

Radiological Safety Assessment of the Zapadnoe Uranium Tailings Facility, Dneprodzerzhynsk , Ukraine

Dmitri Bugai
Institute of Geological Sciences Kiev, Ukraine

Matthew Kozak
INTERA, Inc., Denver, USA

Japie van Blerk
Aquisim Consulting (Pty) Ltd.
Centurion, South Africa

Rodolfo Avila
Facilia SE, Stockholm, Sweden

EU-NORM
Prague
16-20 June 2014



Goals of the Work

- Provide a demonstration safety assessment of the Zapadnoe uranium tailings facility
 - Existing exposure situation
 - Projected potential exposures in future
- Develop capacity within Ukraine for safety assessments and remedial activities
- Support decisions regarding disposition of the Pridneprovsky Chemical Plant

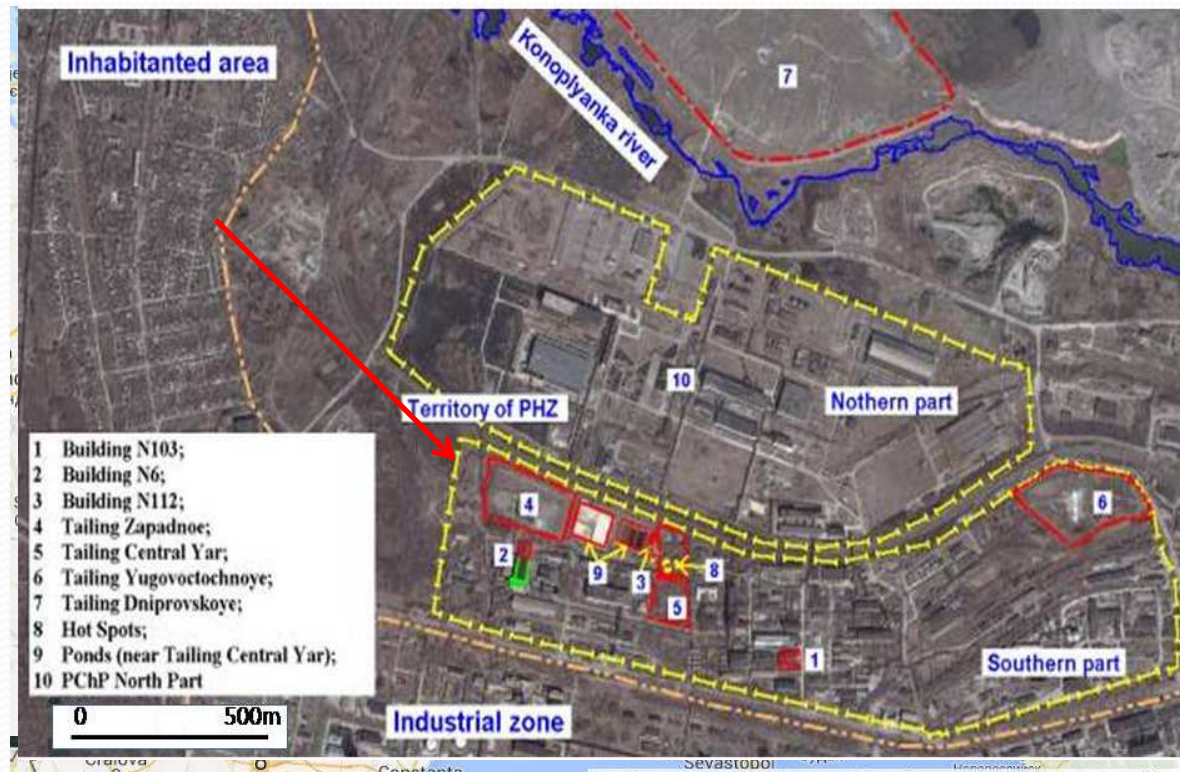


Scope of the Presentation

- The waste, the site, and the disposal facility
- The approach to the safety assessment
- Results and conclusions



Pridneprovsky Chemical Plant



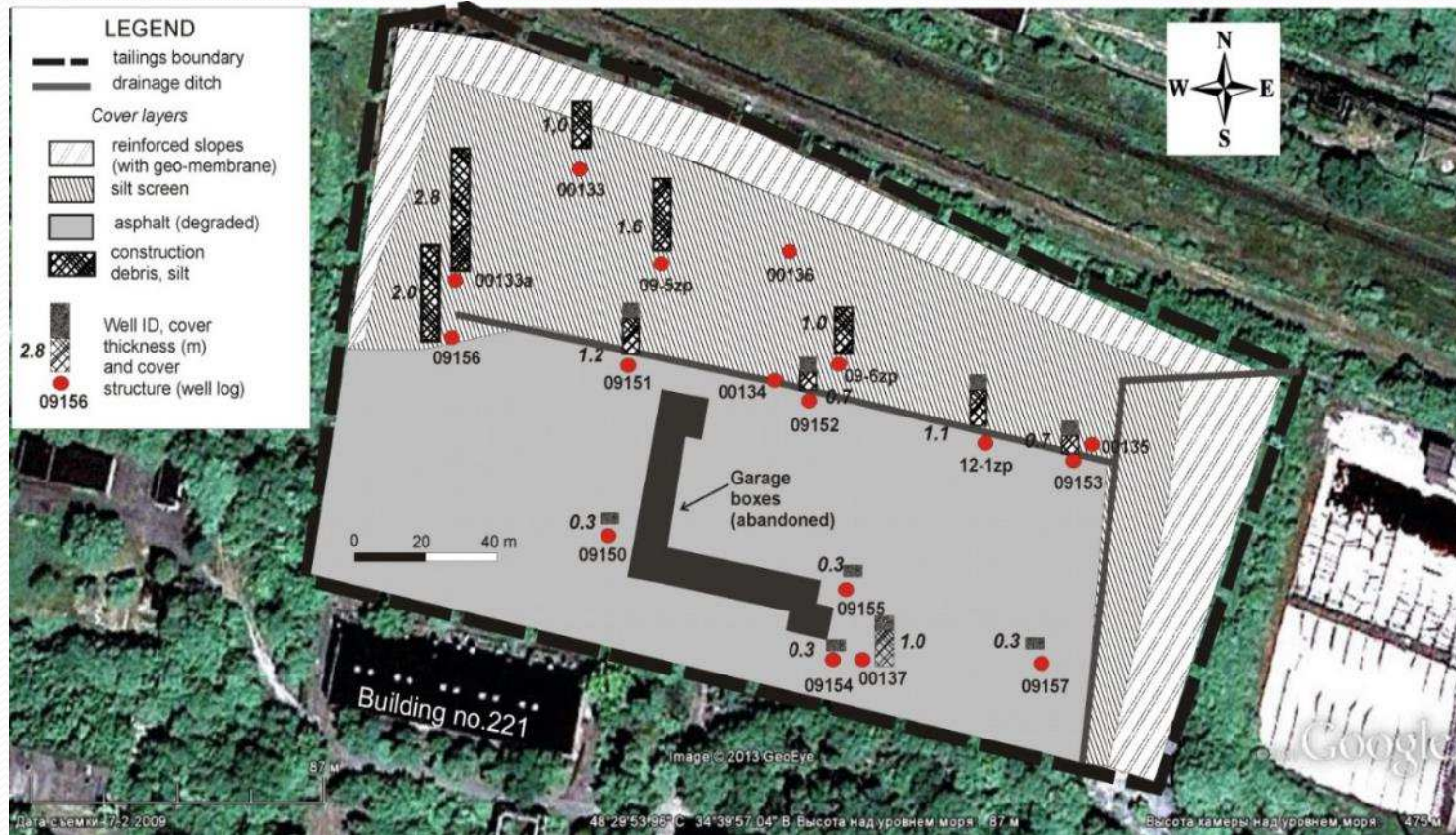
- Soviet-era uranium ore processing operated from 1947 to 1991
- Residues were stored in adjacent ravines

The Zapandoe Tailing Facility

- Received tailings from 1949 until 1954
- A ravine with starter walls
- Disposal of toxic chemicals and NORM residues of uranium production
- Covered with backfill and and engineered cover

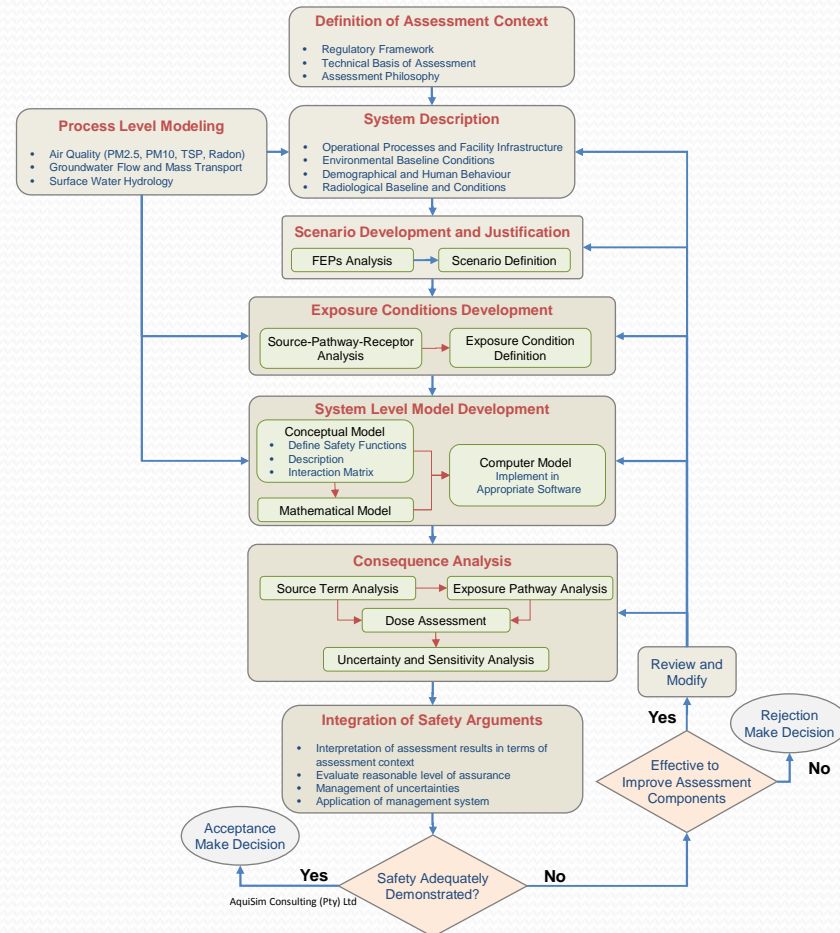


Superficial Plan View



Assessment Framework

- An extension of the IAEA safety assessment methodology for postclosure safety assessment of radioactive waste
- Extensions take account of the differences between a planned facility and a legacy site
- Increased focus on establishing exposure conditions and potential exposure conditions



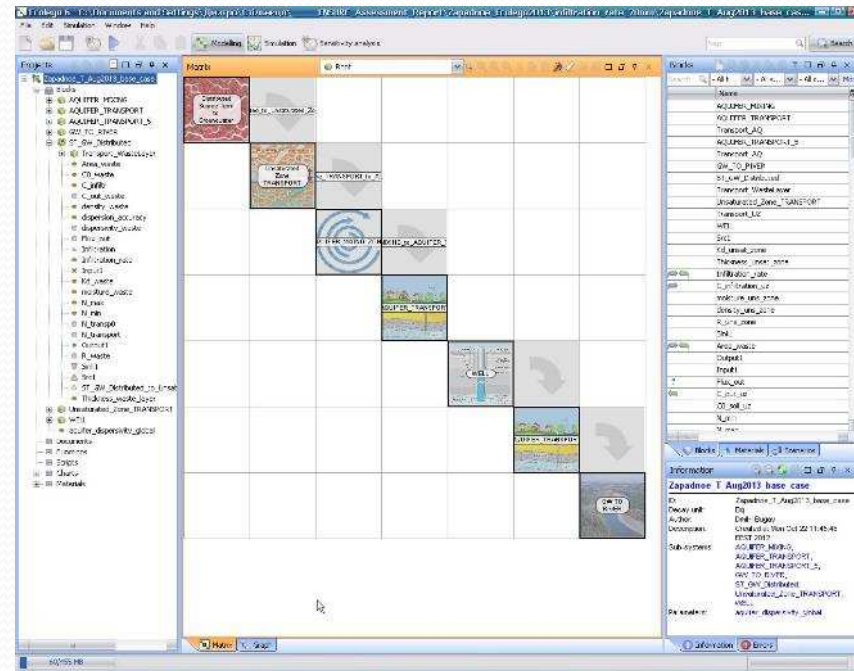
Development and Justification of Scenarios

- Address the uncertainty in the future evolution of the system
- Based on formal methods
 - Based on “Features, Events, and Processes (FEPs)”
 - Based on “Safety Functions”
- Formulation of a Reference Scenario (“design basis” scenario)
- A number of Alternative Scenarios (i.e., “off-normal” scenarios)



Consequence Analyses

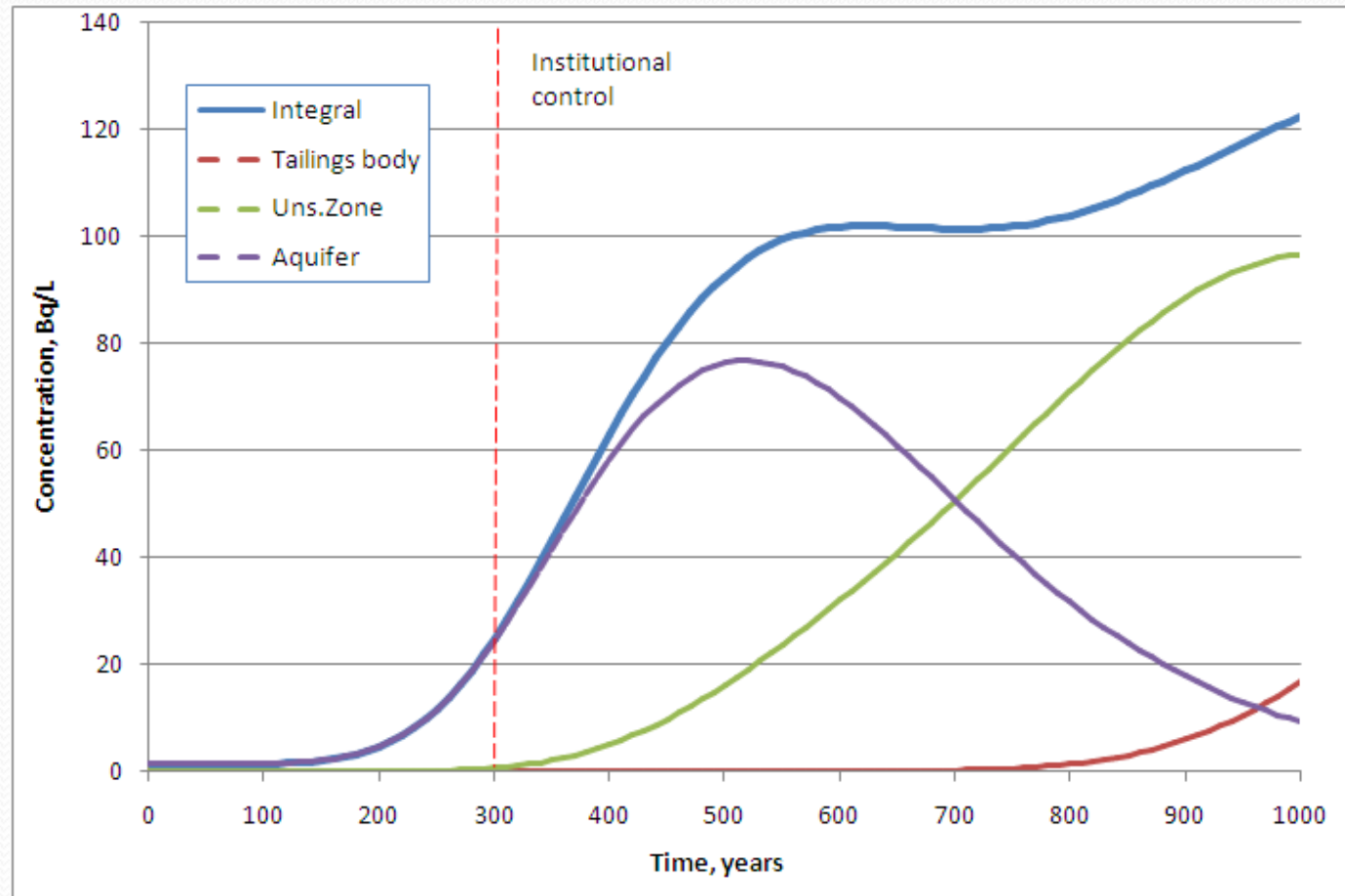
- Environmental transport and dose calculations for the selected scenarios
- Process-level assessment carried out using MODFLOW (groundwater) and Calpuff (atmosphere)
- System assessment carried out using the Ecolego software
- Considered uncertainties in input parameters; both probabilistic and deterministic analyses carried out



<http://ecolego.facilia.se/ecolego/show/HomePage>



Representative Postclosure Results



Representative Peak Doses

Timeframe	Scenario	Exposed Individual	Max.dose, mSv/y	Important Pathways
Current situation	Reference	Member of public	8E-5	Rn dispersion
Current situation	Reference	Site Worker -Guard	0.59	Rn, external
Current situation	Reference	Site Worker –Barrier Staff	0.64	Rn, external
Long-term (>300 y)	Reference	Private Resident	2.64	Vegetable consumption
Long-term (>300 y)	Reference	On-Site Visitor	0.41	Rn, external
Long-term (>300 y)	Faster Cover Degradation	Private Resident	3.0	Vegetable consumption
Long-term (>300 y)	Climate Change	Private Resident	2.9	Vegetable consumption
Long-term (>300 y)	Intrusion Scenario	Private Resident	19.5	Rn (indoors), external (indoors), Vegetable consumption



Summary

- A preliminary safety assessment of the Zapadnoe Tailings Facility has been carried out
 - Existing exposure situation
 - Projected potential exposures in future
- The analysis is intended as a demonstration of the methodology for legacy NORM facilities
- The approach is a template for additional safety assessment analyses that need to be conducted to support decisions regarding cleanup of the broader Pridneprovsky Chemical Plant



