

STUDY OF A DICALCIUM PHOSPHATE INDUSTRIAL PLANT IN THE NORM CONTEXT AND WITHIN THE REGULATORY SPANISH FRAMEWORK

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SPANISH LEGAL FRAMEWORK IN NORM

EURATOM 29/96

RD 783/2001

RD 1439/2010



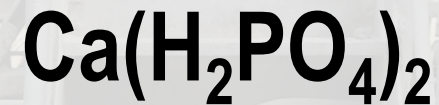
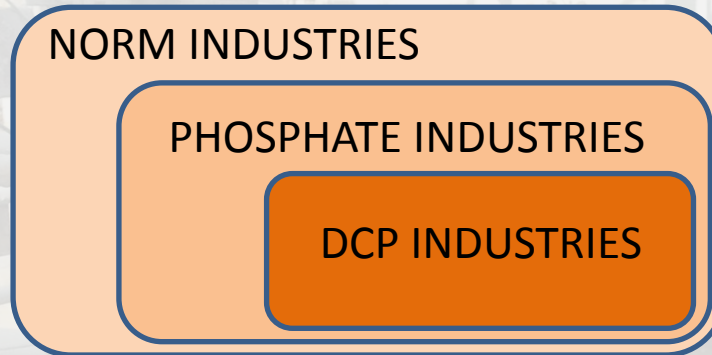
1- The industry holder **MUST** perform the studies to show whether there is an increasing dose to workers and to the public due to the industrial activity.

2- The industry holder **MUST** declare its industrial activity to the Authorities.

3- This RD is also extended to the wastes storage and handling.

Instructions: Nuclear Security Council (CSN)

THE RD1439/2010 IN THE DCP INDUSTRY



- Inorganic feed supplement
- Classified as **feed material** by the European Commission Regulation.
- **Calcium and phosphorus** feed supplement for domestic animals (cattle, poultry, beef, sheep). 18% of P and between 25-30% of Ca.
- High calcium availability (93%).

THE RD1439/2010 IN THE DCP INDUSTRY

1) Radioactivity characterization

- Raw materials
- Intermediate products
- Comercial products
- Wastes
- Suspended matter/dust

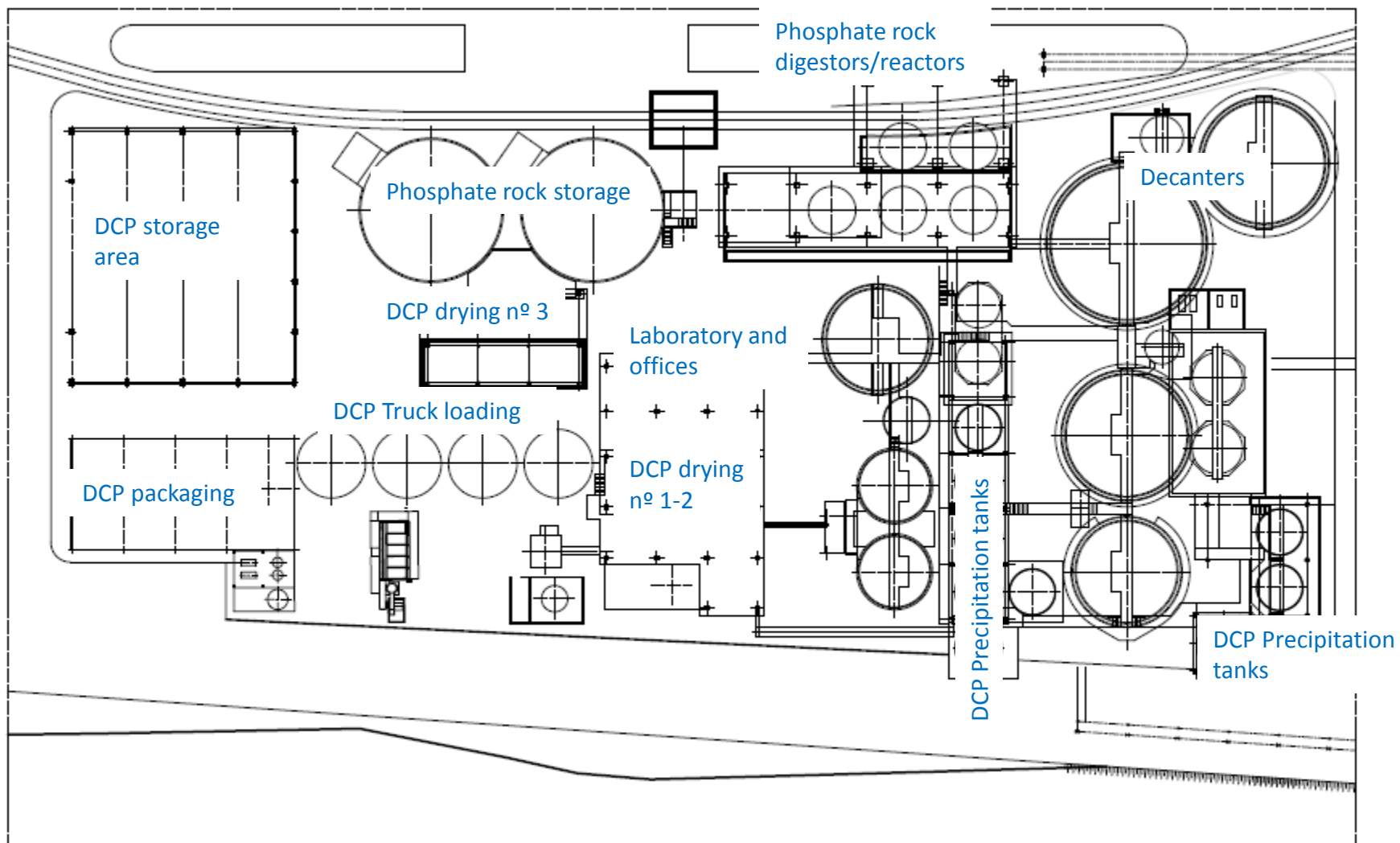
2007-2009

2) Identification of the high dose rates areas

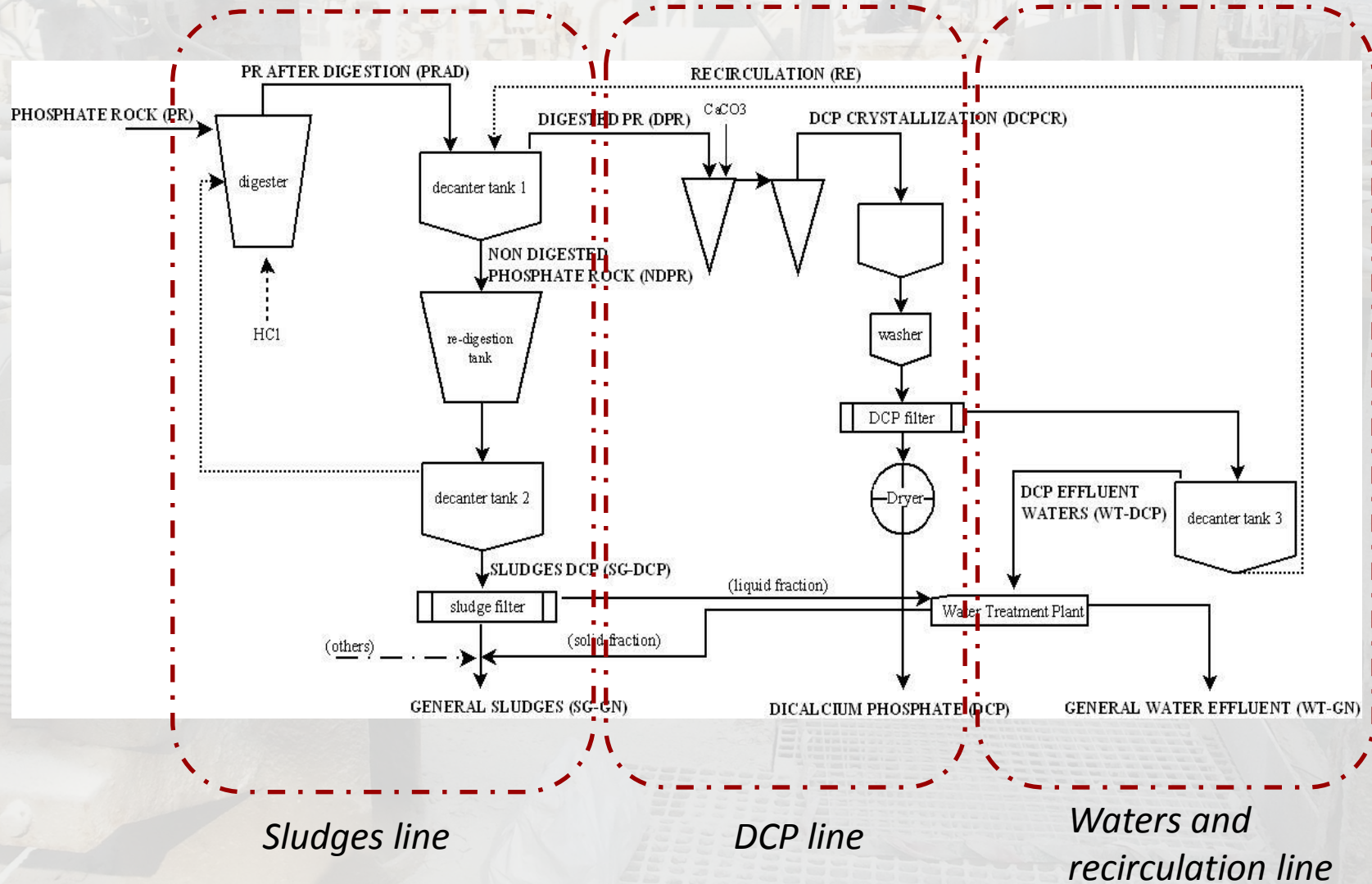
3) Dose evaluation

- Workers
- Public

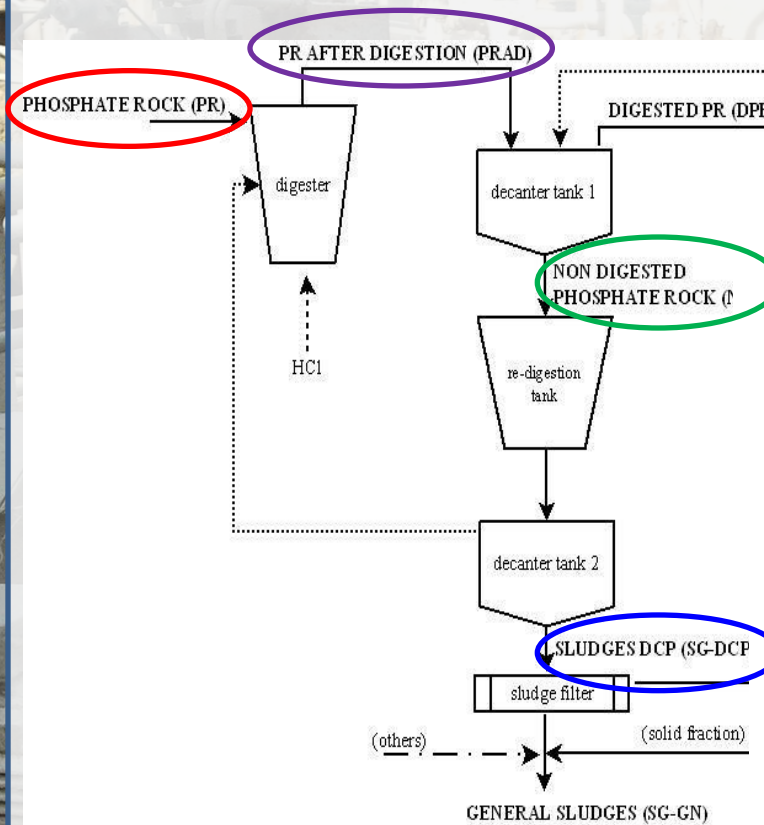
2011-2012



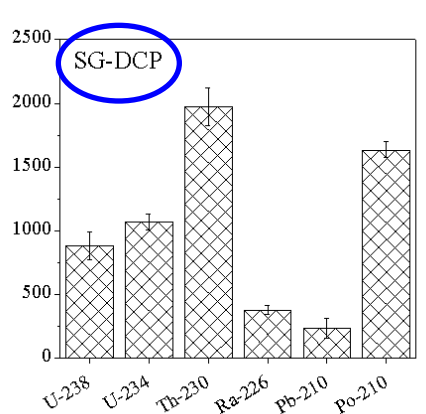
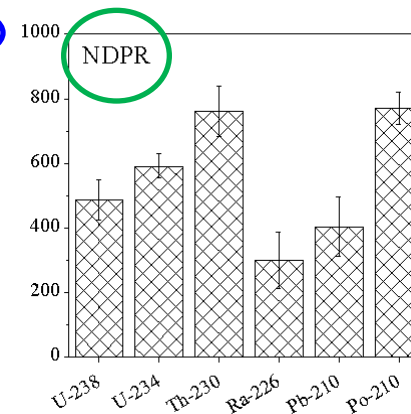
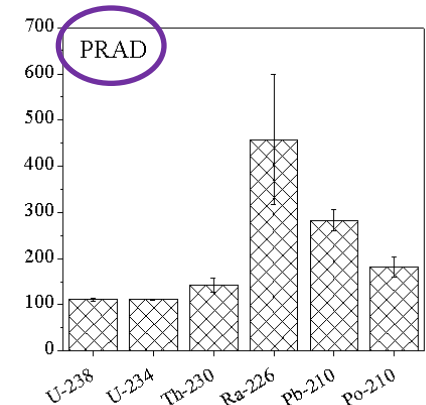
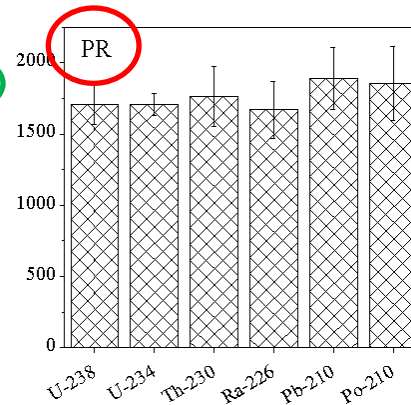
DCP PRODUCTION PROCESS via HCl



THE SLUDGES LINE



Specific concentrations ($\text{Bq}\cdot\text{kg}^{-1}$)

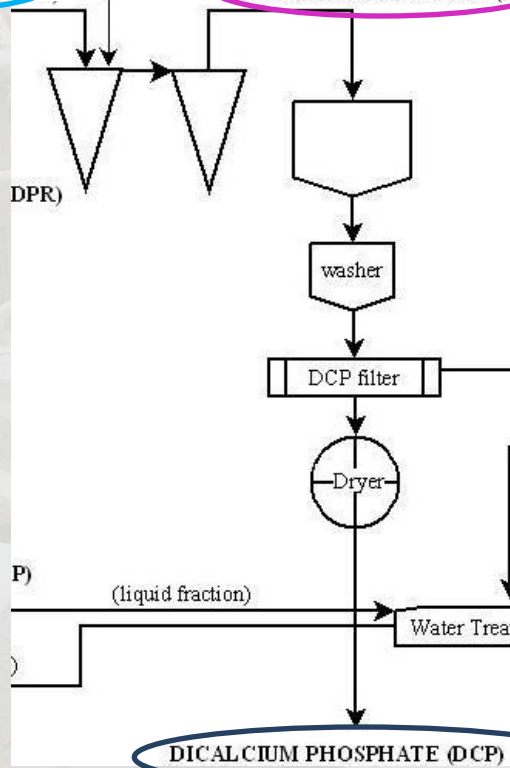


DICALCIUM PHOSPHATE LINE

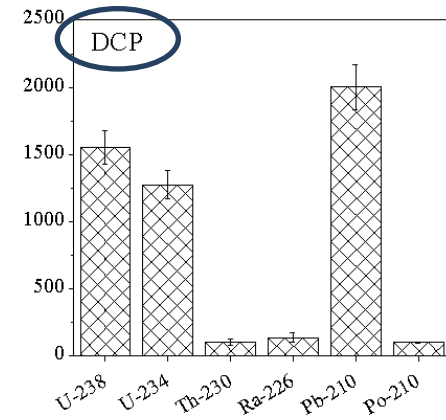
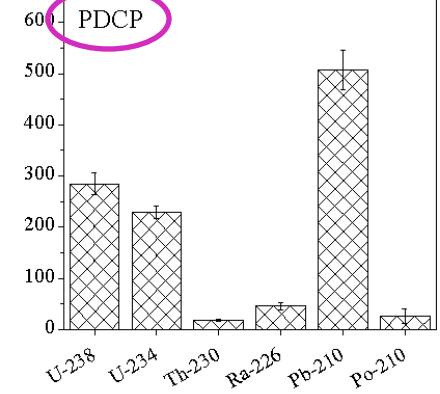
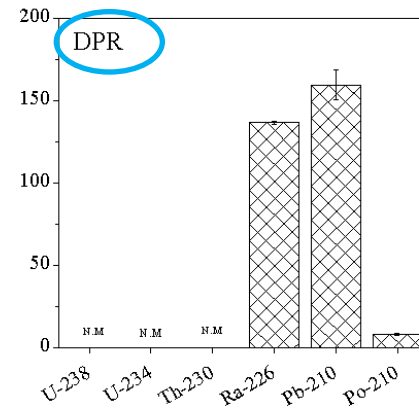
DIGESTED PR (DPR)

CaCO₃

DCP CRYSTALLIZATION (L)

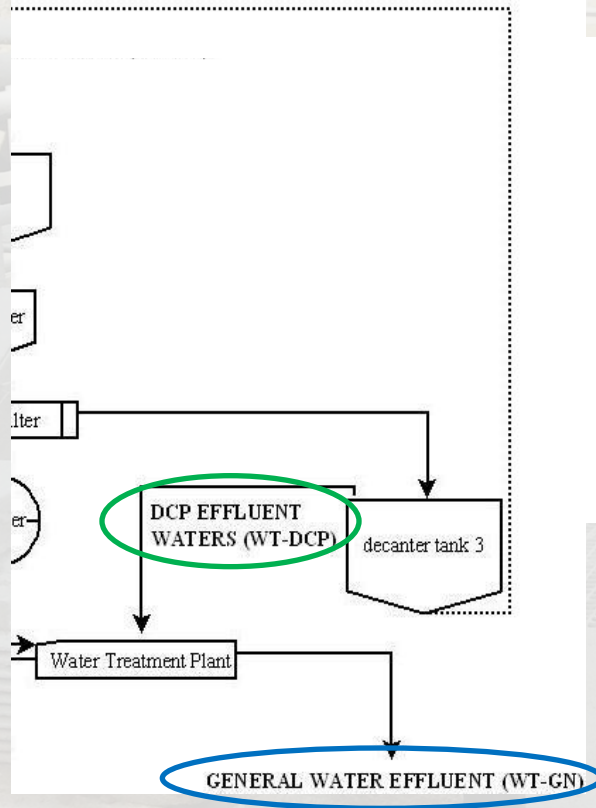


Specific concentrations (Bq·kg⁻¹)

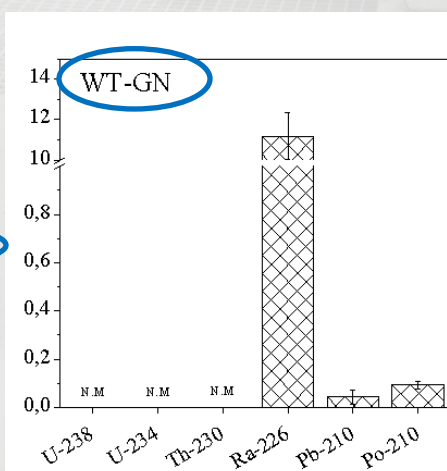
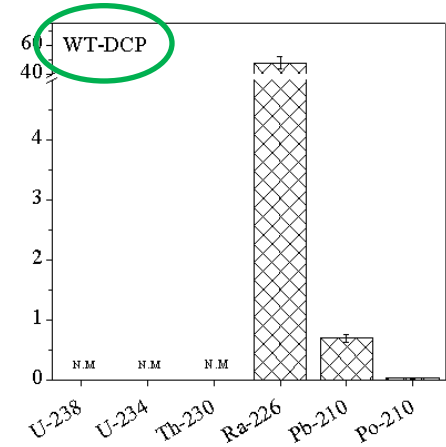
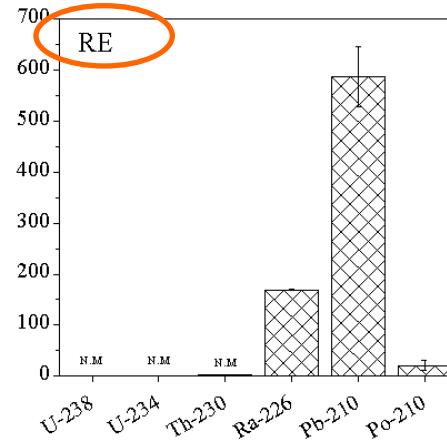


WATERS AND RECIRCULATION LINE

RECIRCULATION (RE)



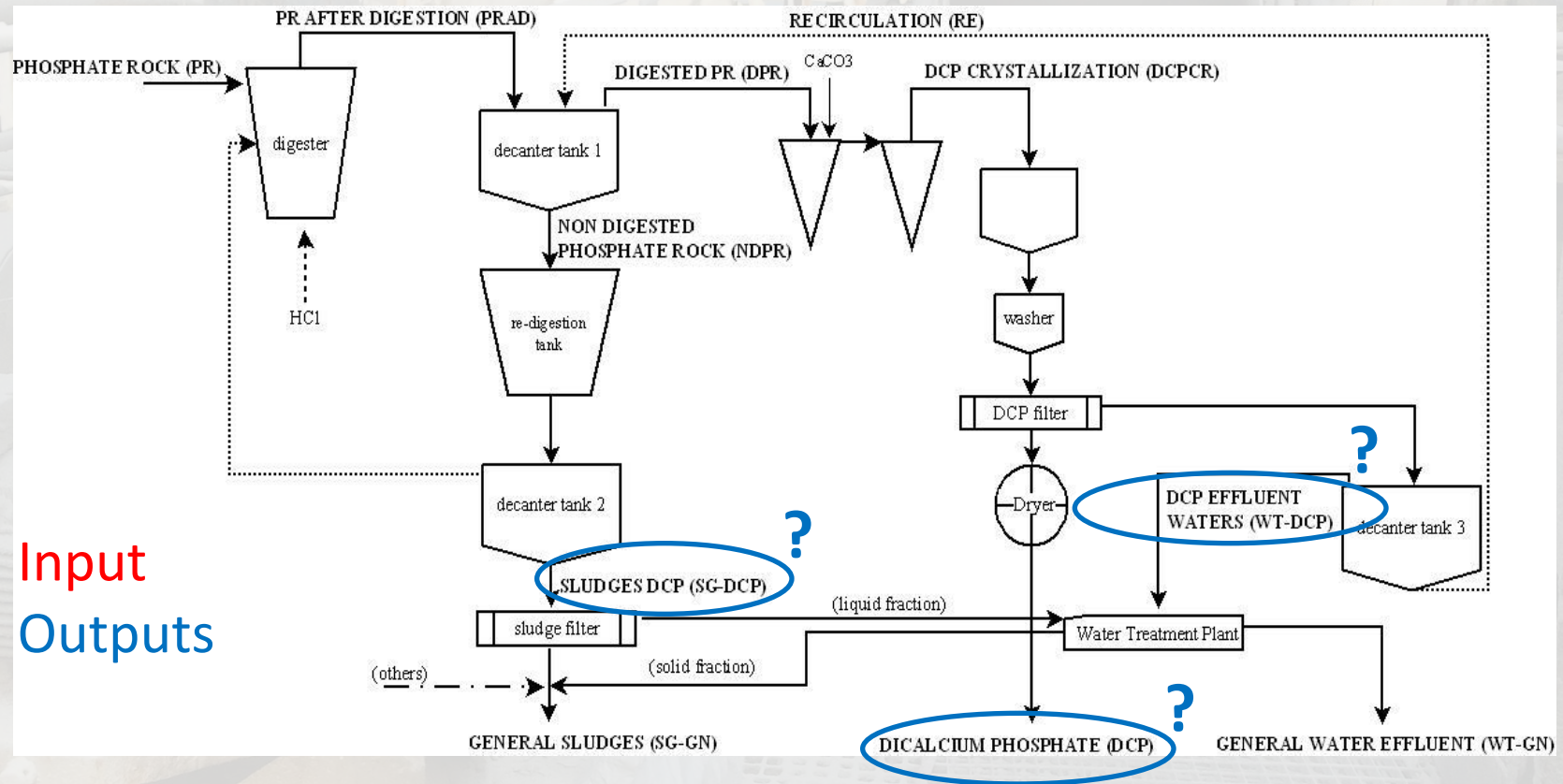
Specific concentrations (Bq·kg⁻¹)



FLUXES OF RADIONUCLIDES

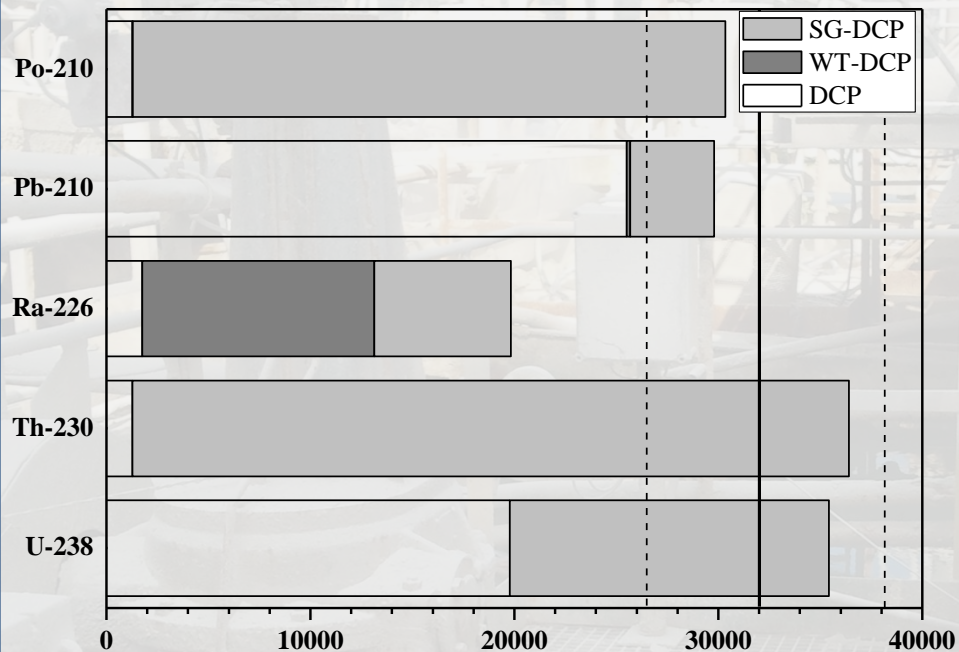
100% kBq·h⁻¹

²³⁸U and daughters



Input
Outputs

FLUXES OF RADIONUCLIDES



OIR

0.91 ± 0.13

CaF₂ flux

0.87 ± 0.13

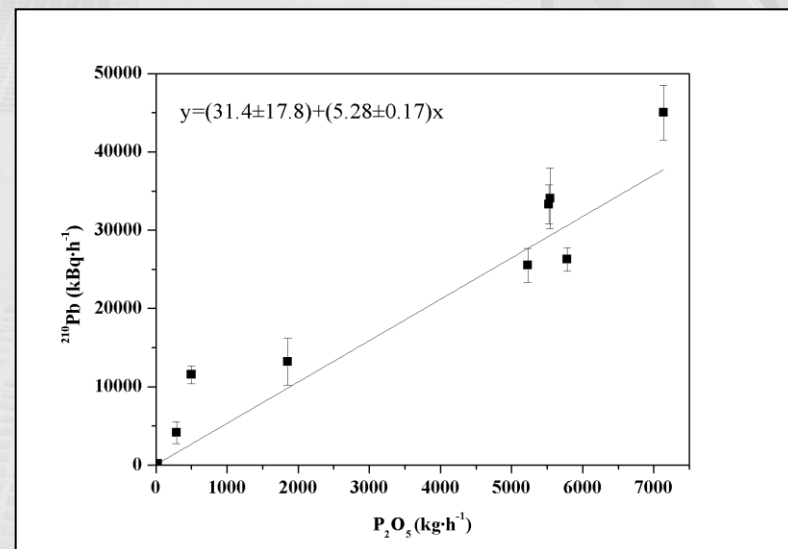
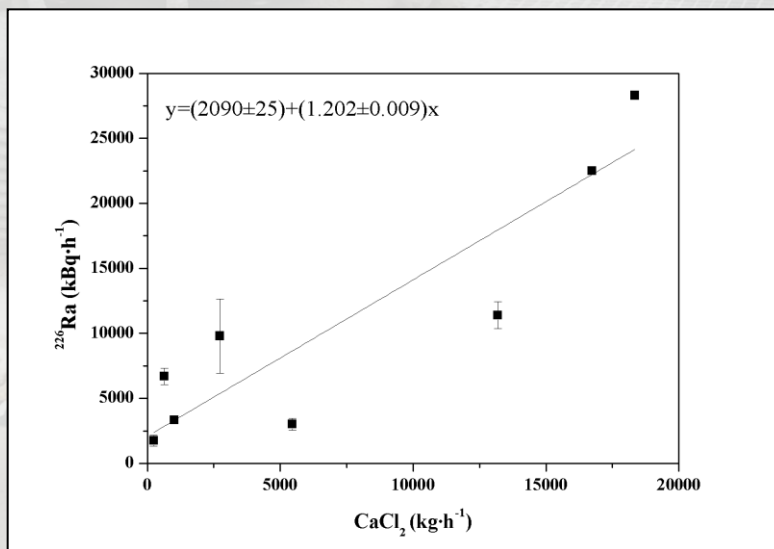
CaCl₂ flux

0.66 ± 0.09

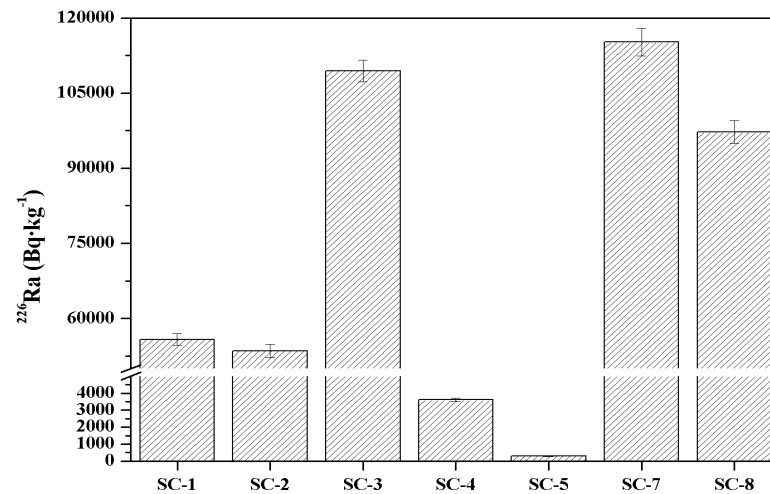
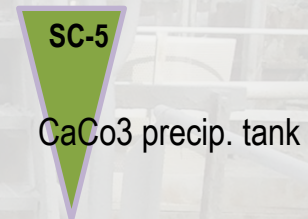
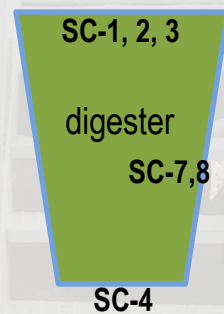
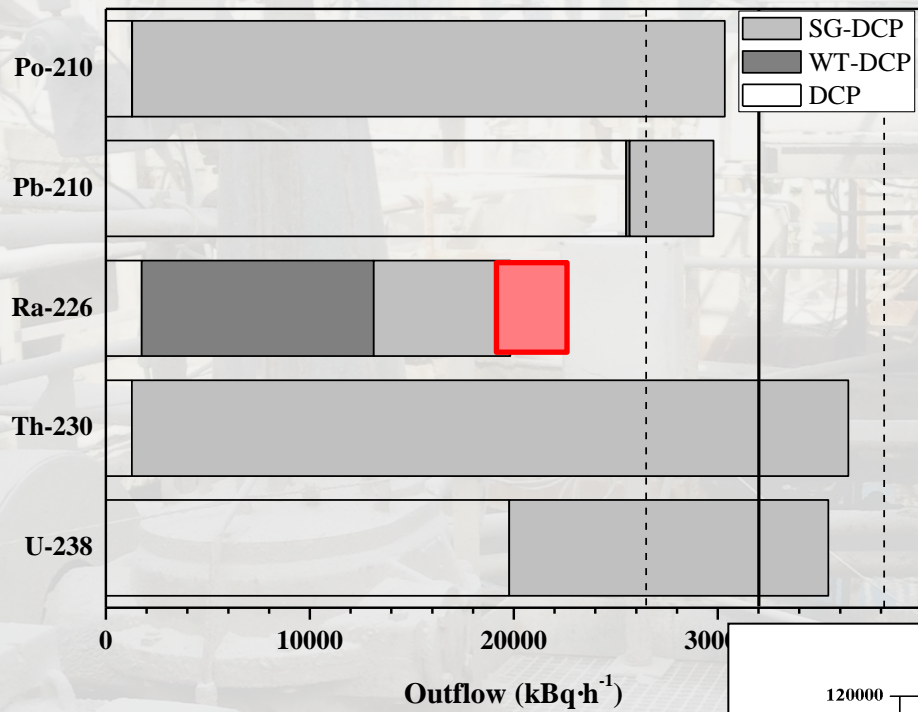
P₂O₅ flux

1.15 ± 0.14

1.15 ± 0.11



FLUXES OF RADIONUCLIDES



WORK IN PROGRESS...

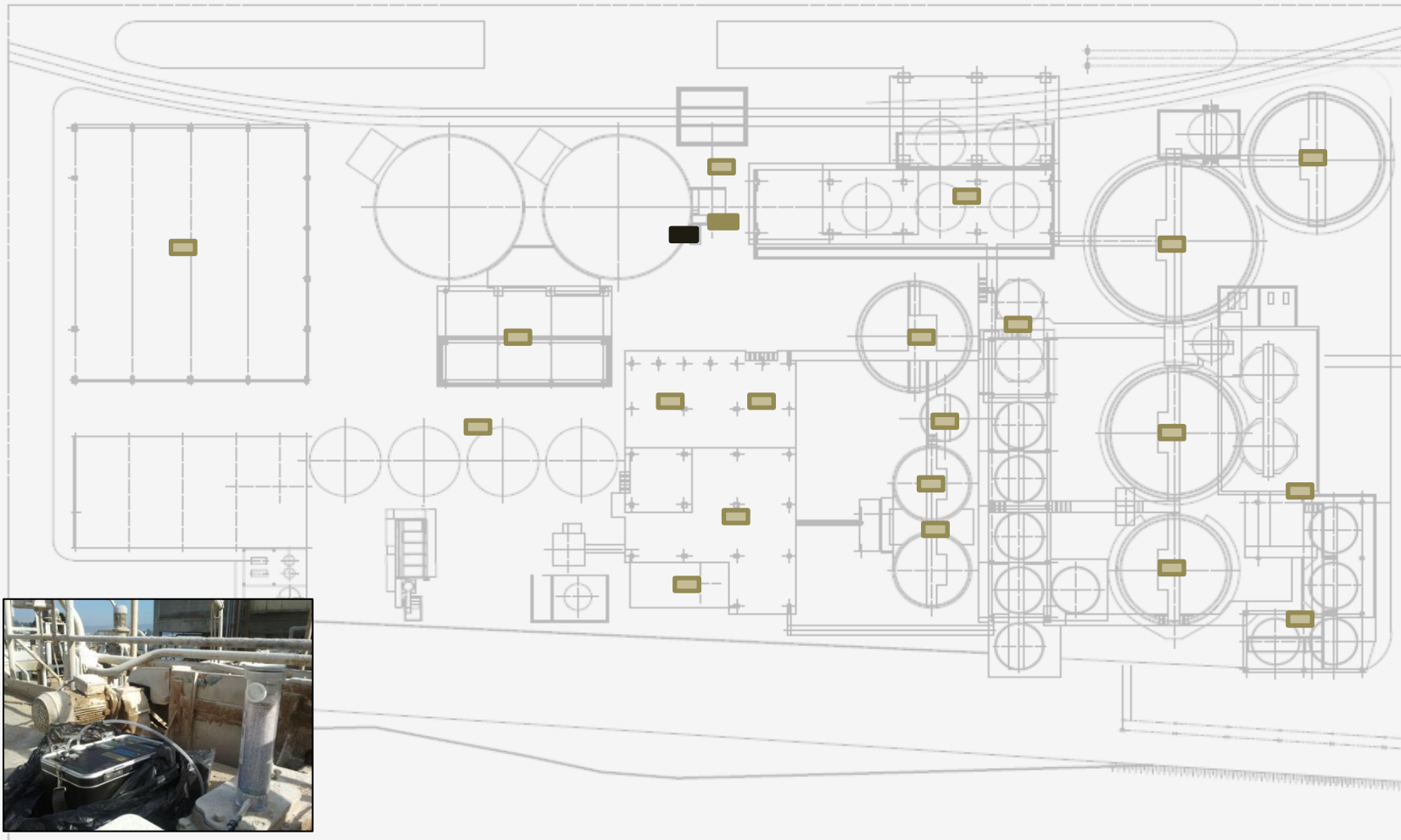
- 1) Radioactivity characterization
 - Raw materials
 - Intermediate products
 - Commercial products
 - Wastes
 - Suspended matter/dust
 - 30 m³ air filtration at 10 different areas at the DCP plant
- 2) Identification of the high dose rates areas
 - Area dosimetry.
 - Identification of the *hot spots* (> 10 uSv·h⁻¹)
- 3) Dose evaluation
 - Workers
 - Internal and external dose evaluation.
 - Special attention at maintenance and cleaning of pipes and digestors.
 - Public (environment)
 - Environmental impact due to releases to the river.

^{222}Rn MEASUREMENTS: July 2011

0 - 100 $\text{Bq}\cdot\text{m}^{-3}$

100 - 200 $\text{Bq}\cdot\text{m}^{-3}$

200 - 400 $\text{Bq}\cdot\text{m}^{-3}$

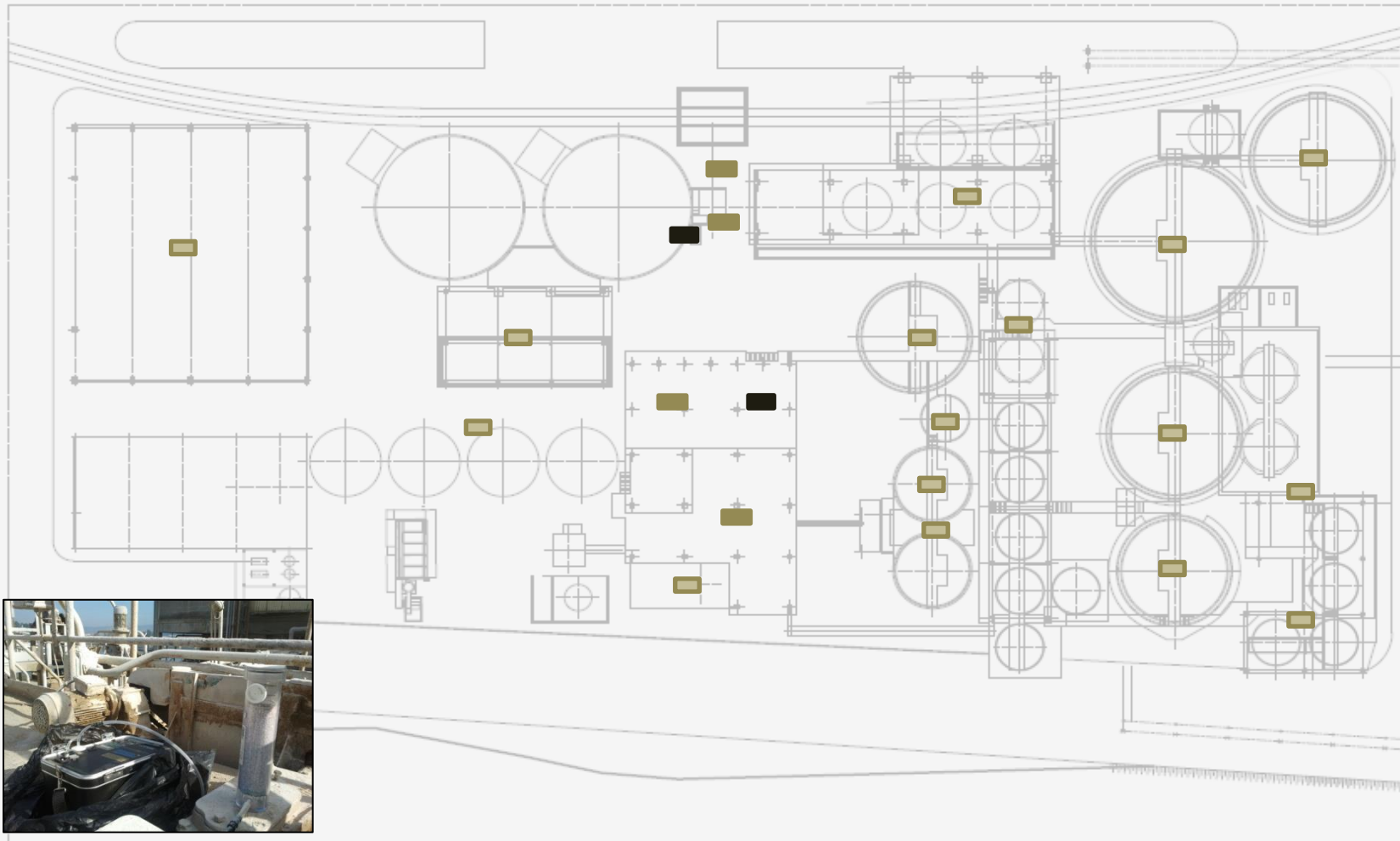


^{222}Rn MEASUREMENTS: November 2011

0 - 100 $\text{Bq}\cdot\text{m}^{-3}$

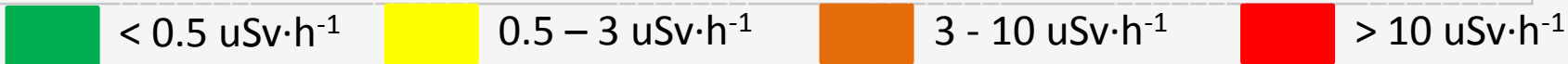
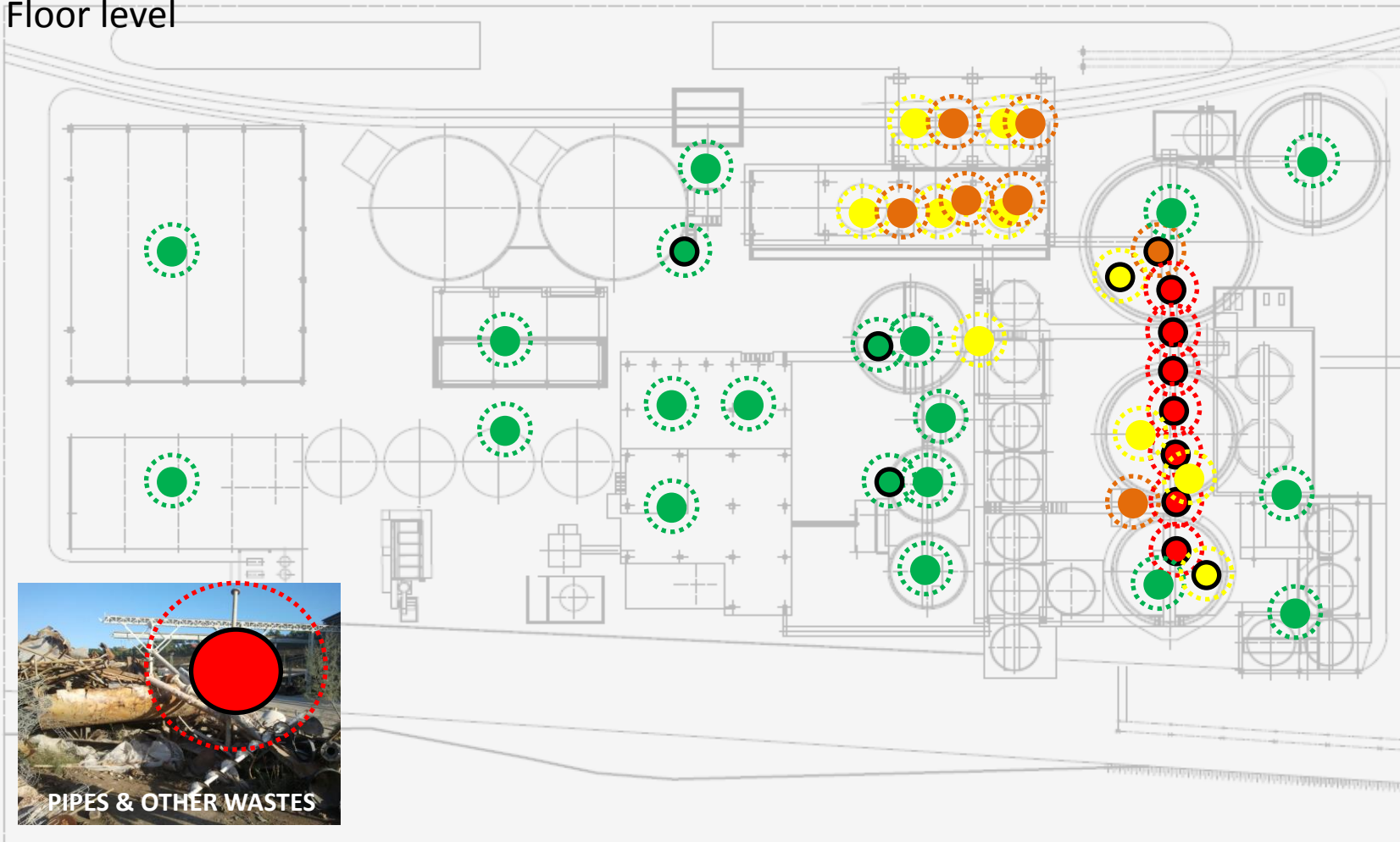
100 - 200 $\text{Bq}\cdot\text{m}^{-3}$

200 - 400 $\text{Bq}\cdot\text{m}^{-3}$



Gamma dose rates: July - November 2011

○ Floor level



Summary

- Activity concentrations of PRODUCTS, INTERMEDIATE PRODUCTS, FINAL PRODUCTS and WASTES of the Dicalcium Phosphate industry **> 1000 Bq·kg⁻¹** (1 Bq·g⁻¹).
 - Scales presenting the highest ²²⁶Ra concentrations (**> 100 Bq·g⁻¹**).
- Fluxes of radionuclides show a consistent balance of inputs and outputs which might be comparable to similar DCP production industries, **but** not exactly the same due to little changes in their production system (see Gäfvert et al., 2001).
- ²²²Rn **should not be a problem** in this particular case as this is an open-air industry.
- Gamma dose rates point to some **“hot spots”** which might be up to **30-40 uSv·h⁻¹**.
- Doses still to be calculated, paying attention on the **maintenance and cleaning**.
- **Waste management problem** (pipes and tubings) as the Instructions of the CSN are still not published.

Thank you!

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