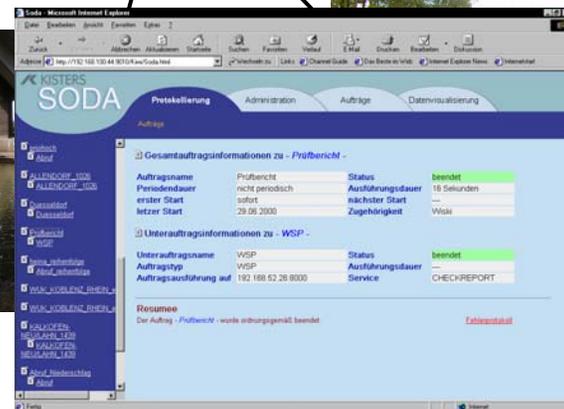
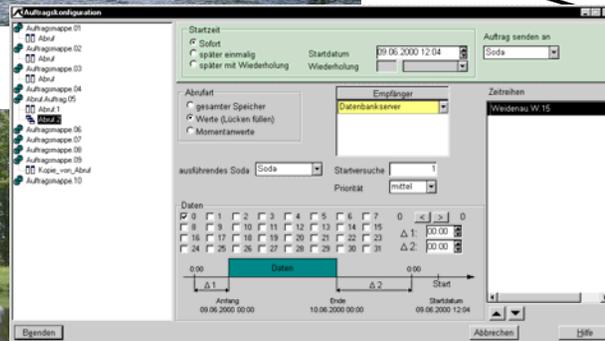
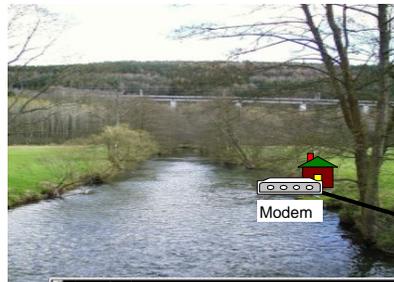
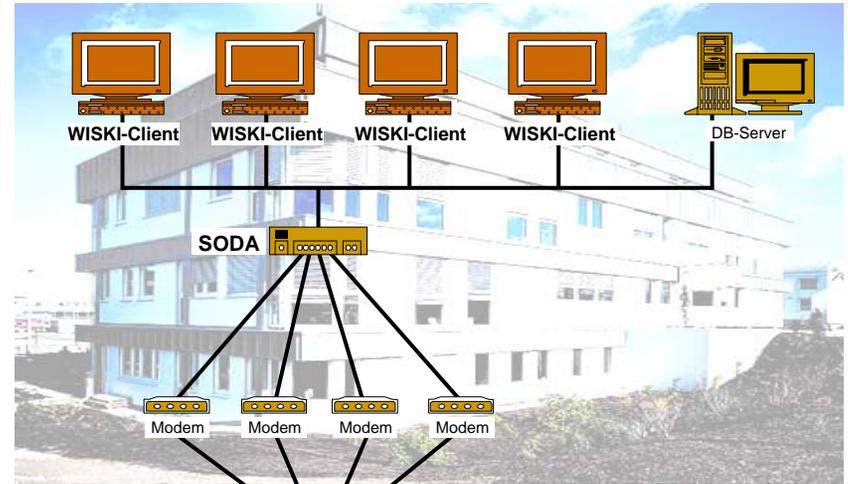
WISKI-Package



WISKI-WQM Workflow



Data remote call



Data import

Sample Selecting Measuring program/ Site/ Sampling

The screenshot shows a software window titled 'Sampling' with a blue title bar. On the left, there are 'New' and 'Delete' buttons. The main area contains several dropdown menus and text boxes. A red box highlights the 'Meas. program', 'Station', and 'Sample no.' dropdowns. Another red box highlights the 'Field and Lab parameter' dropdown. Below these, there are sections for 'Sampling' and 'Sample quality' with various input fields.

Field	Value
Meas. program	Happy fish program
Station	Boundary Creek
Sample no.	03_001 / 01.10.2003 10:29:55
Sample quality	Field and Lab parameter
Survey	authoritative surveillance
Date of sampling	01.10.2003 10:29
Type of sampling	composite sample 2h
Weather	light rain
Observer	Johnny Walker
Weather prev. day	dry
Type of sample	water
Location	---
Way of sampling	bucket, PVC
Sample depth	1.5 m
Type of pump	suction pump
Sample defect	no defects
Remark	
Visible depth	50 cm
Smell	earthy
Smell intensity	weakly
Color	white
Color intensity	pale
Turbidity	almost clear
Lees	no
Ingredients	organic material
Optical result	

Buttons: OK, Cancel, Help

Manual import

Data import

The screenshot shows the 'Sampling' software window with the following settings:

- New** button:
- Delete** button:
- Meas. program:** Happy fish program
- Station:** Boundary Creek
- Sample no.:** 03_001 / 01.10.2003 10:29:55
- Sample quality:** Field and Lab parameter
- Parameter list:** Nutrients (water), Heavy Metals (water)
- Detection limit:** [empty]
- Comp. list 1:** [empty]
- Comp. list 2:** [empty]

on limit	Chemical list (level II)	Lab	Analysis method	Sample preparation
	0.10 <= 1.00	[empty]	[empty]	[empty]
	4.00 <= 8.00	[empty]	[empty]	[empty]
		Laboratory ABC	Arsenic, EN ISO 11969 : 1996/D18 (Hydr	filtration, fluted filter
		Laboratory 123	Determination of metal with AAS-flame	sedimentation
		Laboratory xyz		homogenisation, Ultraturax

Buttons:

Manual import

Data import

Import from spreadsheets

	A	B	C	D	E	F	G	H	I
1	Date	Sample ID	TDP	TP	MRP	TDN	NO3-N	NH4-N	
2			µg/l	µg/l	µg/l	mg/l	mg/l	mg/l	
3	27.12.2003 09:45	BF03/1DD/154	65	160	21	16.3	13.2	0.05	
4	27.12.2003 10:45	BF03/1DD/155	65	160	21	16.3	13.2	0.05	
5	30.12.2003 15:45	BF03/1DD/156	43	64	15	15.5	12.7	0.05	
6	05.01.2004 02:30	BF03/1DD/239	22	59	6	14	13.6	0.05	
7	05.01.2004 06:30	BF03/1DD/240	30	41	16	14.9	14.4	0.05	
8	05.01.2004 10:00	BF03/1DD/241	71	310	40	10.1	8.8	0.05	
9	08.01.2004 12:00	BF03/1DD/242	72	430	37	8.52	7.9	0.05	
10	08.01.2004 12:30	BF03/1DD/243	73	310	37	9.06	8.4	0.05	
11	08.01.2004 13:00	BF03/1DD/244	68	100	34	8.10	7.9	0.05	
12	08.01.2004 15:00	BF03/1DD/245	64	340	32	8.22	7.8	0.12	
13	08.01.2004 20:30	BF03/1DD/247	50	160	21	9.19	8.8	0.05	
14	09.01.2004 09:00	BF03/1DD/248	35	95	13	9.61	9.4	0.05	
15	11.01.2004 08:00	BF03/1DD/376	66	130	19	10	8.8	0.05	
16	11.01.2004 16:15	BF03/1DD/377	56	100	13	8.73	8.8	0.05	
17	12.01.2004 03:15	BF03/1DD/378	53	110	12	10.3	8.9	0.05	
18	12.01.2004 11:15	BF03/1DD/379	65	210	27	8.95	7.3	0.05	

- Configurable csv-importer

- Control files

- Mapping lists (WQ sites, parameters)

- Import of measured values, detection limits, signs

Import from laboratory information management systems (LIMS)

- XML-importer
- Automatic import
- Import of qualitative data
- Import of measured values, detection limits, signs

```
- <QualityData>
- <Sample>
  <StationNumber>sw1</StationNumber>
  <!-- Stationnummer (eindeutig) -->
  <Number>2000</Number>
  <!-- Nummer -->
  <MeasurementProgram>webstoffe</measurementProgram>
  <!-- Name des Messprogramms -->
  <DateTis>
    <Value>1994-12-31 13:07:00</value>
    <!-- Zeitpunkt der Probenahme -->
  </DateTis>
  <Sampling>
    <medium>Wasser</medium>
    <!-- Probenart -->
    <observer>Hugo Schmitz</observer>
    <!-- Probenehmer -->
    <placeofSampling>von Brückenmitte</placeofSampling>
    <!-- Probenahmestelle -->
    <denhofSamnling>3.1</denhofSamnling>
```

Data Management

View mode „Measuring pr

Edit mode „Sampling“

The screenshot shows the WISKI Explorer application window. The left pane displays a tree view of programs and locations. The right pane shows a table titled "Samples of year" with columns for "Sampling number" and "Date". The "View" dropdown is set to "Measuring programs" and the "Edit" dropdown is set to "Sampling".

Sampling number	Date
-	01.01.1991 00:00
-	14.01.1991 00:00
-	28.01.1991 00:00
-	11.02.1991 00:00
-	25.02.1991 00:00
-	11.03.1991 00:00
-	25.03.1991 00:00
-	08.04.1991 00:00
-	22.04.1991 00:00
-	06.05.1991 00:00
-	21.05.1991 00:00
-	03.06.1991 00:00
-	17.06.1991 00:00
-	01.07.1991 00:00
-	15.07.1991 00:00
-	29.07.1991 00:00

Sampling access

Data Management

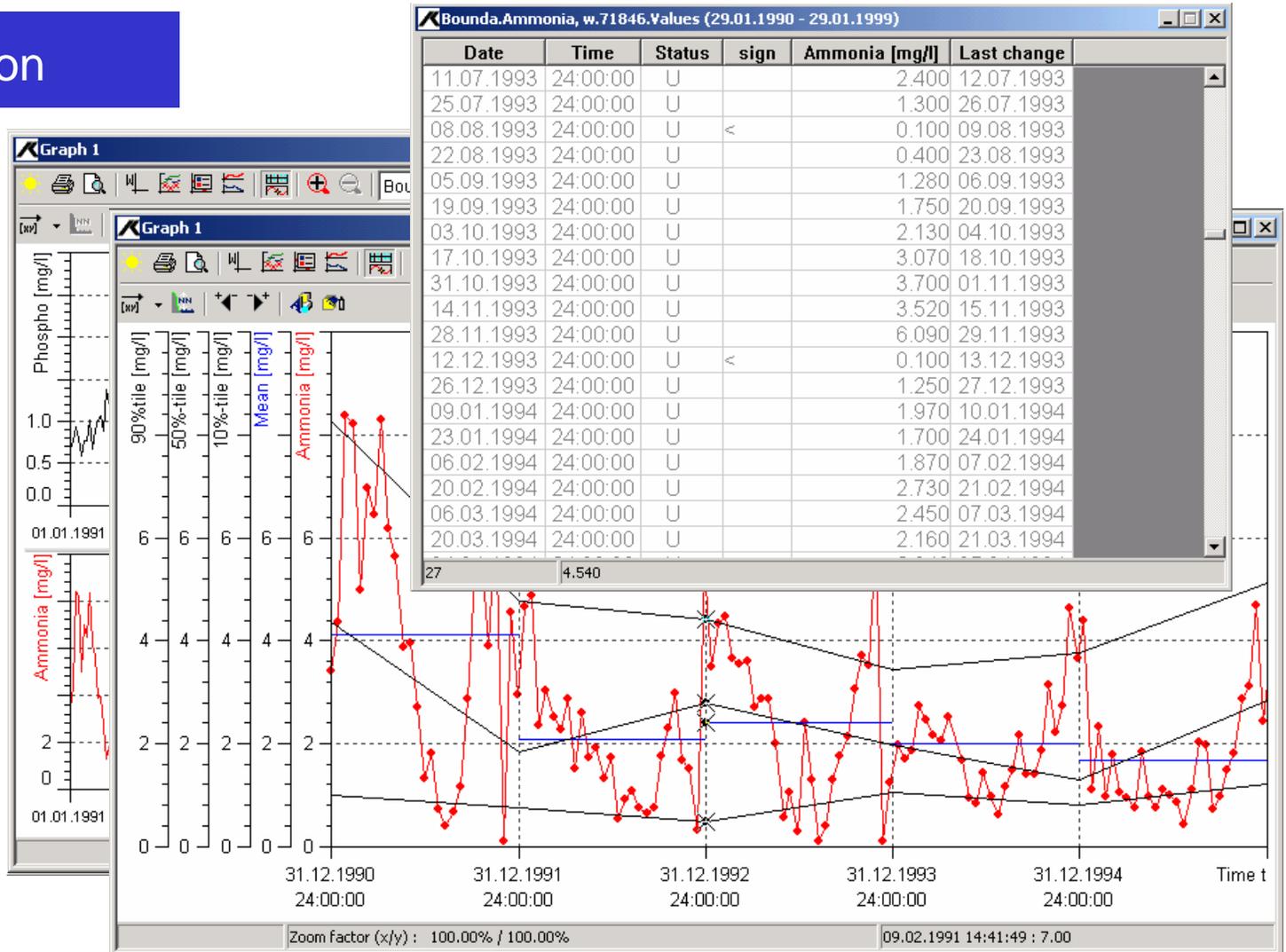
View mode „Station types“ Edit mode „Sample parameter“

The screenshot shows the WISKI Explorer application window. The left pane displays a tree view of station types, with 'Boundary Creek/15' selected. The right pane shows the 'Time series of sample parameter' table. The table has three columns: 'Time series', 'Data from', and 'Data to'. The data rows are as follows:

Time series	Data from	Data to
Bounda.Ammonia, w.71846. %-tile	01.01.1991	01.01.1998
Bounda.Ammonia, w.71846.Values	29.01.1990	29.01.1999
Boundary .Ammonia, w.71846.Fra		
Boundary .Ammonia, w.71846.Max		
Boundary .Ammonia, w.71846.Min		
Boundary.Ammonia, w.71846.Stat	01.01.1991	01.01.1998

Time series access

Visualization



Data Analysis

Time series of sample parameter		
Time series	Data from	Data to
Bounda.Ammonia, w.71846.%-tile	01.01.1991	01.01.1998
Bounda.Ammonia, w.71846.Values	29.01.1990	29.01.1999
Boundary .Ammonia, w.71846.Fra		
Boundary .Ammonia, w.71846.Max		
Boundary .Ammonia, w.71846.Min		
Boundary.Ammonia, w.71846.Stat	01.01.1991	01.01.1998

Mean values $\bar{x} = \frac{1}{n} \cdot \sum_{i=1}^n x_i$

Standard deviations $s = \sqrt{\frac{1}{n} \cdot \sum_{i=1}^n (x_i - \bar{x})^2}$

Extreme values
 Min = $\min(x_i)$
 Max = $\max(x_i)$

Loads $F_{Jahr}^E = \frac{364 \cdot 86400}{1000 \cdot 1000} \cdot \frac{1}{n} \sum_{i=1}^n c(t_i) \cdot Q(t_i)$

Data Analysis

Time series of sample parameter

Time series	Data from	Data to
Bounda.Ammonia, w.71846. %-tile	01.01.1991	01.01.1998
Bounda.Ammonia, w.71846.Values	29.01.1990	29.01.1999
Boundary .Ammonia, w.71846.Fra		
Boundary .Ammonia, w.71846.Max		
Boundary .Ammonia, w.71846.Min		

Origin

Time series: Bounda.Ammonia, w.71846. %-tile

Type	Valid from	Active
WQM Percentiles	1950	<input checked="" type="checkbox"/>

WQM Percentiles

Name: Calculation of percentiles

Source time series: Bounda.Ammonia, w.71846.Values Selection

Percentile calculation from n = 11

Method: VDI-Richtlinie 2450
VDI-Richtlinie 2450
SAS (Statistik-Analyse-System) Definition 4
SAS (Statistik-Analyse-System) Definition 5 (Lorenz-Methode)
EXCEL-Methode
Hazen-Methode

OK Cancel Help

Origin system

Data Analysis

Example:

Calculation of ammonia using measured ammonium, temperature and pH as input

The screenshot displays the Origin software interface. A 'Formula' dialog box is open, showing the following expression:

$$\text{result} = 1.059 * \text{value}(1) / (10^{(0.09018 + 2729.92 / ((\text{value}(2) + 273.15) - \text{value}(3)))})$$

The 'Origin' window shows a time series named 'Bouda.Ammonia, w.71846.Values'. A table below it has columns 'Valid from' and 'Active'. The first row shows a date '01/01/1990 00:00' and a checked 'Active' box.

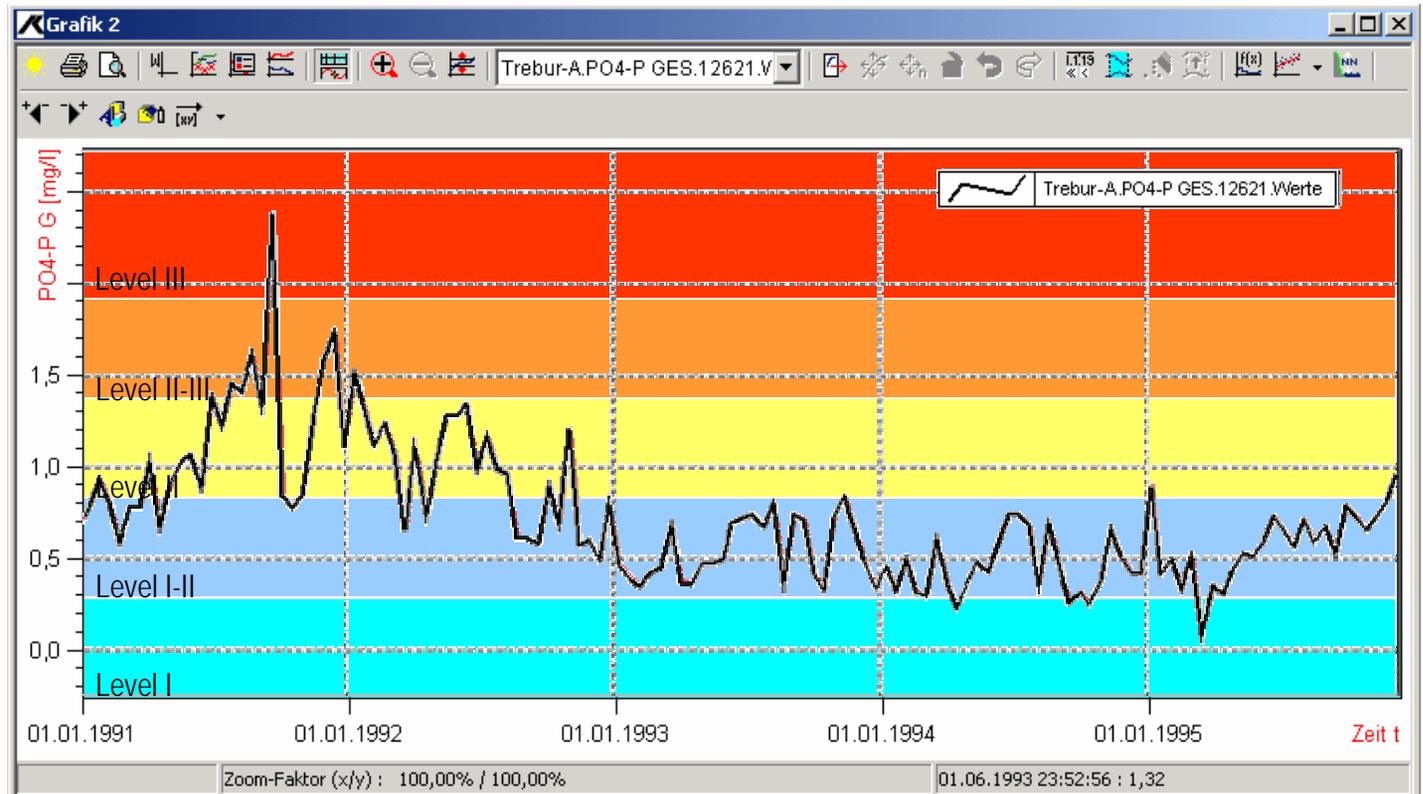
The 'Formula' dialog box also shows the same formula in a text field, a checked box for 'Delete destination before calculation', and four input fields for variables 1 through 4, each with a 'dt' and 'min' field:

Variable	Source	dt	min
1	Bouda.Temperatur.00011.Values	0	min
2	Bouda.Ammonia, w.71846.Values	0	min
3	Boundary Creek.pH.00400.Values	0	min
4		0	min

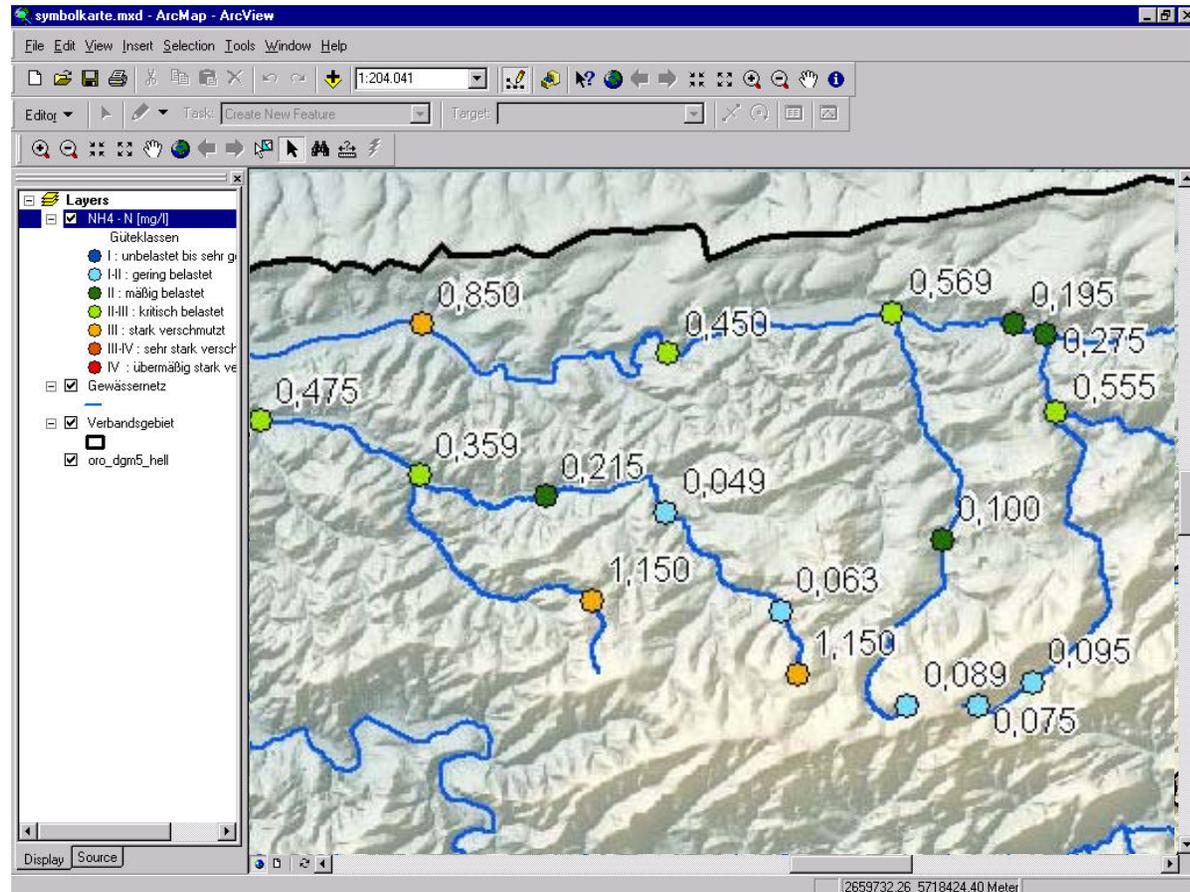
Buttons for 'OK', 'Cancel', and 'Help' are visible at the bottom of the dialog box.

Formula editor

Data Analysis

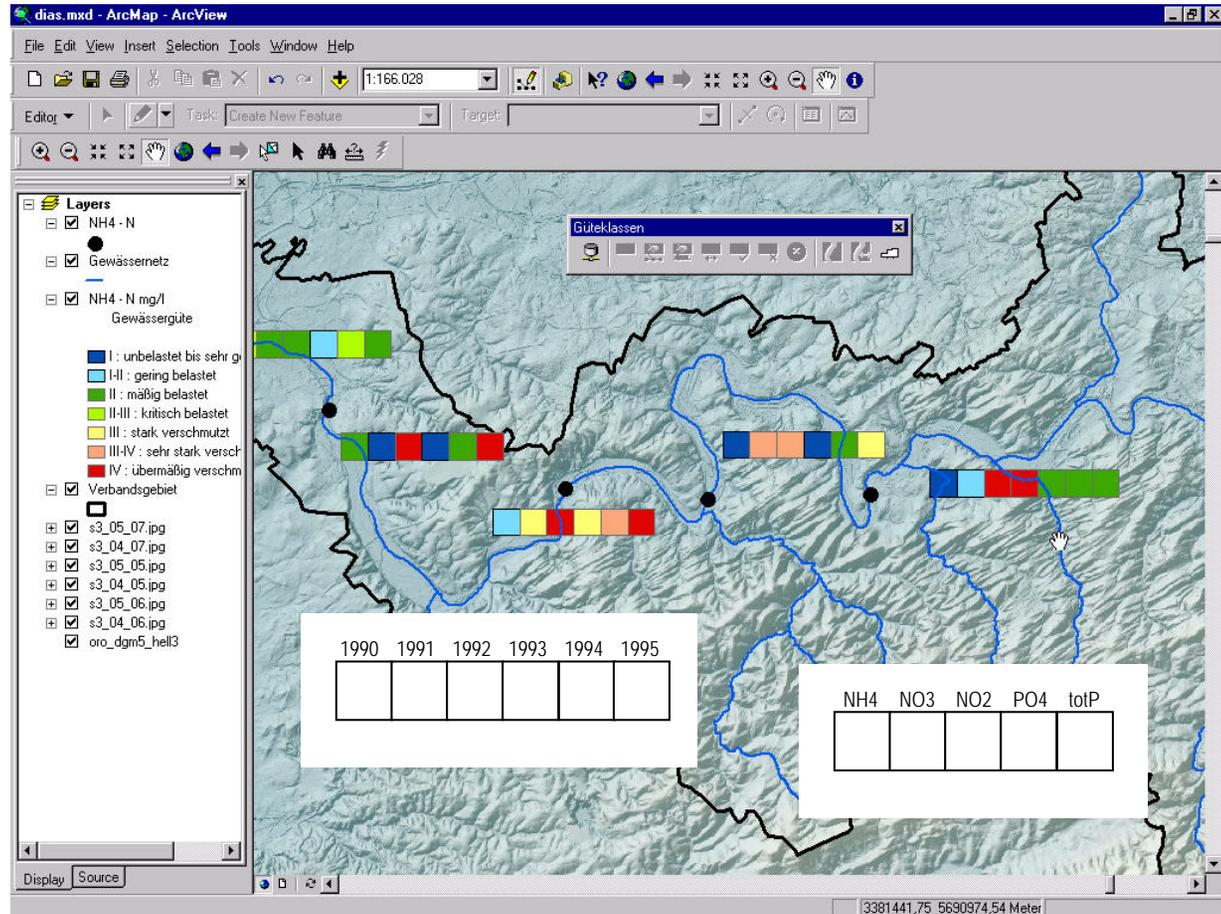


WQ classification

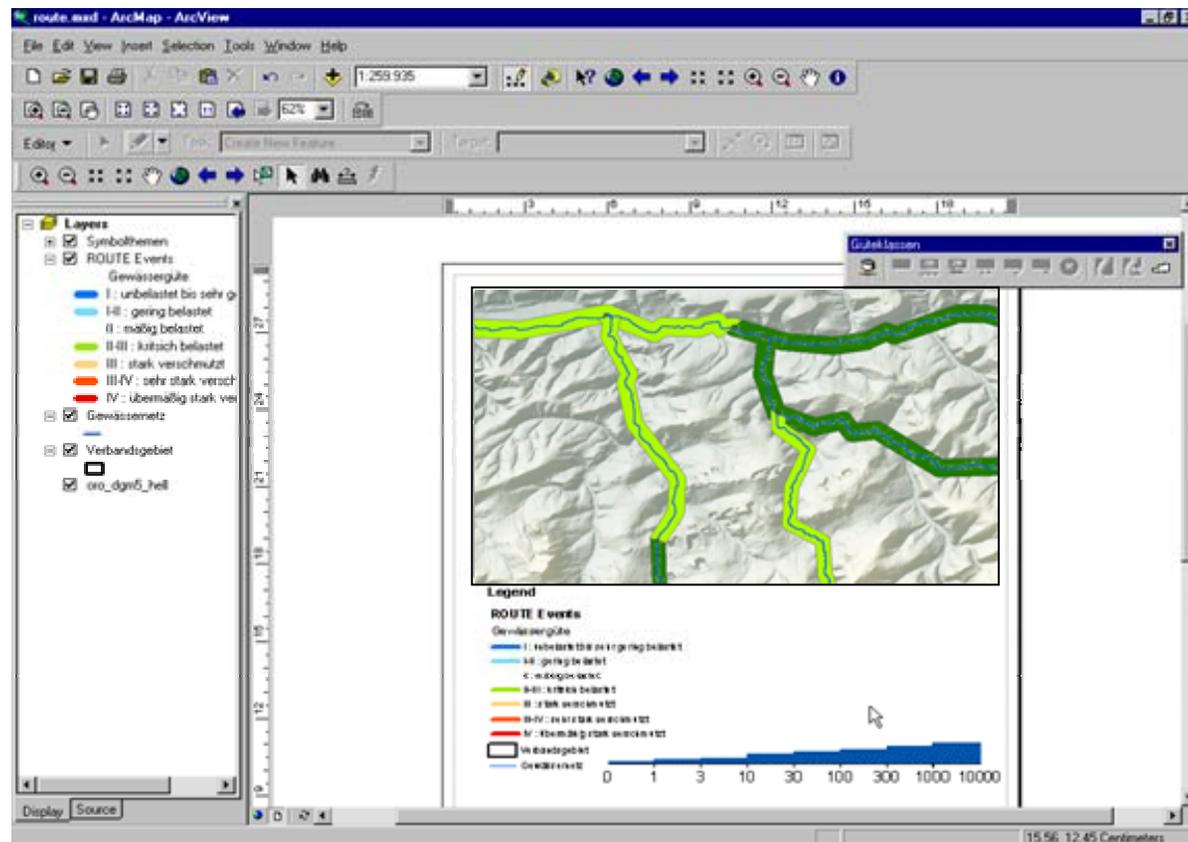


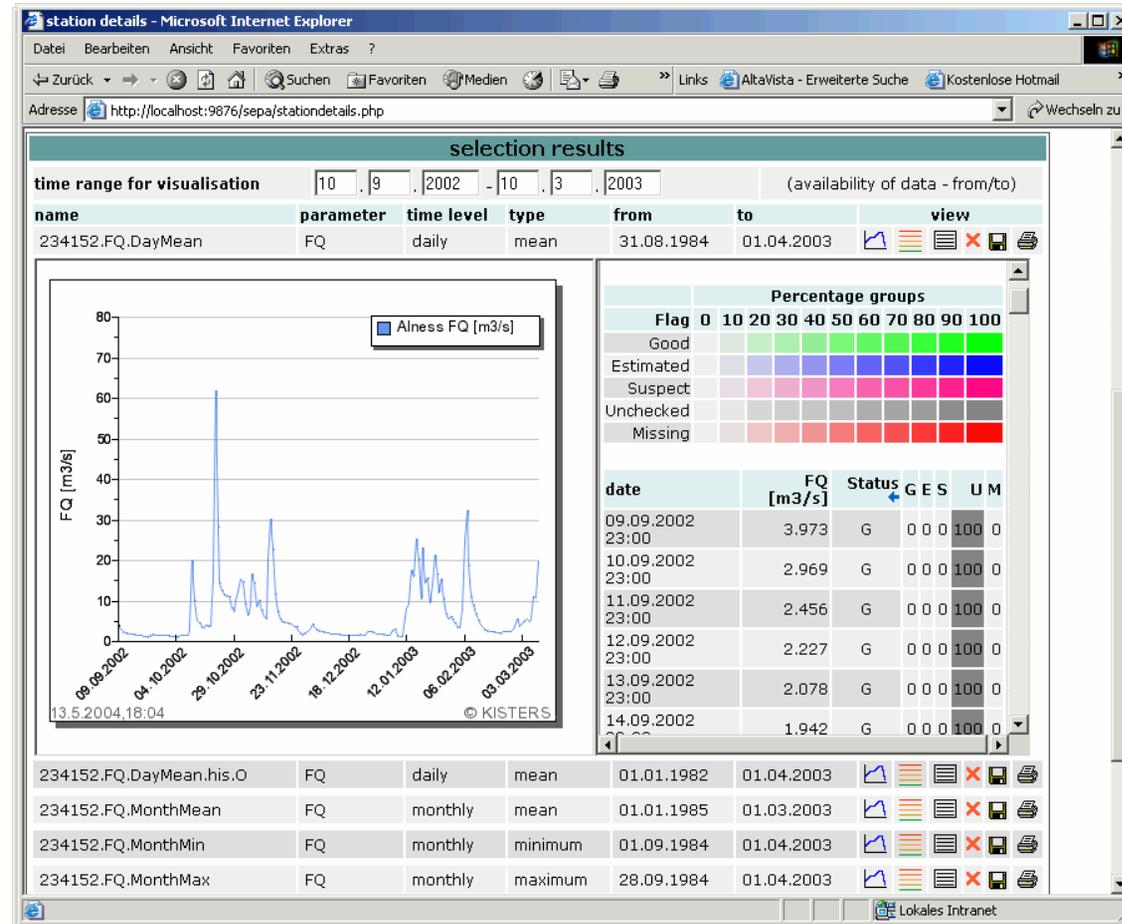
Presentation

Diagram maps



Water Quality - Bands





Summary

- Requirements of EU-WFD lead to need of software for integrated data management
- Existing software WISKI for water quantity management
- Extension by Water Quality Module WQM
 - Data management
 - Data monitoring
 - Data analysis
 - Data visualization
 - Data presentation
- Complete solution for decision support and data management
- Useful tool to meet requirements of WFD

May 18, 2004

Thank you

Frank Schlaeger, Ph.D.
Stan Malinky
Jürgen Stein, Ph.D.

 KISTERS

 JBS
ENERGY INC.

