RĪGAS ŪDENS

03.04.2019

Variations in industrial wastewater composition at inflow of Riga wastewater treatment plant «Daugavgriva», Latvia

Information about SIA «Rīgas ūdens» 2018

- Riga city service territory 307 km2
- Riga citizens 677 295

  connected to town water&sewage network 619 703

  PE - 701 534
- Clients – 15 000
- Drinking water supply 39,147 million/m3
- Treated wastewater 47,540 million /m3
- Financial turnover 45,6 million /EUR
- Employees 772

Project «Development of Water Management in Riga, 5th stage» 2018 – 2019

Project funding
26, 07 million/EUR
Including Cohesion fund cofunding
9, 93 million/EUR

Planned activities of the Project in Berģi, Imanta and Beberbeķi:

- **New Sewerage network 34,59 km;**
- **Sewer network reconstruction 0,44 km,**
- **18 new Sewerage Pumping Stations.**

In addition to 2014-2020 period planned activities of **24,73 km** new centralized water supply networks will be built and **0,41 km** reconstructed (financed as project non-related expenses).
Planned project period is 69 months with the deadline on 31th December in 2023

RĪGAS ŪDENS

Investments

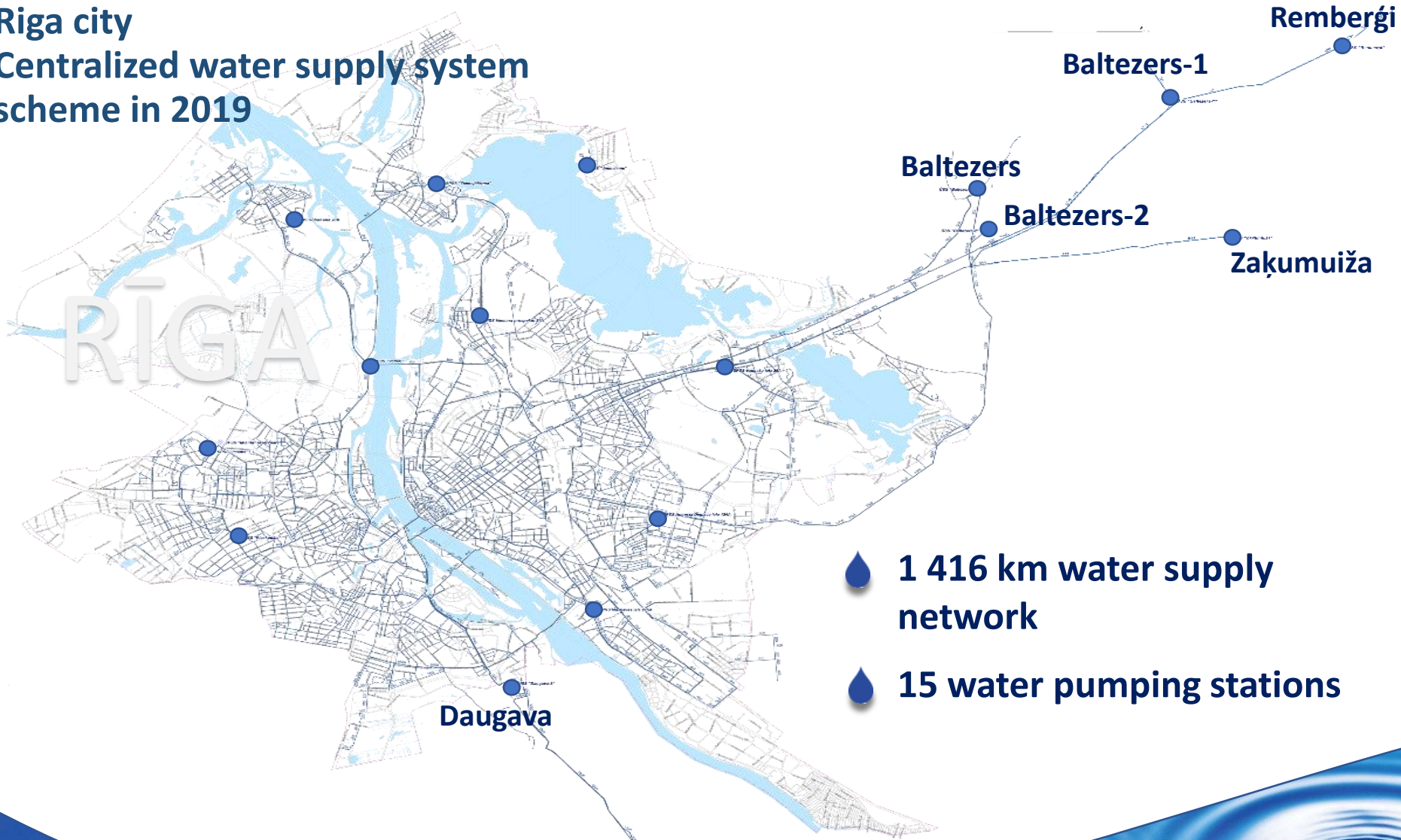
Main investments in drinking water and sewer networks

Investment type	2016	2017	2018
Water network rehabilitation	~ 0,9 km	~ 8,2 km	~ 3,6 km
Gravity sewer rehabilitation	~ 3,4 km	~ 10,7 km	~ 9,9 km
Pressure sewer rehabilitation	0 km	~ 1 km	~ 8,9 km
Fire hydrants replaced	510	483	472
Valves replaced (DN≥100 mm)	1447	1133	1010

RĪGAS ŪDENS

Water supply network

Riga city
Centralized water supply system scheme in 2019

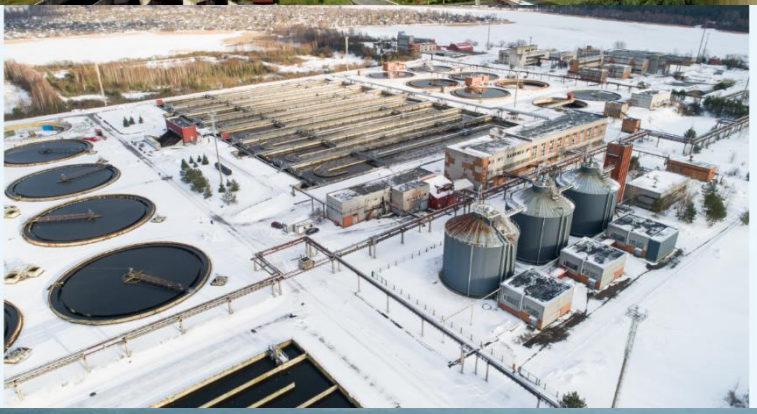


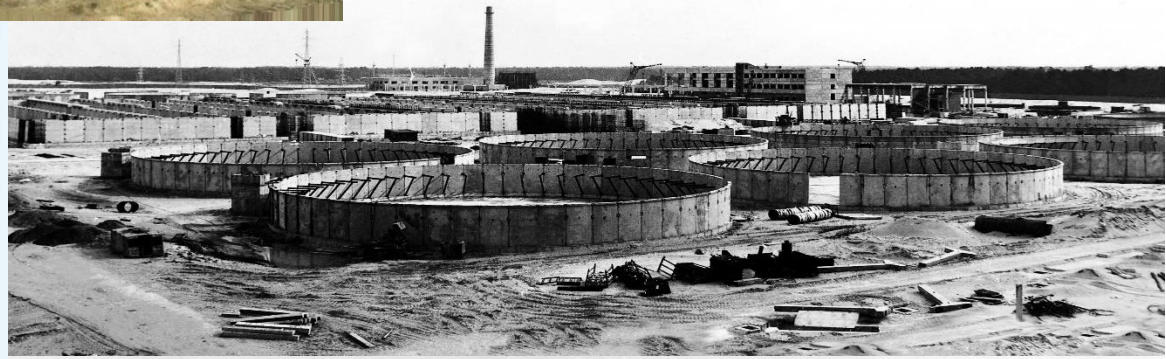
- 1 416 km water supply network
- 15 water pumping stations

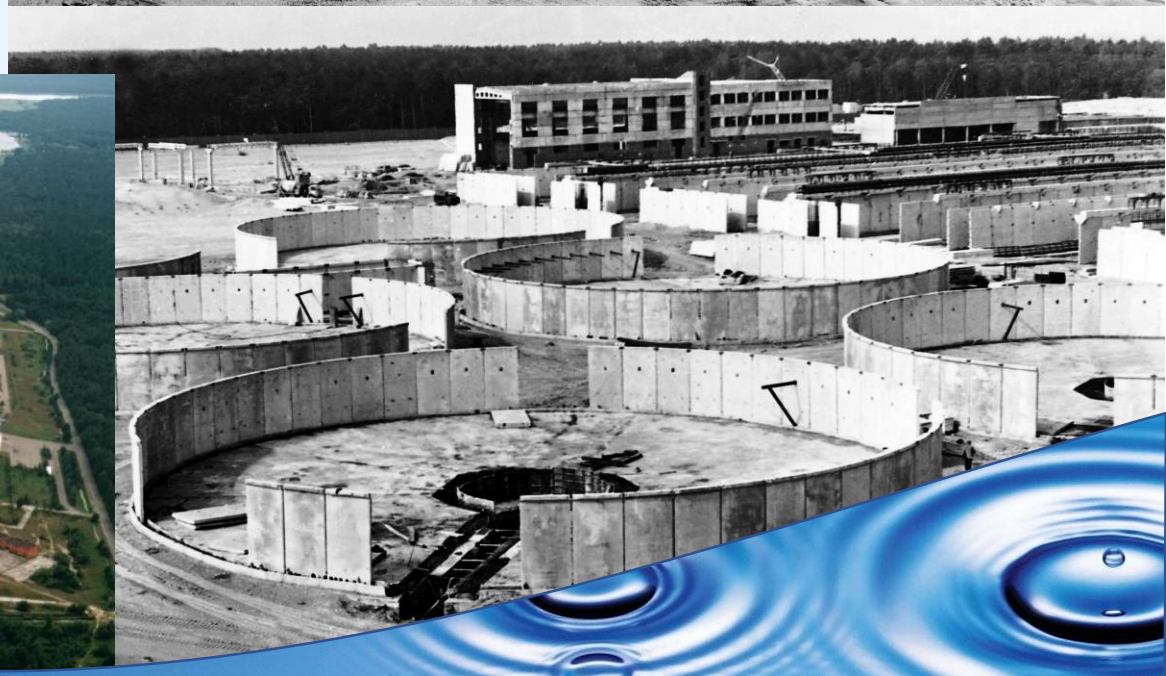
RĪGAS ŪDENS

WWTP “Daugavgrīva”

WWTP “Daugavgriva” (1991)
PE 750 000 to 1 million
Average flow 150 000 m3/day







RĪGAS ŪDENS

WWTP “Daugavgrīva”

Key Performance Indicators(2018)

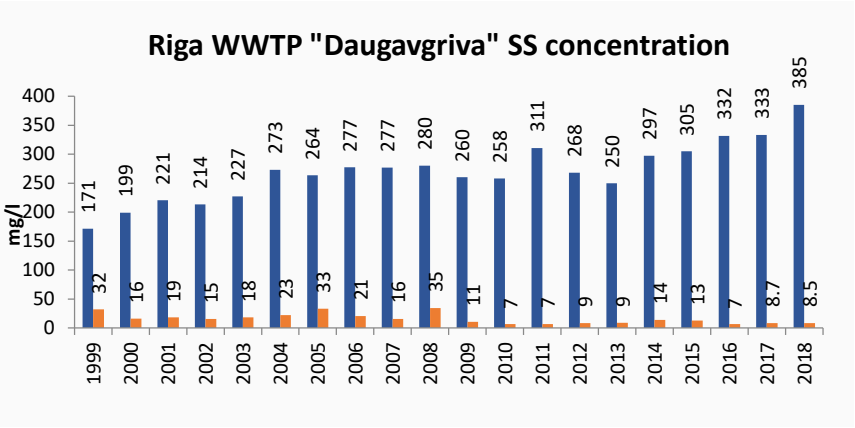
47 540 576 m³ of treated wastewater

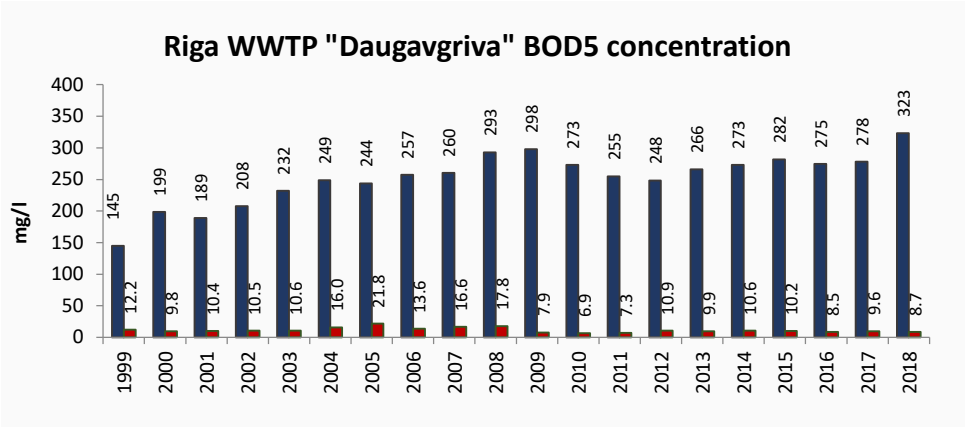
40 865 t of sludge production

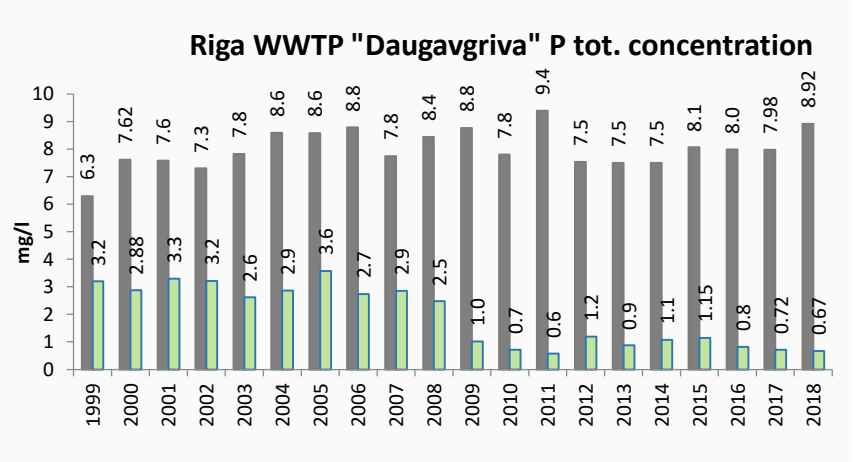
Treated wastewater costs 0,33 EUR/m³

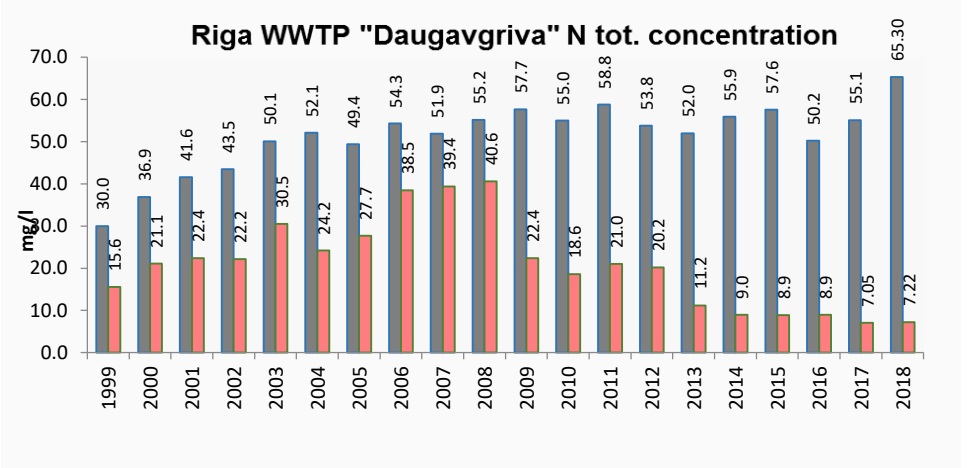
RĪGAS ŪDENS

WWTP “Daugavgrīva”





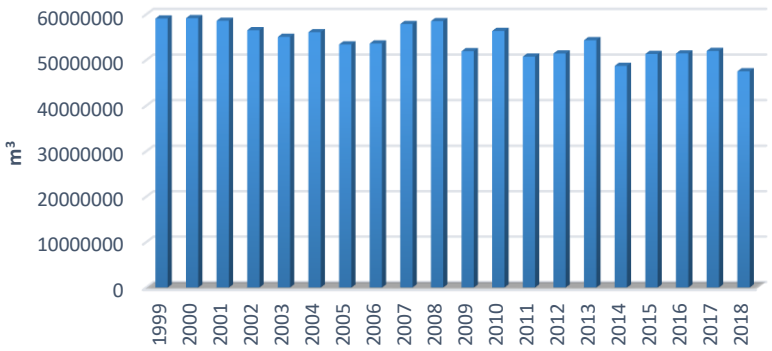




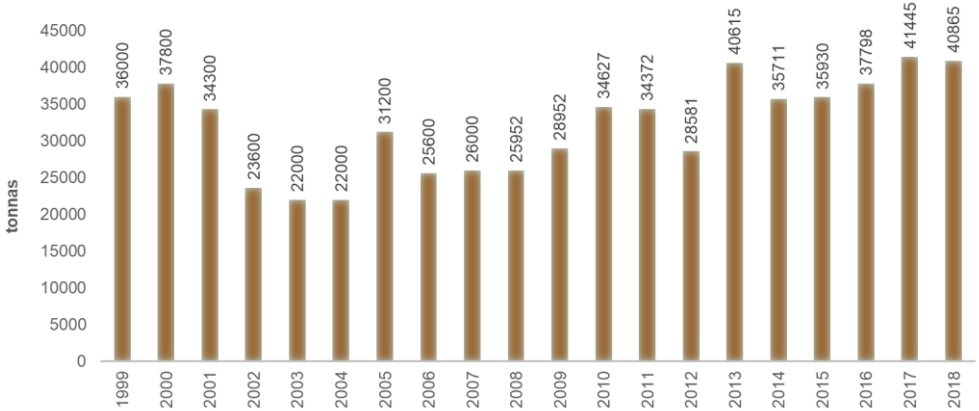
RĪGAS ŪDENS

WWTP “Daugavgrīva”

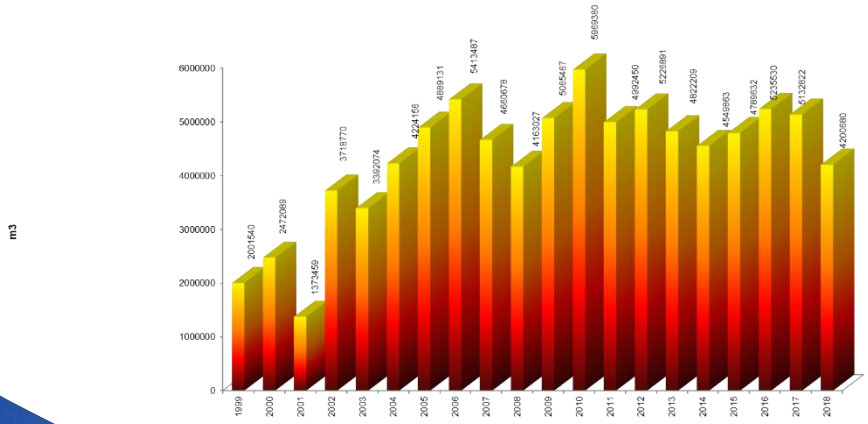
Treated effluent volume (mln.m3) 1999-2018



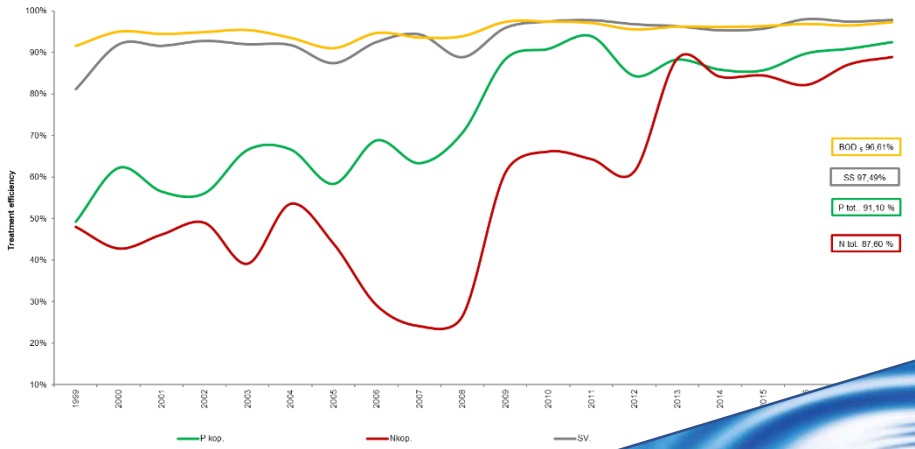
Production of sludge 1999-2018 (tonns)



Production of biogas 1999-2018 (mln.m3)



Treatment efficiency %



RĪGAS ŪDENS

WWTP “Daugavgrīva”

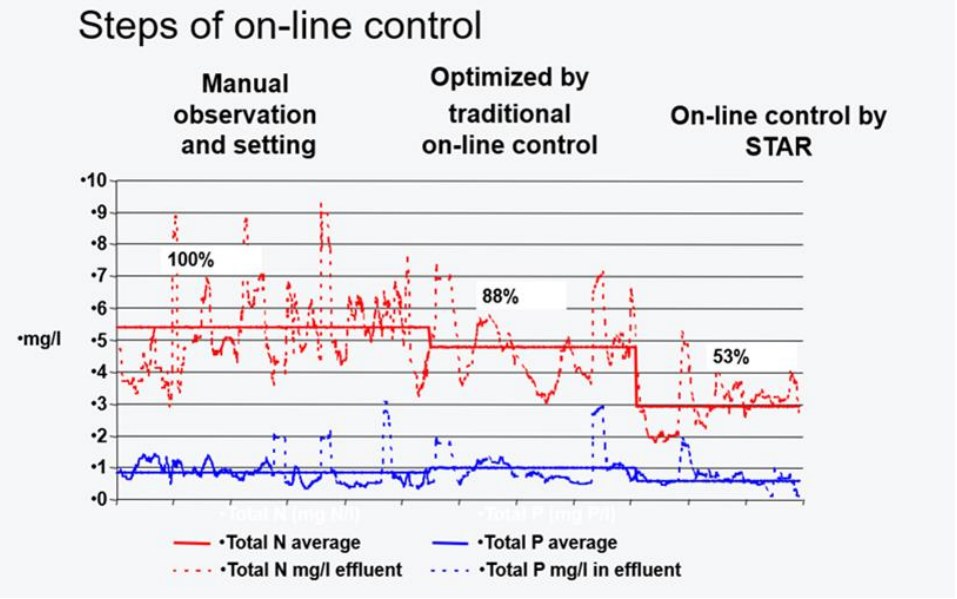
Superior Tuning And Reporting

A tool for

- *Operational savings*
- *Lower effluent concentrations*
- *More biological capacity*
- *More hydraulic capacity*
- *More capacity in sewer system*

Lower OPEX

Lower CAPEX



RĪGAS ŪDENS

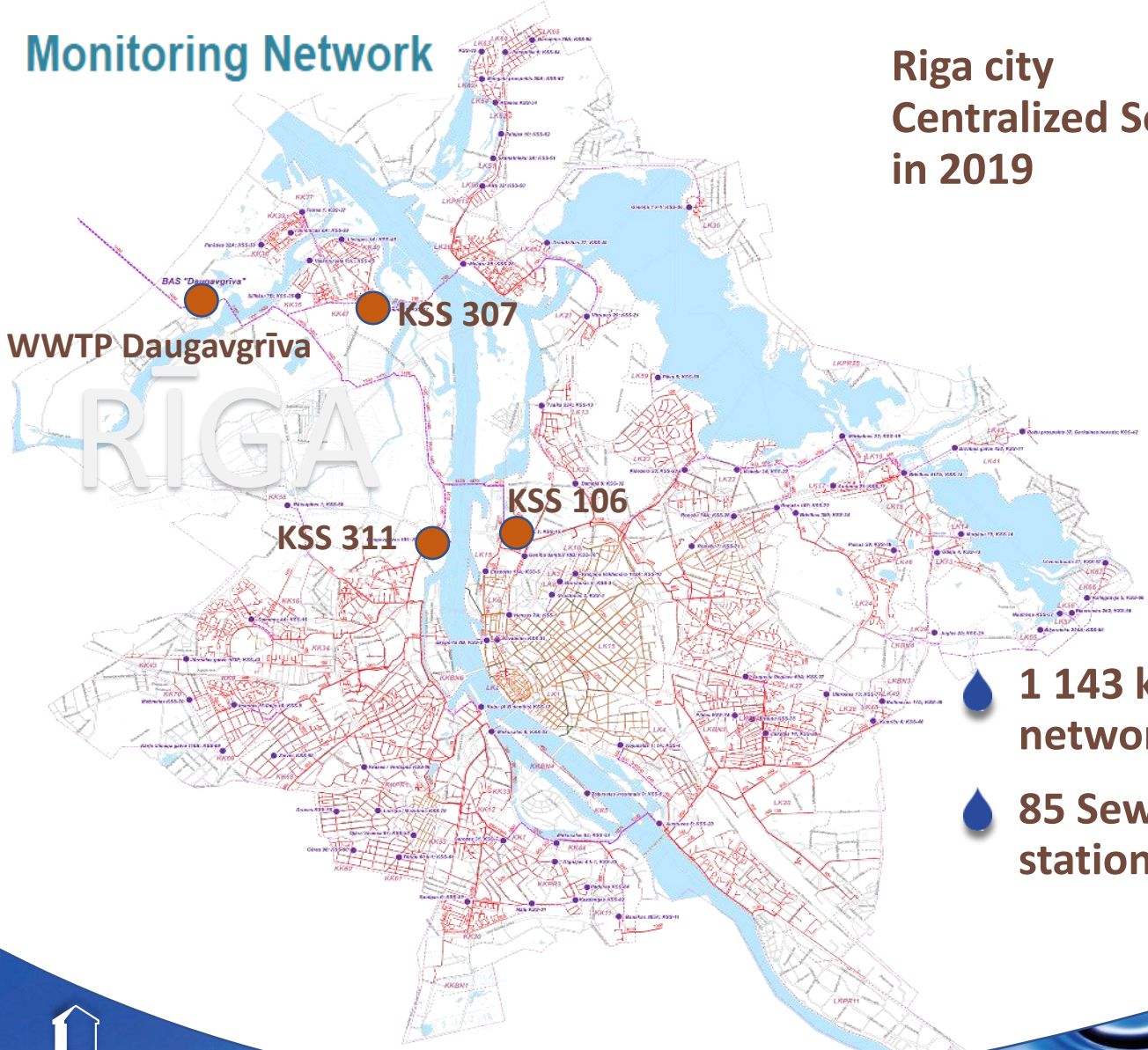
WWTP “Daugavgrīva”

Riga Water wastewater treatment WWTP Daugavgriva performance data 2018

Parameter	Average concentrations inlet to WWTP 2017 (mg/l)	Average concentrations effluent 2017 (mg/l)	Latvian regulation Nr.34 (mg/l)	Pollution load to Baltic sea (tons/year)
N tot.	65,3	7,22	10	344
P tot.	8,92	0,67	1	31
BOD5	323,1	8,7	25	415
SS	385,1	8,5	35	405

RĪGAS ŪDENS

Wastewater network



Riga city
Centralized Sewage system in 2019

- **1 143 km Sewage network**
- **85 Sewage Pumping stations**

RĪGAS ŪDENS

Legislation Riga City Council Binding Regulations No.17
Binding regulations of operation, use and protection of Riga city centralized water supply and sewerage system

Pollution	Maximum permissible concentration (MPC) mg/l
SS	450,00
COD	700,00
N tot	**46,00**
P tot	9,00
Extractable substances	40,00
Oil products	4,00
Surface active agents	5,00
Cr	0,40
Ni	0,40
Zn	0,30
Cu	0,20
As	0,02
Pb	0,20
Hg	0,01
Phenols	0,1
Formaldehyde	0,5
Cd	0,01

Types of monitoring used by Riga Water:

Ambient monitoring (existing…)

- Status and trend detection
- Testing of wastewater pollutants
- Calculation of loads

Effluent monitoring WWTP Daugavgriva (existin….)

- Calculation and control of discharge standards
- Monitoring of plant performance

Operational monitoring WWTP Daugavgriva (existing…)

Monitoring for operation of wastewater treatment works.

Early warning (Riga sewage network/WWTP-developing 2017/2019)

Riga Water levels of wastewater pollution monitoring (where we are….)

Simple monitoring

based on a limited number of samples, simple analysis or observations, and obtained data treatment (.....excel)

Intermediate-level monitoring

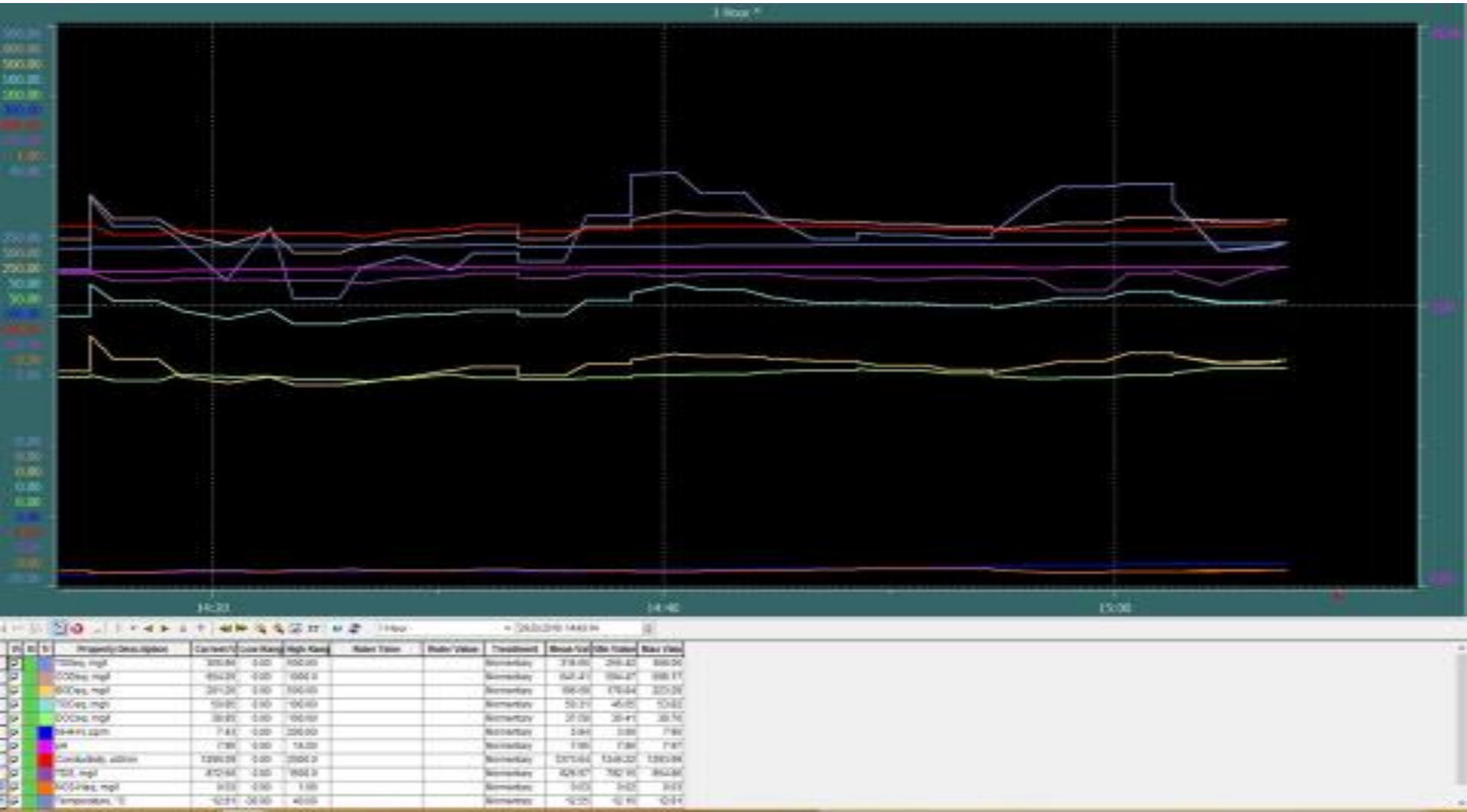
requiring more variables, stations, and specific laboratory equipment and PCs/software for data handling

Advanced level monitoring

involving sophisticated techniques and highly trained technicians and engineers for sample analysis and data handling, often using mainframe computer systems.

Intermediate-level monitoring (on-line)

More variables - TSS, COD, BOD, TOC, DOC, NH4-N, NO3-N, TDS, Conductivity, pH, temperature - inlet chamber WWTP Daugavgriva, main pumping stations (3-4) and specific laboratory equipment and PCs/software for data handling, via online....



Advanced level monitoring (2018 -2020)

Involving sophisticated techniques (on-line data from town sewage network) and highly trained technicians and engineers for sample analysis and data handling, using mainframe computer systems.

Wastewater Network Modeling and Analysis Solution

Bentley

CAPABILITIES:

Analyze hydraulic performance of flow rate > dilution of pollutants. Use a hydraulic model and wastewater GIS.

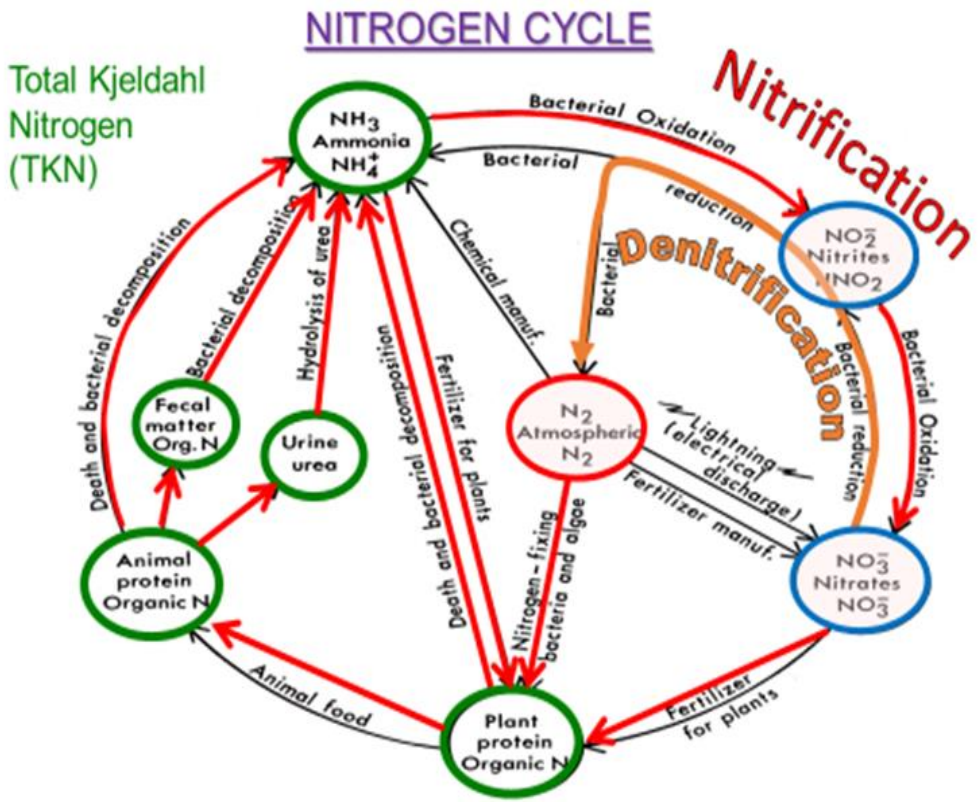
Analyze hydrogen sulfide formation

Determine sewer overflow risk

Identify areas of inflow and infiltration

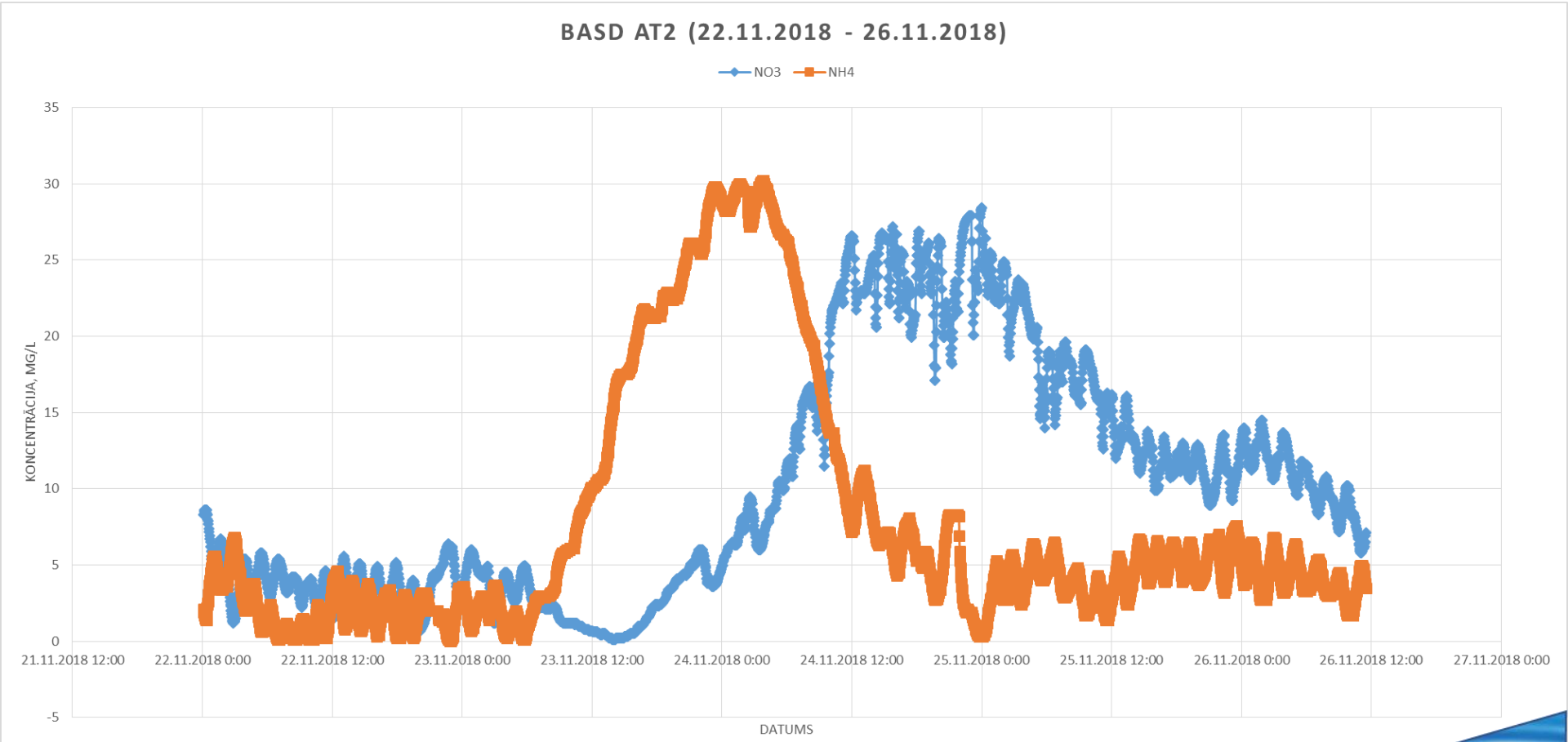
Simulate wastewater concentration

Situation today:



Inhibition

Nitrification works with two groups of nitrifying bacteria, AOB (ammonia oxidizing bacteria) and NOB (Nitrite oxidizing bacteria), are sensitive to booths substrate of their own and each other. Antohnisen et.al. 1976. They are autotrophic, as they oxidize inorganic nitrogen and use it as an energy source.


BASD AT2 (22.11.2018 - 26.11.2018)
NO3
NH4
35
30
25
20
15
10
5
0
-5
KONCENTRĀCIJA, MG/L
21.11.2018 12:00
22.11.2018 0:00
22.11.2018 12:00
23.11.2018 0:00
23.11.2018 12:00
24.11.2018 0:00
24.11.2018 12:00
25.11.2018 0:00
25.11.2018 12:00
26.11.2018 0:00
26.11.2018 12:00
27.11.2018 0:00
DATUMS


Online
AT2 NH4: 3
AT2 NO3: 4.5
[mg/l]
[green=out]
01-04-2019 05:00
06:00
07:00
08:00
09:00
10:00


Online
AT1 OUR filt: 0.63
AT2 OUR filt: 21
AT12 OUR cy: 15
[mg/l]
Online
Cy Length: 144
AT12 % N-time: 29
AT1 % N-time: 29
AT2 % N-time: 29
[min]
[%]
01-04-2019 05:00
06:00
07:00
08:00
09:00
10:00

SUMMARY:

1. Industrial wastewater monitoring programm via check list/investigation relates to Eco toxicity (OSPAR, EU Toxicology of Chemicals report No. 80 – ECETOC 2001);

2. Nitrification inhibition definition for monitoring points (Inhibition index - for sewage network& WWTP Daugavgriva - Inhibition %) accordingly to EN ISO 9509:2006. Water quality – Toxicity test for assessing the inhibition of nitrification of activated sludge microorganisms. Inhibition index ($Inh^1_i = MEC_{max} / PEC_{LD50}$), when <1 no environmental risk?

   - Analysis of Free Ammonia - Inhibition of Nitrite Oxidizing Bacteria (RTU, UITK 2018-2019); AOB, NOB?

3. Wastewater Network Modeling and Analysis Solution (Bentley®) Dilution rate?

4. Early warning «on line» information system for shock loads and toxic substances.


RĪGAS ŪDENS
Thank you for your attention!