EU-NORM2
2014

ELIMINATION AND CONCENTRATION OF NATURAL RADIONUCLIDES IN DRINKING WATER TREATMENT PLANTS

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URAIS

Consorci d'Aigües de Tarragona

June 17 – 19, 2014, Prague, Czech Republic

OVERVIEW

- Introduction
- Objectives
- Results
  - Radioactive measurements
  - Tertiary treatments
- Conclusions

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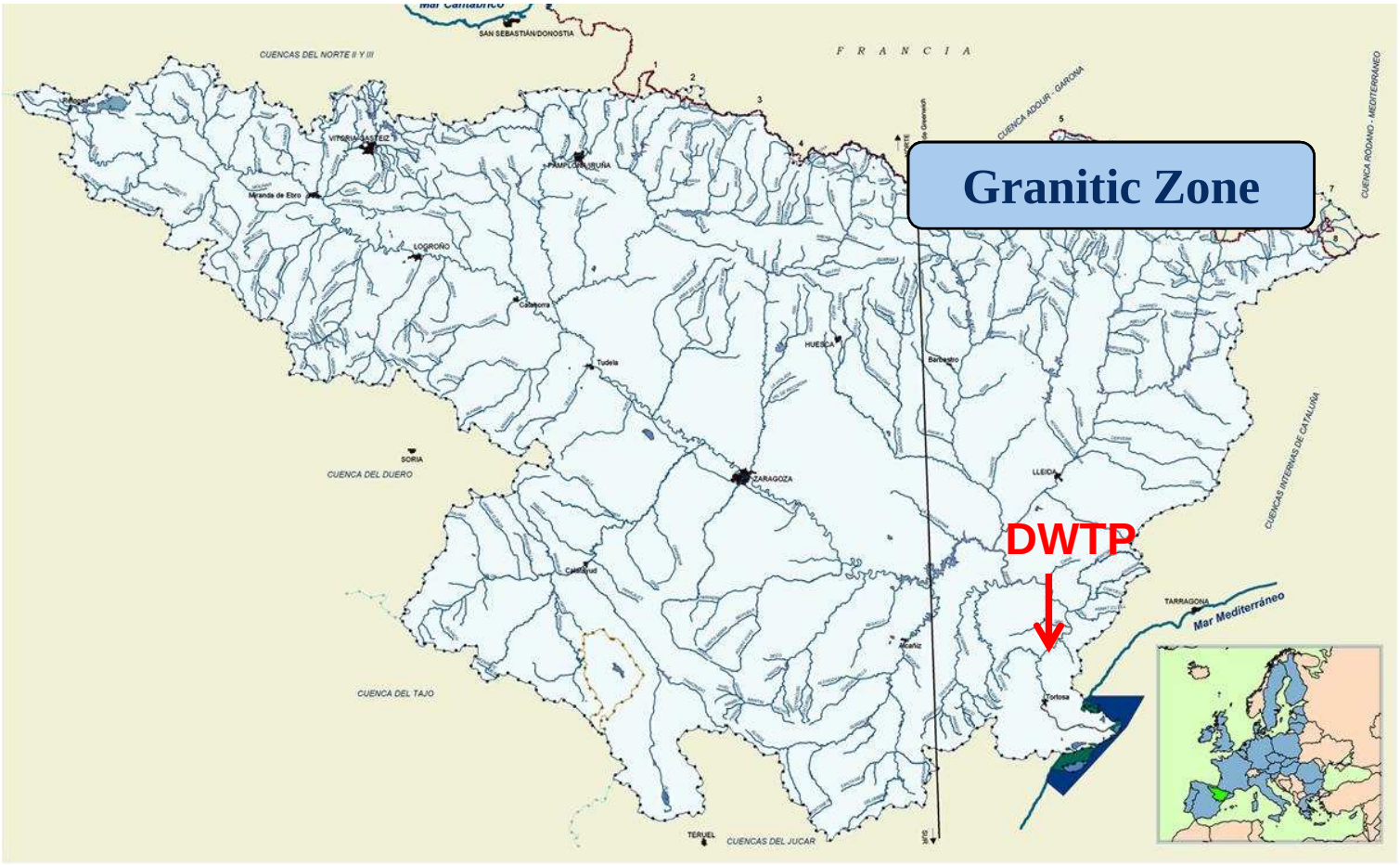
TARRAGONA

Due to the industrialization of Tarragona, more water was necessary

Water from the Ebro River is transfer to the city



High gross alpha values

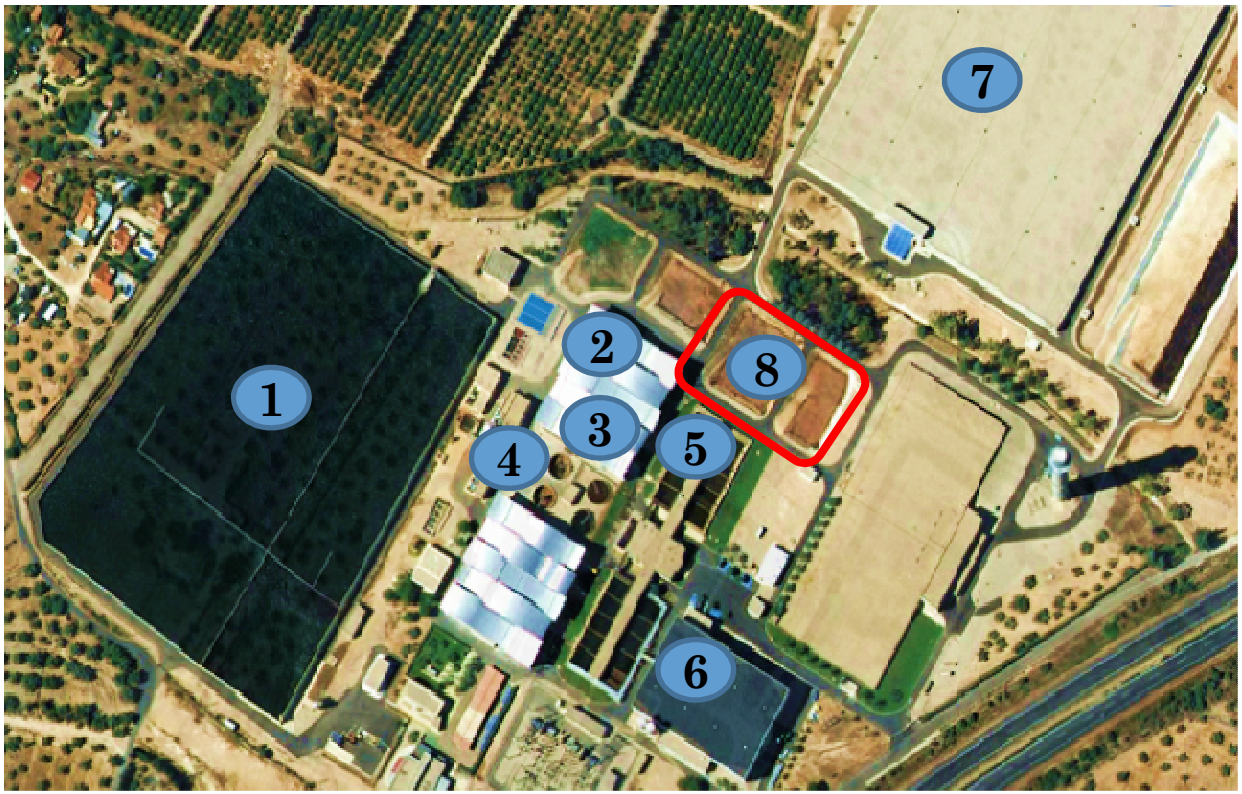
VOCs

Heavy metals (Hg, ..)

Radionuclides

RADIOACTIVITY CONTROL IS REQUIRED

Drinking Water Treatment Plant in L'Ampolla (Tarragona)



1. Ingoing Water
2. Floculation
3. Decantators
4. Sludges
5. Sand Filters
6. Carbon Filters
7. Treated water
8. Dry Sludge

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Evaluate regulated radioactivity parameters in the river water and drinking water

Study the influence of the decontamination works carried out due to the residue generated by the DCP factory

Evaluate the application of tertiarty treatments in the DWTP

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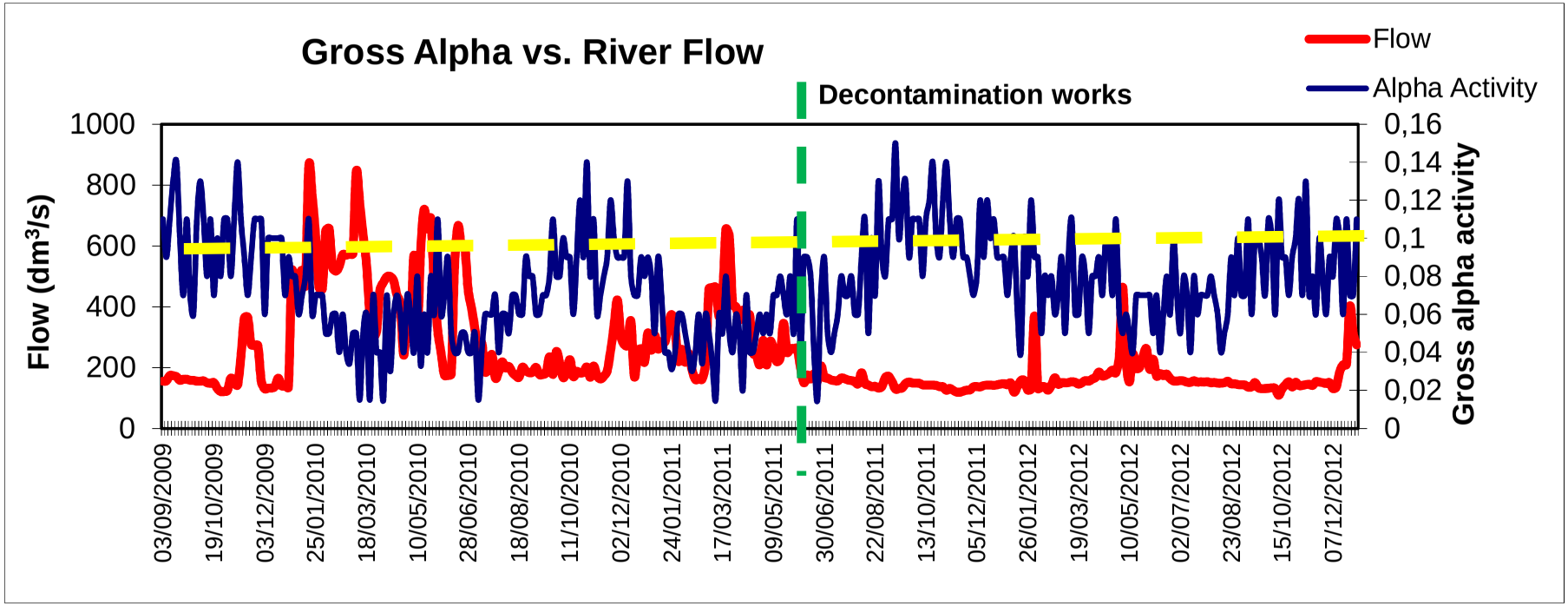
ALPHA ACTIVITY



Flow → Gross Alpha ↓

INDIVIDUAL RADIONUCLIDES

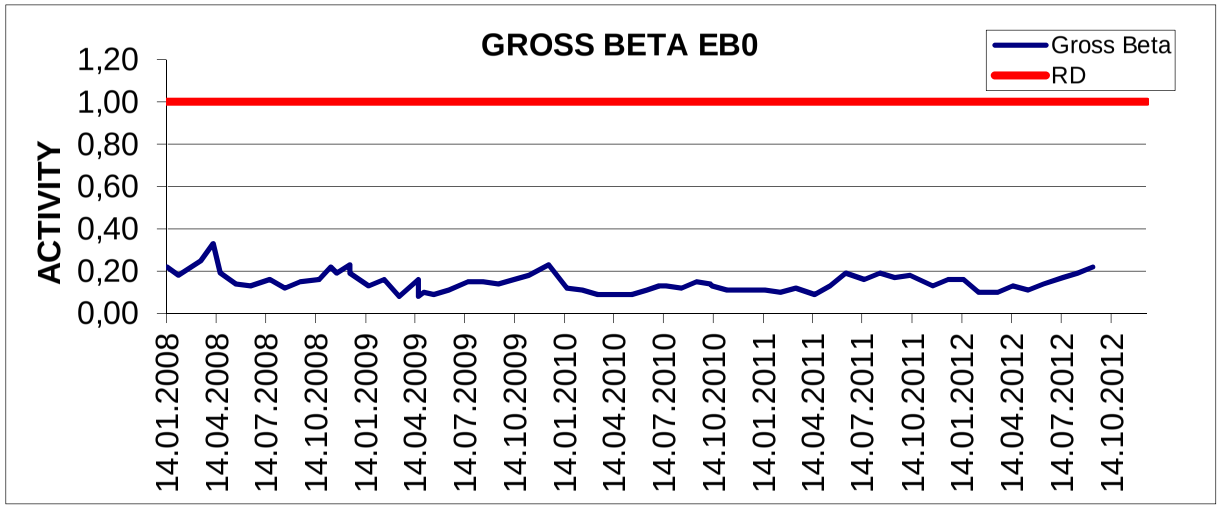
Methods

Parameter	Methodology	Detection	MDA (Bq/L)
^{234}U, ^{235}U, ^{238}U	UTEVA resin + electrodeposition (500 mL)	Alpha spectrometry	0.001
^{226}Ra	Coprecipitation with barium (500 mL)	ZnS(Ag) detector	0.001

Activity of radionuclides in mBq/L

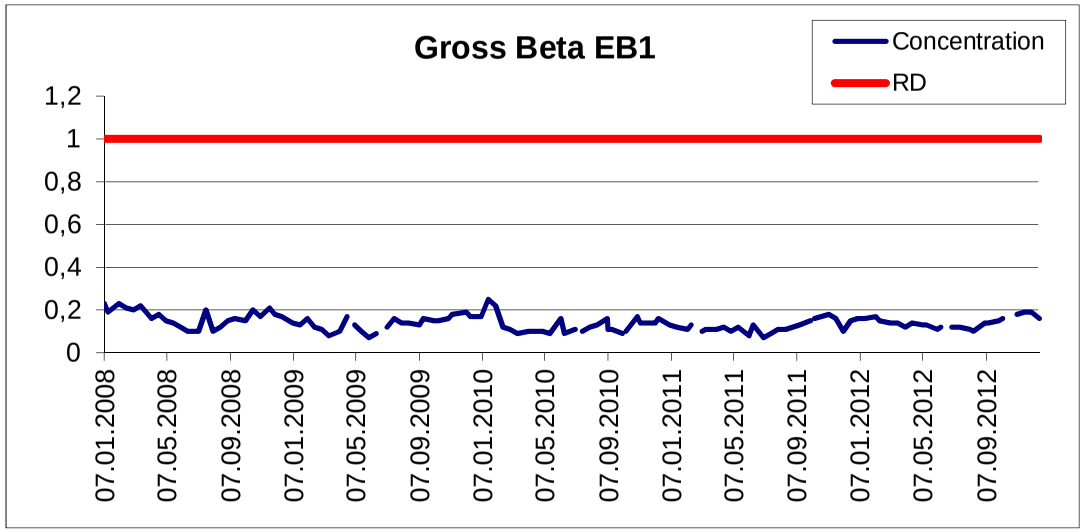
	^{234}U	^{235}U	^{238}U	^{226}Ra
Ingoing	46 ± 4	1.4 ± 0.7	39 ± 3	30 ± 5
Decantator	49 ± 2	1 ± 0.6	41 ± 3	-
Carbon Fil.	38 ± 4	1.0 ± 0.2	34 ± 3	27 ± 5

BETA ACTIVITY



Activities lower than 0,4 Bq/L in ingoing and outgoing

Decontamination work does not affect



GAMMA ANALYSIS

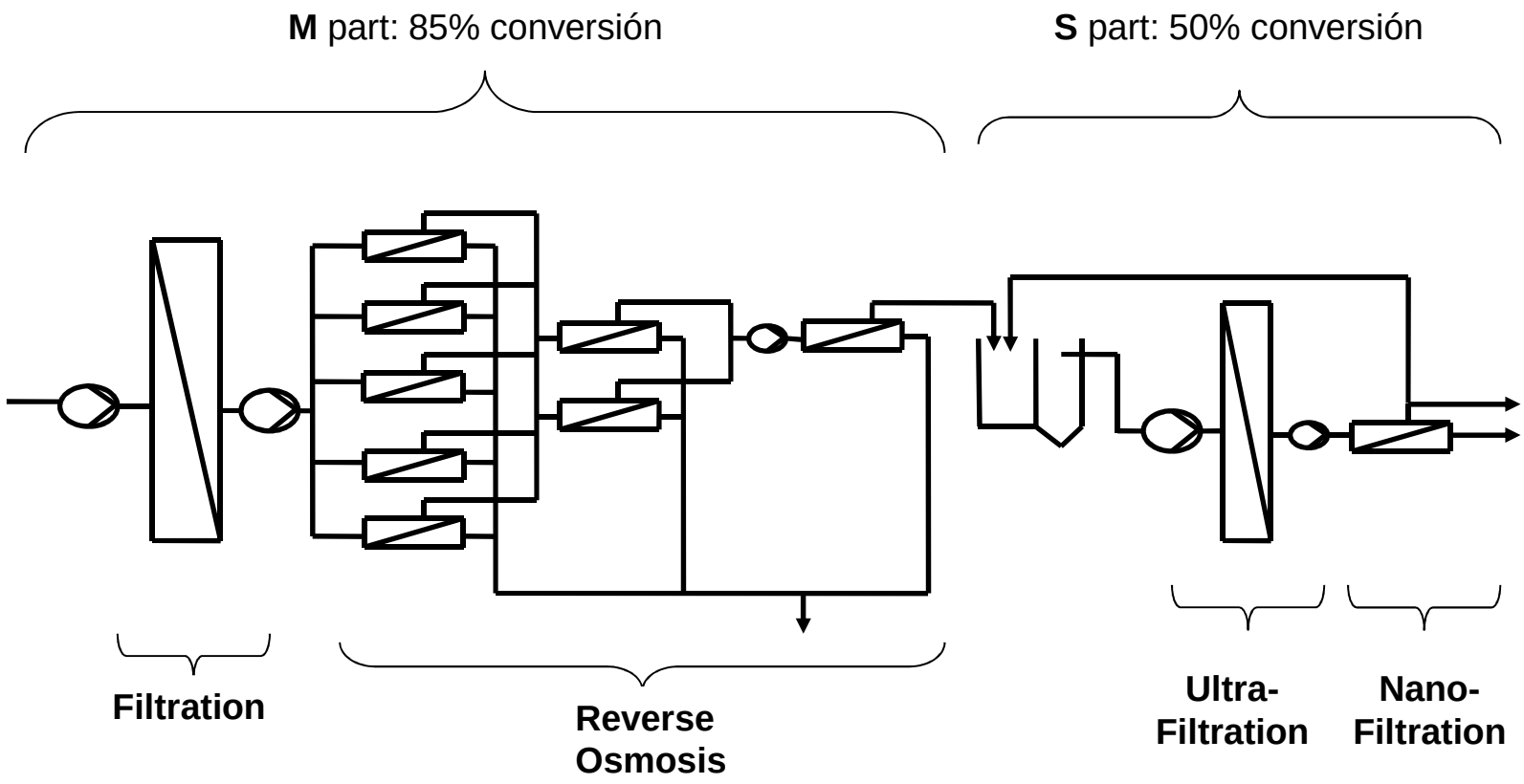
WATER: < MDA

SLUDGE:

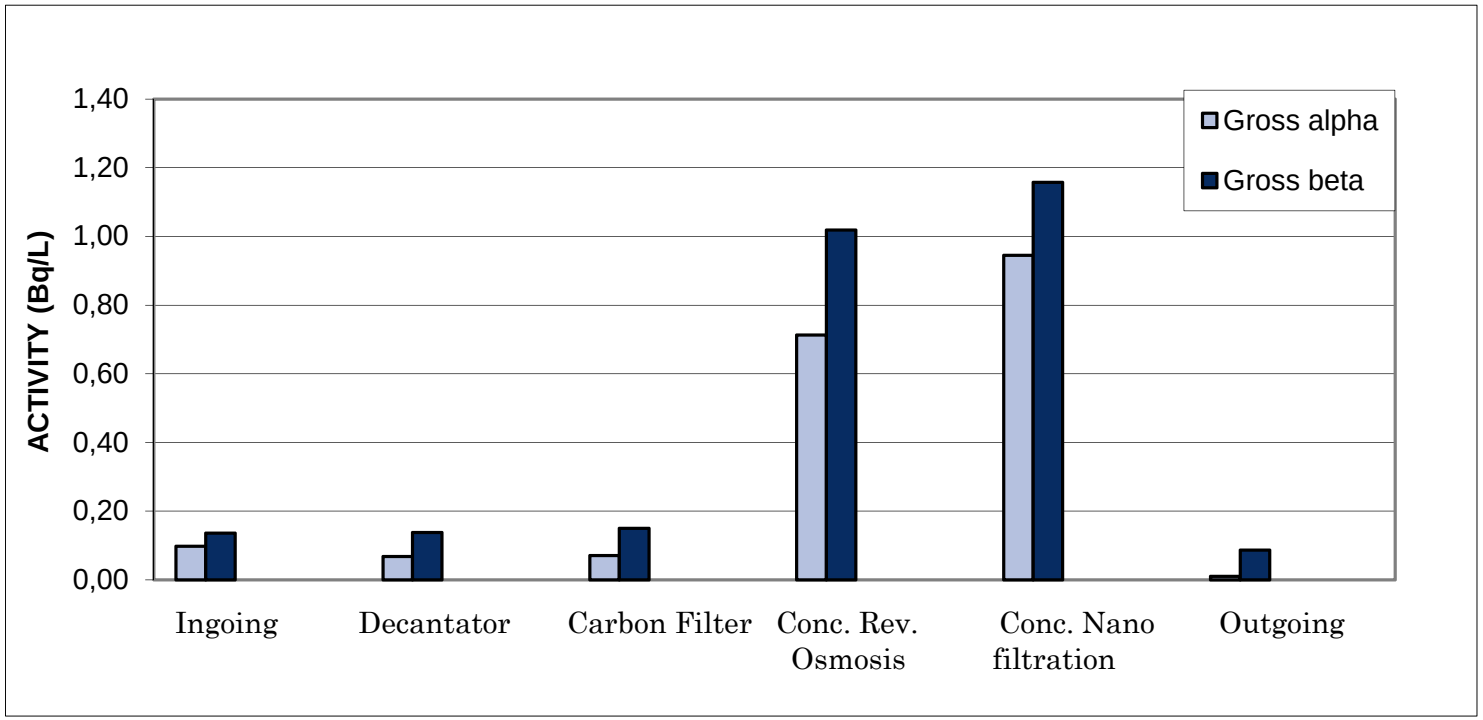
Decontamination works

	2008	2009	2010	2011	2012
^{228}Ac	176 (12)	141 (11)	183 (10)	161 (12)	69 (12)
^{7}Be	129 (12)	112 (12)	167 (12)	123 (12)	147 (12)
^{212}Bi	35 (12)	23 (12)	26 (12)	22 (12)	13 (12)
^{214}Bi	541 (12)	263 (12)	323 (12)	269 (12)	65 (12)
^{212}Pb	33 (12)	37 (12)	34 (12)	32 (12)	23 (12)
^{214}Pb	543 (12)	269 (12)	326 (12)	265 (12)	83 (12)
^{40}K	192 (12)	272 (12)	201 (12)	150 (12)	118 (12)
^{208}Tl	9 (12)	10 (12)	21 (12)	8 (12)	5 (12)
^{235}U	8 (6)	9 (10)	8 (11)	10 (12)	10 (12)

PILOT PLANT


M part: 85% conversión
S part: 50% conversión
Filtration
Reverse Osmosis
Ultra-Filtration
Nano-Filtration

ALPHA AND BETA ACTIVITY



	Gross Alpha	Gross Beta
DWTP	≈ 20%	-
Tertiary treatment	> 90%	50%

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- **No significant variation has been observed since the decontamination work has started.**

- **The gross alpha activity in the Ebro River depends on the river's flow.**

- **The reverse osmosis is a useful tertiary treatment to reduce the salt content in the drinking water.**

Thank you for your attention!

Questions?

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