



WATER SMART INDUSTRIAL SYMBIOSIS

CS3 – Development of an early warning system for saltwater intrusion in the sewer system

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20th May 2021



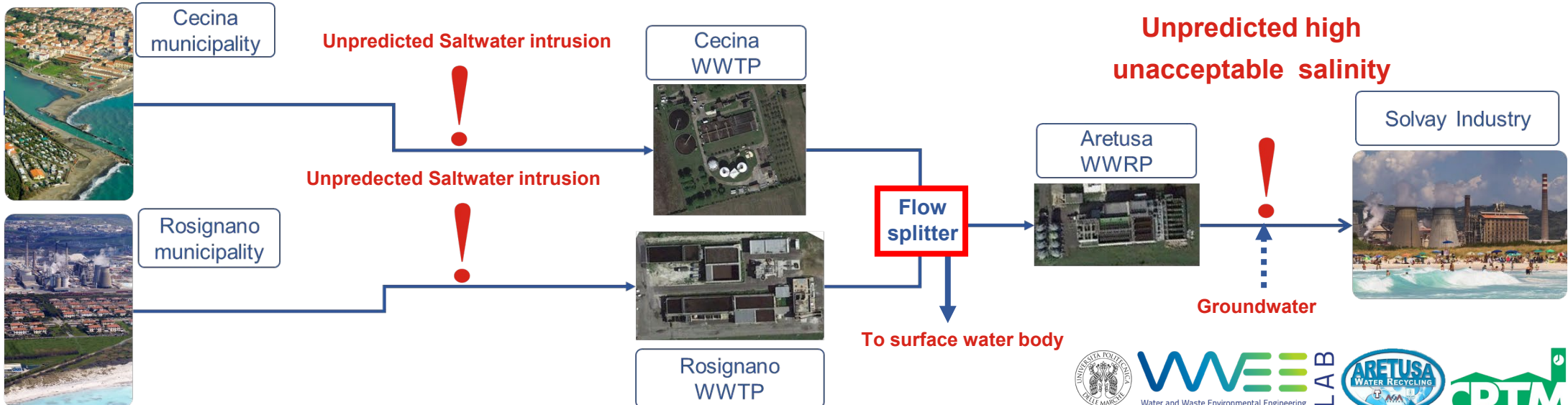


ULTIMATE Project

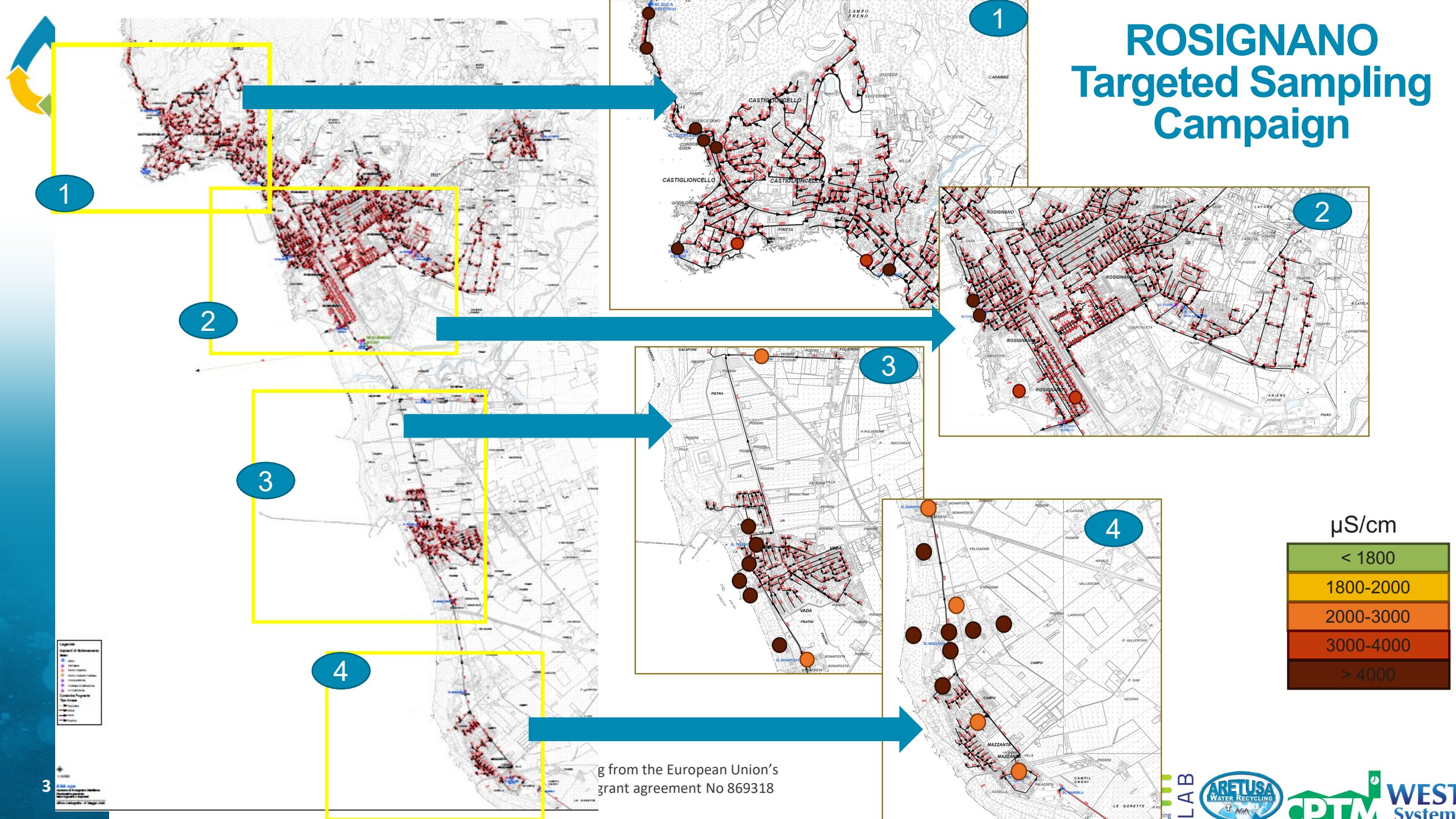
9 DEMOSITES

ULTIMATE will implement Water Smart Industrial Symbiosis in nine large-scale business cases from the international agro-food, petrochemical and biotech sector.

- 1- Tarragona (ES)
- 2- Nieuw Prinsenland (NL)
- 3- Rosignano (IT)
- 4- Naflpio (EL)
- 5- Lleida (ES), Ostrava (CZ)
- 6- Karmiel, Shafdan (IL)
- 7- Tain (UK)
- 8- Saint-Maurice l'Exil (FR)
- 9- Kalundborg (DK)



ROSIGNANO Targeted Sampling Campaign



g from the European Union's grant agreement No 869318

$\mu\text{S}/\text{cm}$
< 1800
1800-2000
2000-3000
3000-4000
> 4000



CECINA Sensor network



- ✓ 3 conductivity sensors in Cecina sewer network
- ✓ 4 flow sensors in Cecina sewer network
- ✓ 2 conductivity sensors at Cecina WWTP





ROSIGNANO and ARETUSA Sensor network



Influent



ROSIGNANO WASTEWATER TREATMENT PLANT



Effluent



Influent



ARETUSA WASTEWATER REUSE PLANT



Effluent

- ✓ 6 conductivity sensors in Rosignano sewer network
- ✓ 6 flow sensors in Rosignano sewer network
- ✓ 2 conductivity sensors at Rosignano WWTP
- ✓ 2 conductivity sensors at Aretusa WWRP



Smart equalization before ARETUSA WWRP

Flow = 2458 ± 3241 m³/d
EC = 2661 ± 552 μ S/cm → **Surface water body**



Flow = 9281 ± 3623 m³/d
EC = 2661 ± 552 μ S/cm

Rosignano WWTP

Cecina WWTP



Flow = 3477 ± 2140 m³/d
EC = 1976 ± 541 μ S/cm

Flow = 2893 ± 2798 m³/d
EC = 1976 ± 541 μ S/cm → **Surface water body**

Aretusa WWRP



1. Equalization
2. Coagulation/flocculation
3. Sedimentation
4. Sand filtration
5. Biological activated carbon
6. Activated carbon filtration

Wastewater to Solvay

Flow = 9753 ± 1945 m³/d
EC = 2319 ± 483 μ S/cm

Required EC: < 2000 μ S/cm

SOLVAY

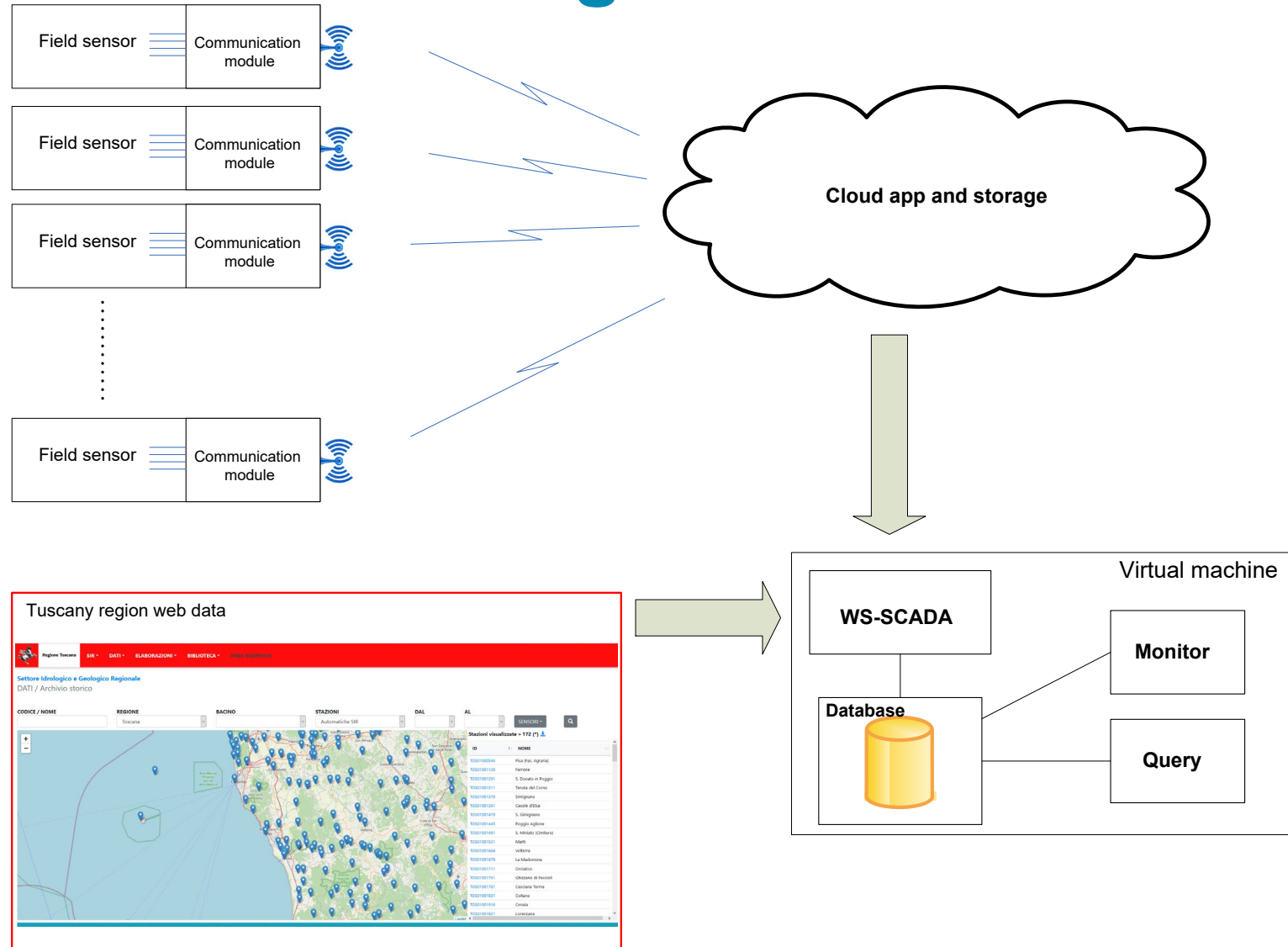


Groundwater





Real-time data monitoring



The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869318



Sensor

- 4 electrodes (2 graphic, 2 platinum)
- Range 0 to 200 mS/cm
- Digital sensor / **Modbus** RS-485
- Robust and Watertight

Resolution Conductivity	0,01 to 1 according the range
Accuracy Conductivity	+/- 1 % of the full range Beyond 100 mS/cm use appropriate buffer solution
Measure range salinity	5-60 g/Kg
Measure range TDS -KCl	0-133 000 ppm
Measure range Temperature	0,00 °C to + 50,00°C
Resolution Temperature	0,01 °C
Accuracy temperature	± 0,5 °C
Response time	< 5 s
Working temperature	0°C to 50°C
Temperature compensation	NTC
Stocking temperature	- 10°C to + 60°C
Signal interface	Modbus RS-485 (option SDI-12)
Maximum refreshing time	Max < 1 s
Sensor power-supply	5 to 12 volts
Electric consumption	Standby : 25 µA Average RS485 (1 measure/seconde) : 6,3 mA Average SDI12 (1 measure/seconde) : 9,2 mA Current pulse : 500 mA





Datalogger



- 2 Analog inputs (0-20 mA, 0-5 V, 0-10 V)
- RS-485 Communication
- Cloud computing (MiDOMetSoft)
- Battery powered
- GSM/GPRS data communication

The data logger is connected to a cloud platform to upload the data recorded





WS-SCADA software suite



WS-Scada

WS-Scada (SCADA - *Supervisory Control And Data Acquisition*)



Monitor

Monitor



Query

Query



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WS-SCADA software suite

WS-SCADA is able to download data from different sources and save onto the database.

Parameters of each sensor/datalogger connected to the system is shown inside a box

The first line shows date and time of the last value downloaded

The screenshot displays the WS-SCADA software interface with the following data panels:

- RMU 1:**

CS1 S1 Date	18/05/2021
CS1 S1 Level	2.72 m
CS1 S1 Conductivity	125.83 µS
CS1 S1 Temperature	23.0 °C
CS1 S1 Battery	12.90 V
- RMU 2:**

CS1 S2 Date	18/05/2021
CS1 S2 Level	3.23 m
CS1 S2 Conductivity	897.50 µS
CS1 S2 Temperature	142.7 °C
CS1 S2 Battery	12.32 V
- RMU 3:**

CS1 S3 Date	18/05/2021 17:0
CS1 S3 Level	1.67 m
CS1 S3 Battery	12.60 V
- RMU 4:**

CS1 S4 Date	18/05/2021
CS1 S4 Level	1.40 m
CS1 S4 Conductivity	3000.00 µS
CS1 S4 Temperature	50.0 °C
CS1 S4 Battery	12.98 V
- RMU 5:**

CS1 S5 Date	
CS1 S5 Level	m
CS1 S5 Conductivity	µS/cm
CS1 S5 Temperature	°C
CS1 S5 Battery	V
- RMU 6:**

CS1 S6 Date	18/05/2021 16:2
CS1 S6 Level	2.97 m
CS1 S6 Battery	11.70 V
- RMU 7:**

CS1 S7 Date	18/05/2021 17:0
CS1 S7 Level	4.66 m
CS1 S7 Battery	12.81 V
- RMU 8:**

CS1 S8 Date	18/05/2021
CS1 S8 Level	0.00 m
CS1 S8 Conductivity	0.00 µS/cm
CS1 S8 Temperature	23.1 °C
CS1 S8 Battery	12.61 V
- RMU 9:**

CS1 S9 Date	18/05/2021
CS1 S9 Level	1.12 m
CS1 S9 pH	7.43 pHu
CS1 S9 Temperature	16.7 °C
CS1 S9 ORp	337.00 mV
- Multiparametrica 1:**

HYD Date	18/05/2021 17:00:2
HYD Temp	15.06 °C
HYD pH	7.20 pHu
HYD Cond	667 µS/cm
HYD ORP	628 mV
HYD Depth	1.51 m
HYD DO	4.62 mg/l
- Multiparametrica 2:**

SCAN Date	18/05/2021
SCAN Turbidity	12.85 FTUed
SCAN NO3-Neq	1.26 mg/l
SCAN TOCeq	2.59 mg/l
SCAN DOceq	0.07 mg/l
SCAN COLORtru	4.92 Hazen
SCAN COLORapp	76.81 Hazen
SCAN UV254f	0.00 Abs/m
SCAN Temperature	20.62 °C
- Centro controllo:**

SUV Date Level	18/05/2021
SUV Level	0.43 m
SUV Date Pump	18/05/2021
SUV Pump Enable	OFF
SUV Pump mode	AUTO
WDOG Watchdog	ON
- Telemetria:**

TELT Uptime	38113 sec
TELT Temp	67.0 °C
TELT 230V	ON
TELT Pump Status	OFF
TELT IP Address	10.41.48.124
TELT AnalogInput	12.674 V
- Station Log:**

18/05/2021 17:07:57	CS1	Normal	Record saved to DB (OK)
18/05/2021 17:08:14	CS1	Normal	Record saved to DB (OK)
18/05/2021 17:08:30	CS1	Normal	Record saved to DB (OK)
- Communicator Log:**

18/05/2021 17:08:12	CS1	RS232:9	#09, 20210518, 170812, 0015, 00
			08, F30F<CR>

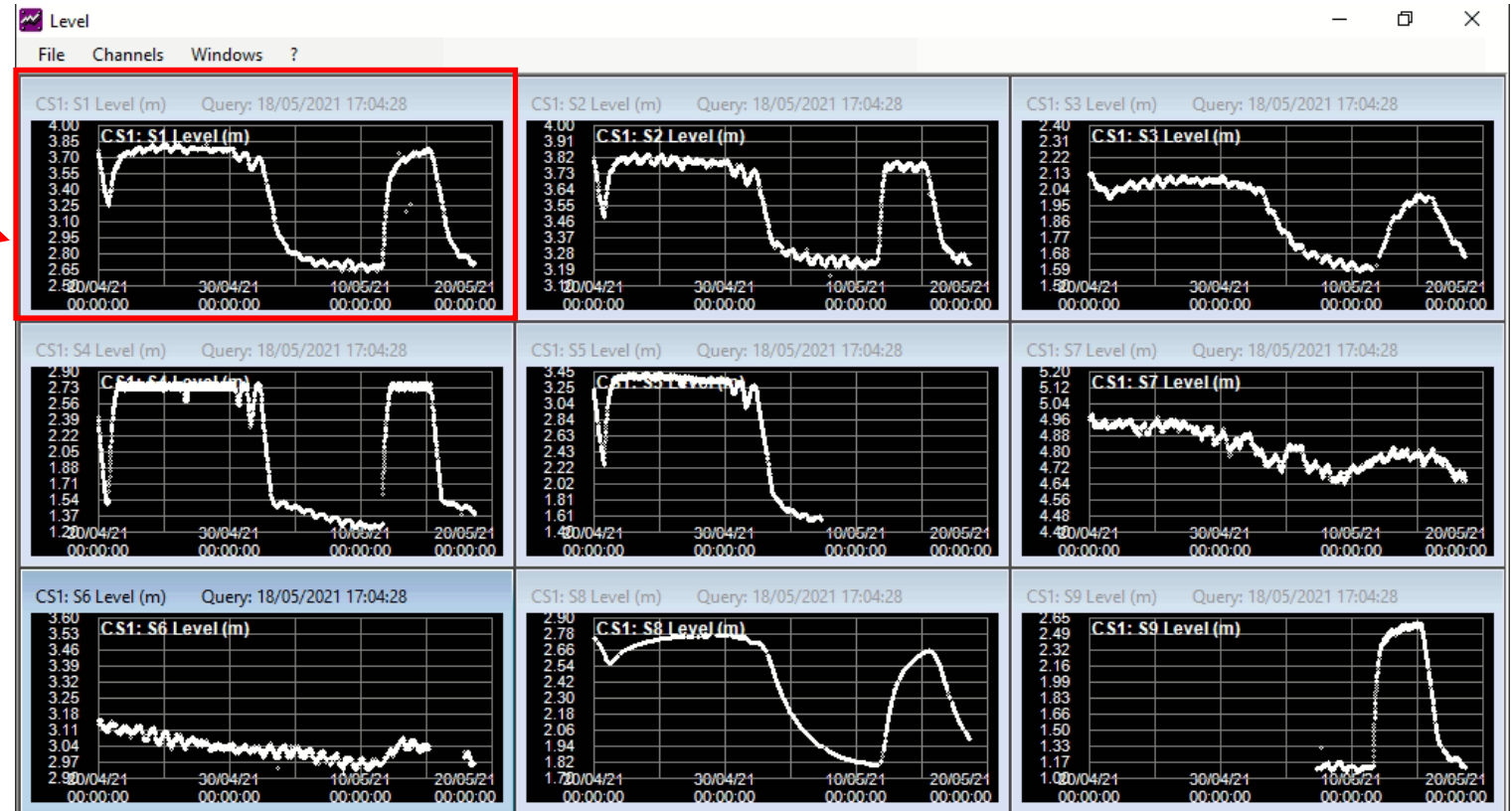




WS-SCADA monitor

Each box shows the plot of the temporal variation of a single parameter monitored

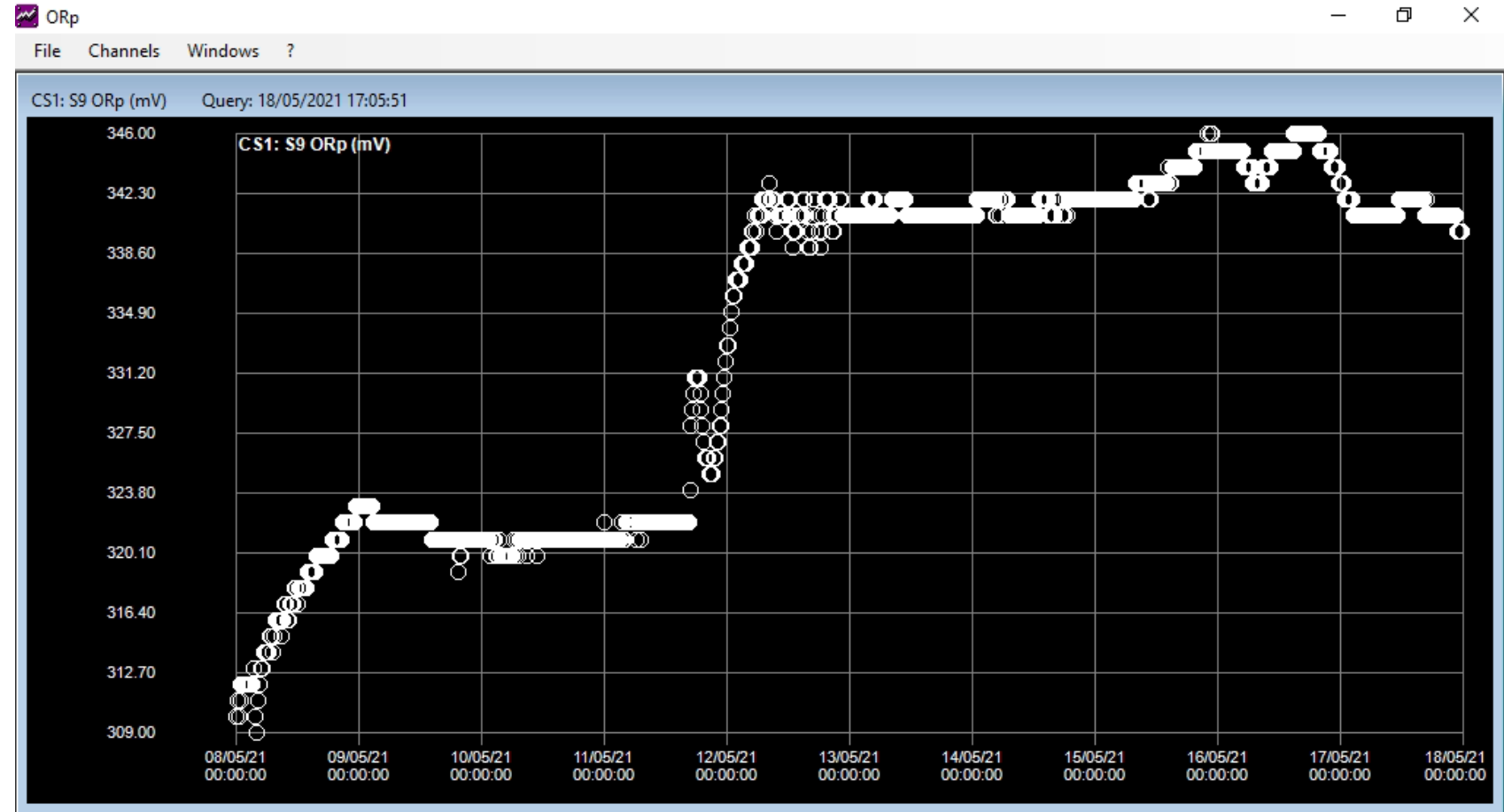
Time scale (x) and vertical scale (y) can be configured to set a different zoom





WS-SCADA monitor

Each dot on the plot represents the value of a single measurement stored in the database

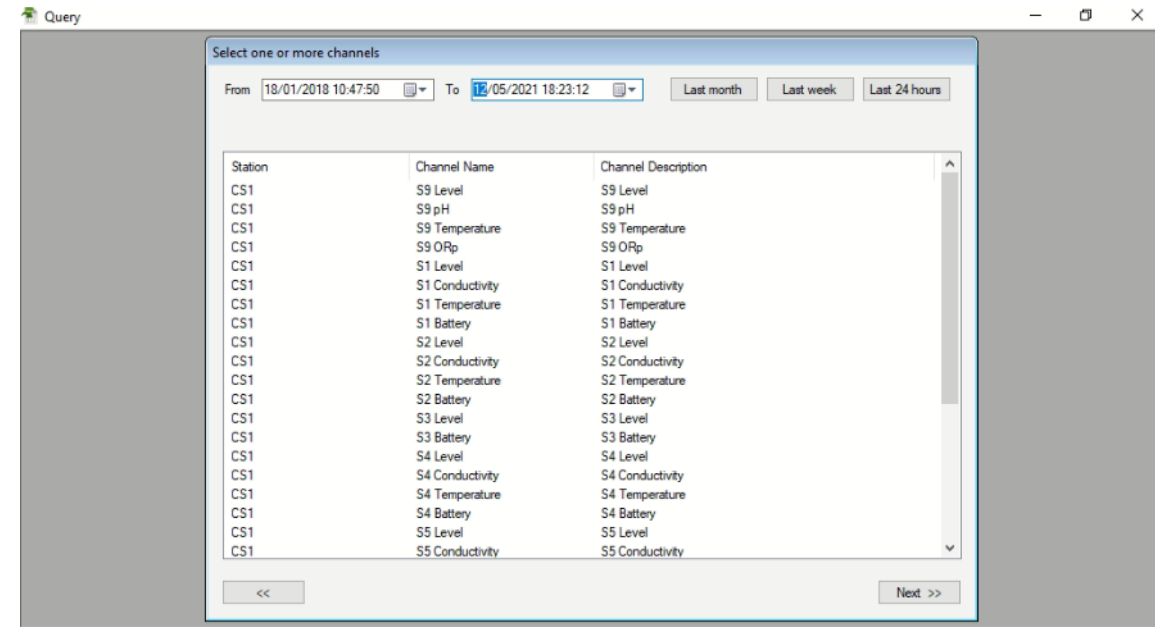
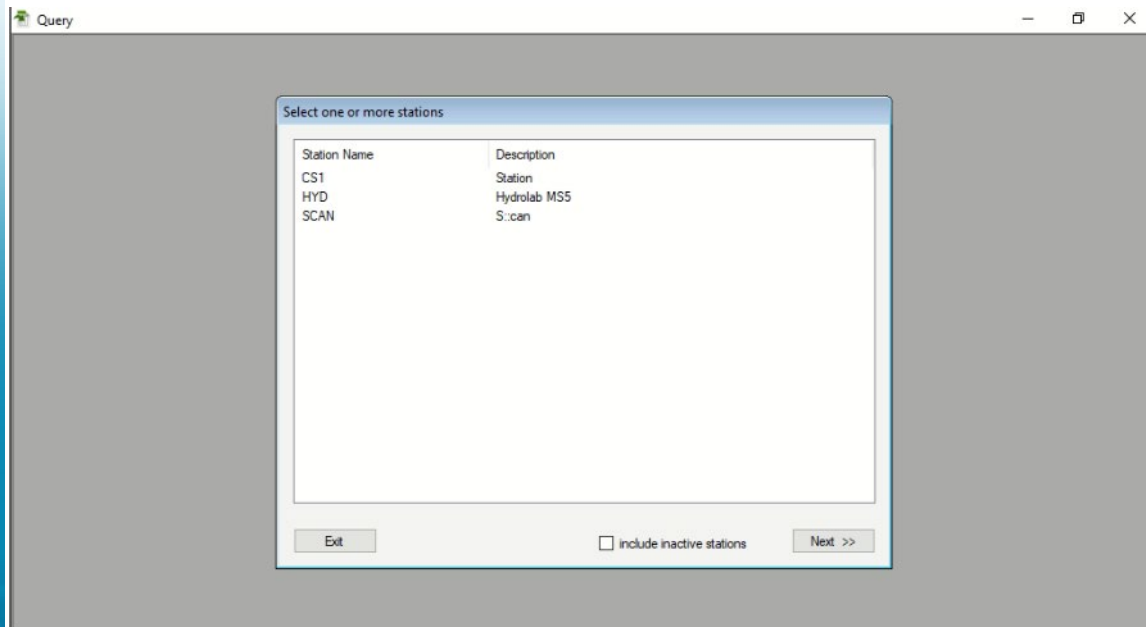




WS-SCADA query

Query

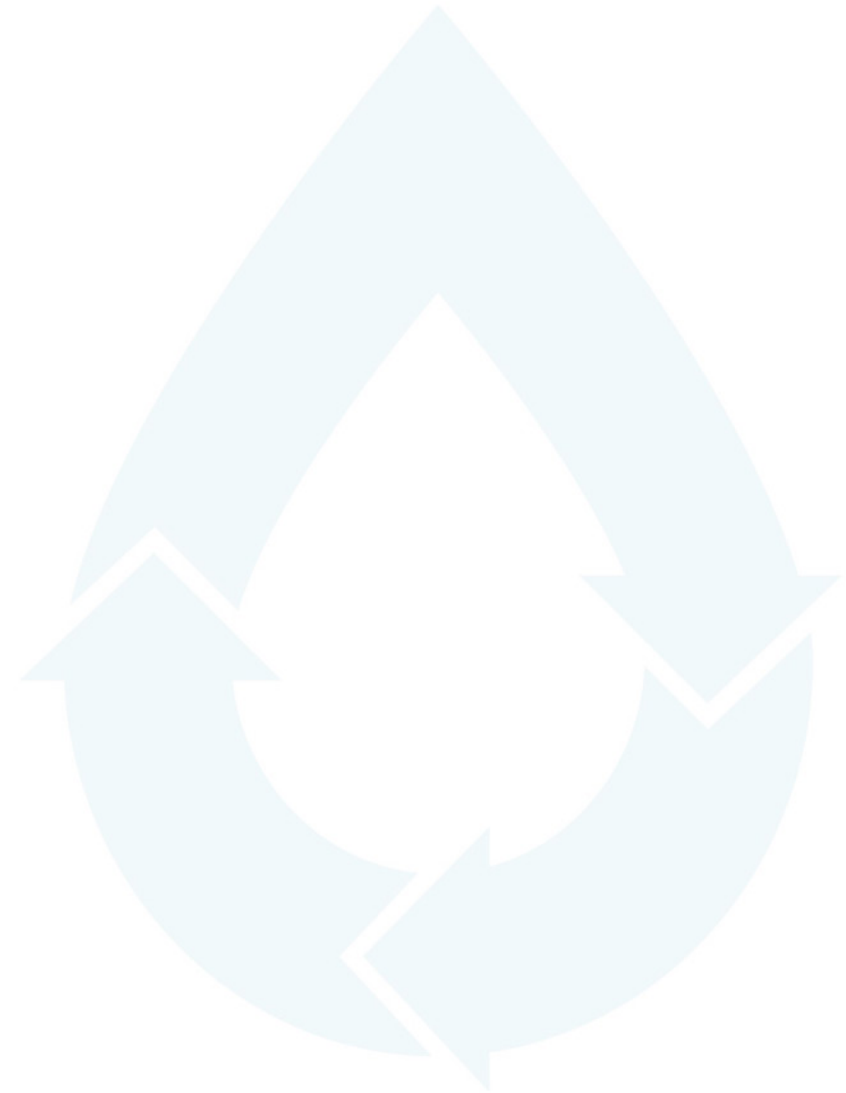
Allows to export data from the database and save them in Excel format or in Text format for data processing





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Thank You!



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