The Condition Assessment of Earthfill Dams

Case project Kalajärvi

3rd Nordic Dam Safety Seminar

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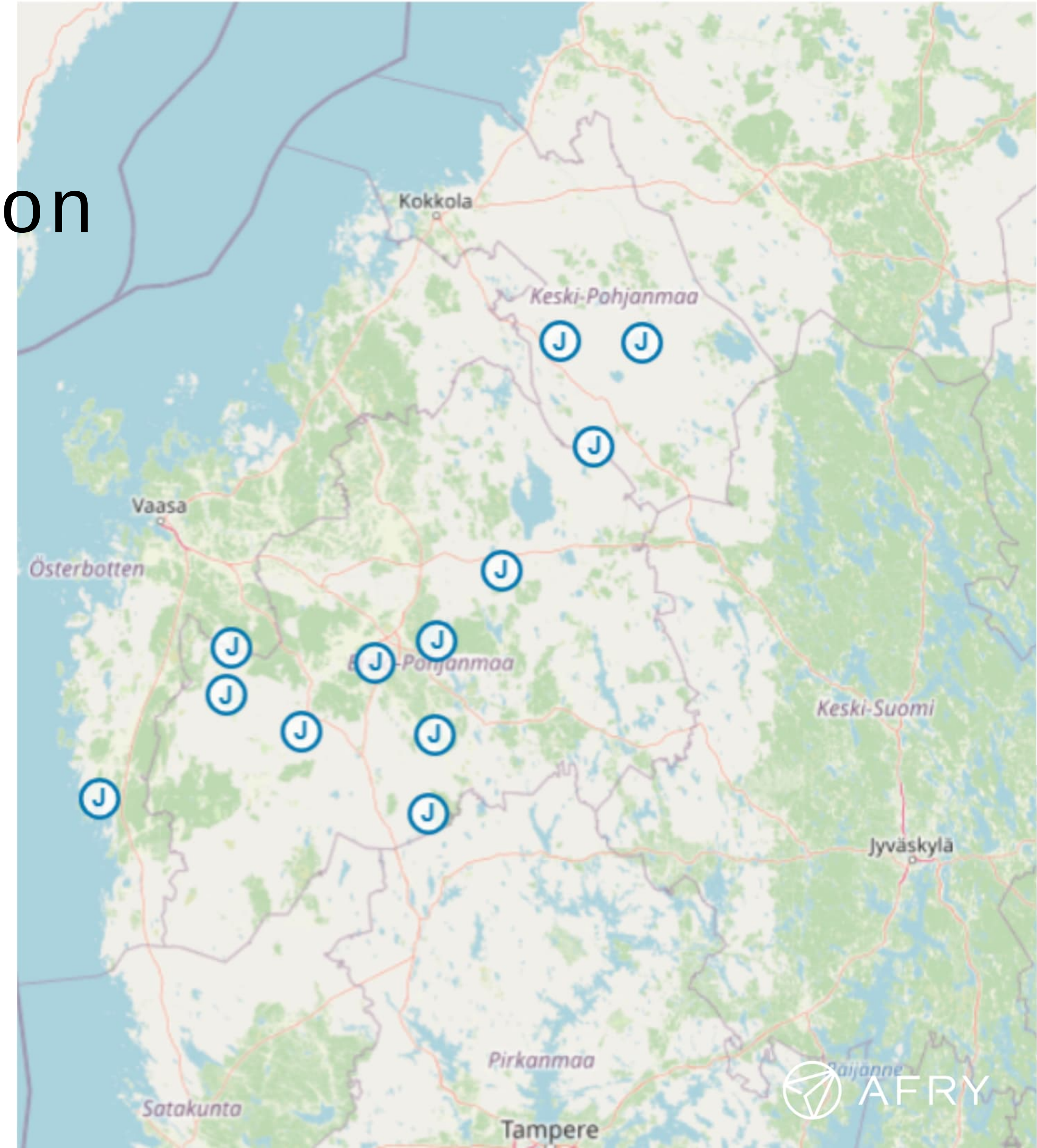
Background Information

- Client: ELY-Centre for South Ostrobothnia
  - (Centre for Economic Development, Transport and the Environment)
- There are a total of 15 artificial lakes or dammed natural lakes in the responsibility area of the South Ostrobothnia ELY Centre.
  - Lakes have been constructed for flood protection, hydropower, and water supply purposes
- South Ostrobothnia ELY Centre act as the owner and permit holder of the structures and is responsible for their condition and maintenance.
- To unify the safety level of dams and to prioritize future maintenance work it was necessary to create a process for assessing the condition of earthfill dams



Background Information

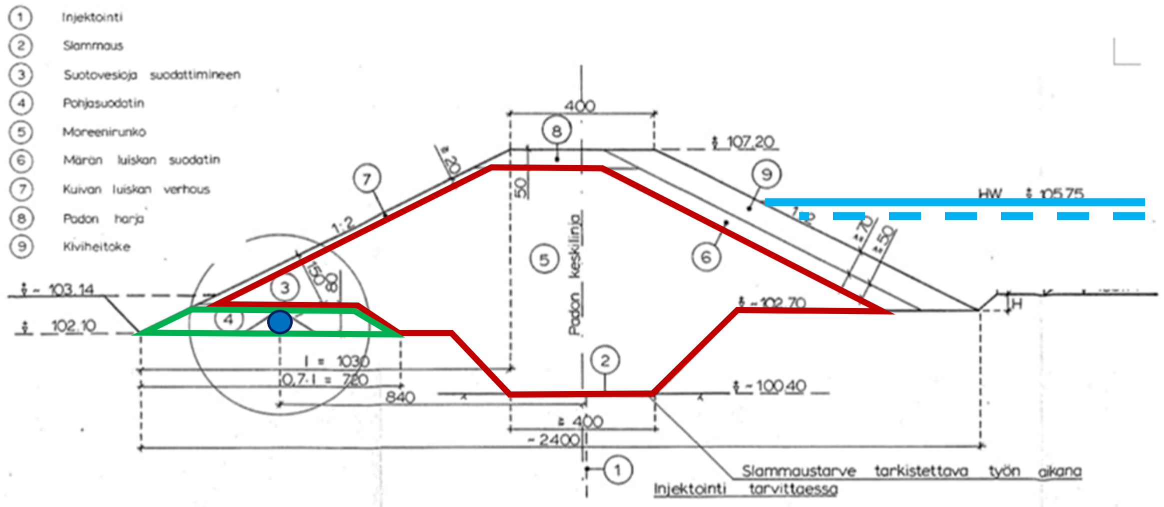
Goals for the process to create the condition assessment

- Identify the necessary initial data for assessing the condition
- Condition assessments are carried out in the future on the same basis at all sites
- Recommendations for further actions (additional investigations, repairs, enhanced monitoring) are based on the investigations and assessments carried out during the process

THE CONDITION ASSESSMENT OF EARTHFILL DAMS – CASE KALAJÄRVI

Background Information

- Lake Kalajärvi, Artificial lake
- Built in 1970s for flood protection
- Water capacity 41,5 million cubic meters
- Includes more than 10 km of earthfill dams
- Problems with wet areas and springs behind some dam sections



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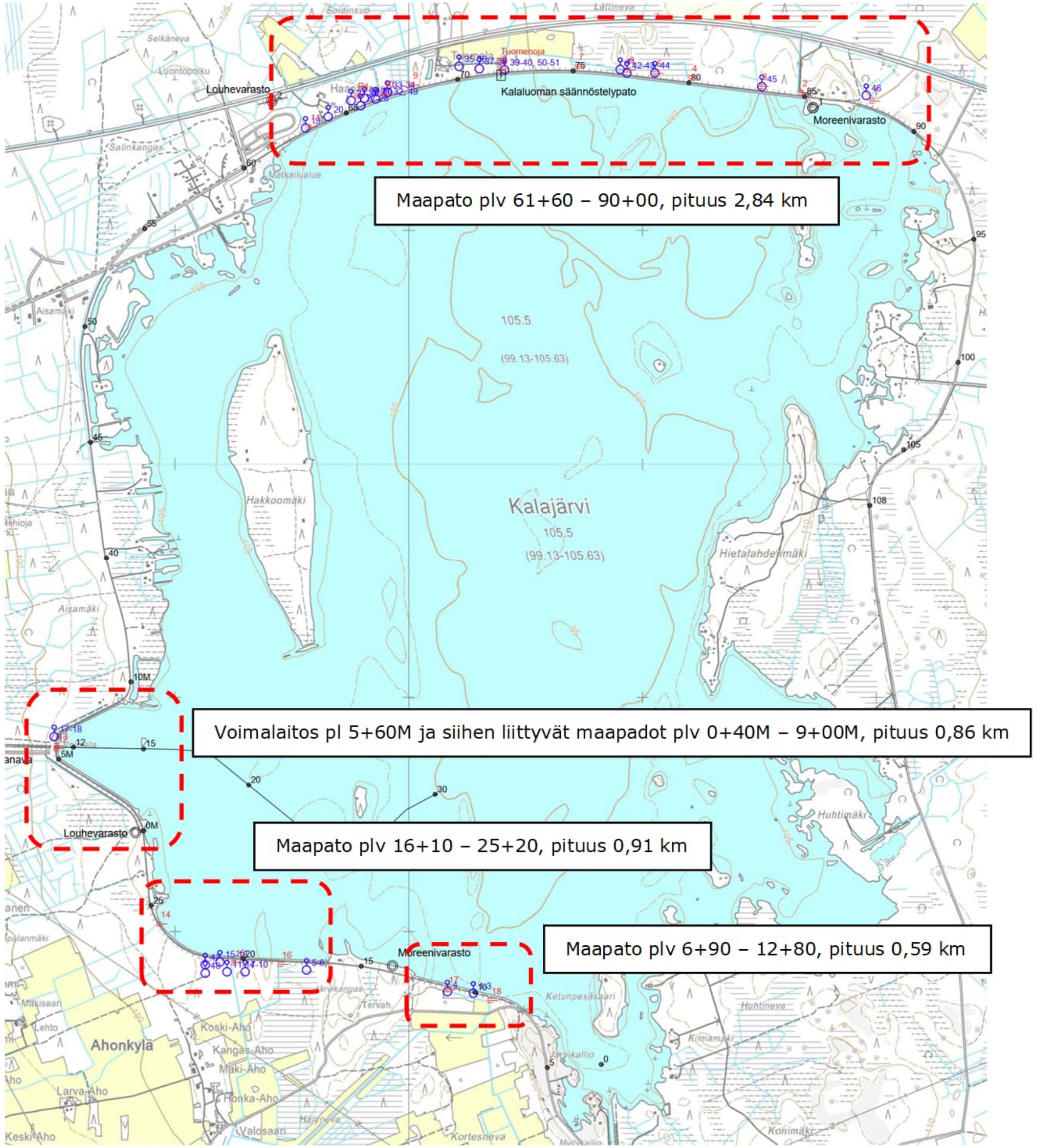
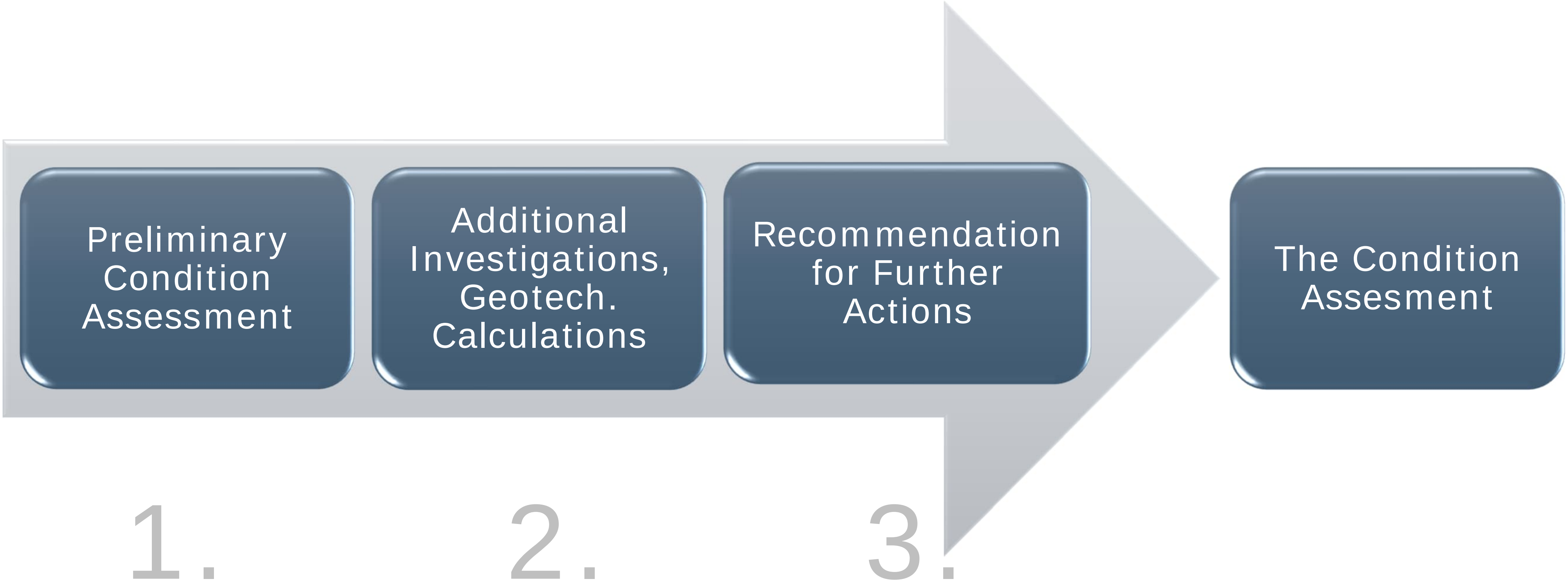


Process Model



Process Model

Preliminary Condition Assessment

1. Compiling and analyzing initial data
2. Field inspection of the dam

1.

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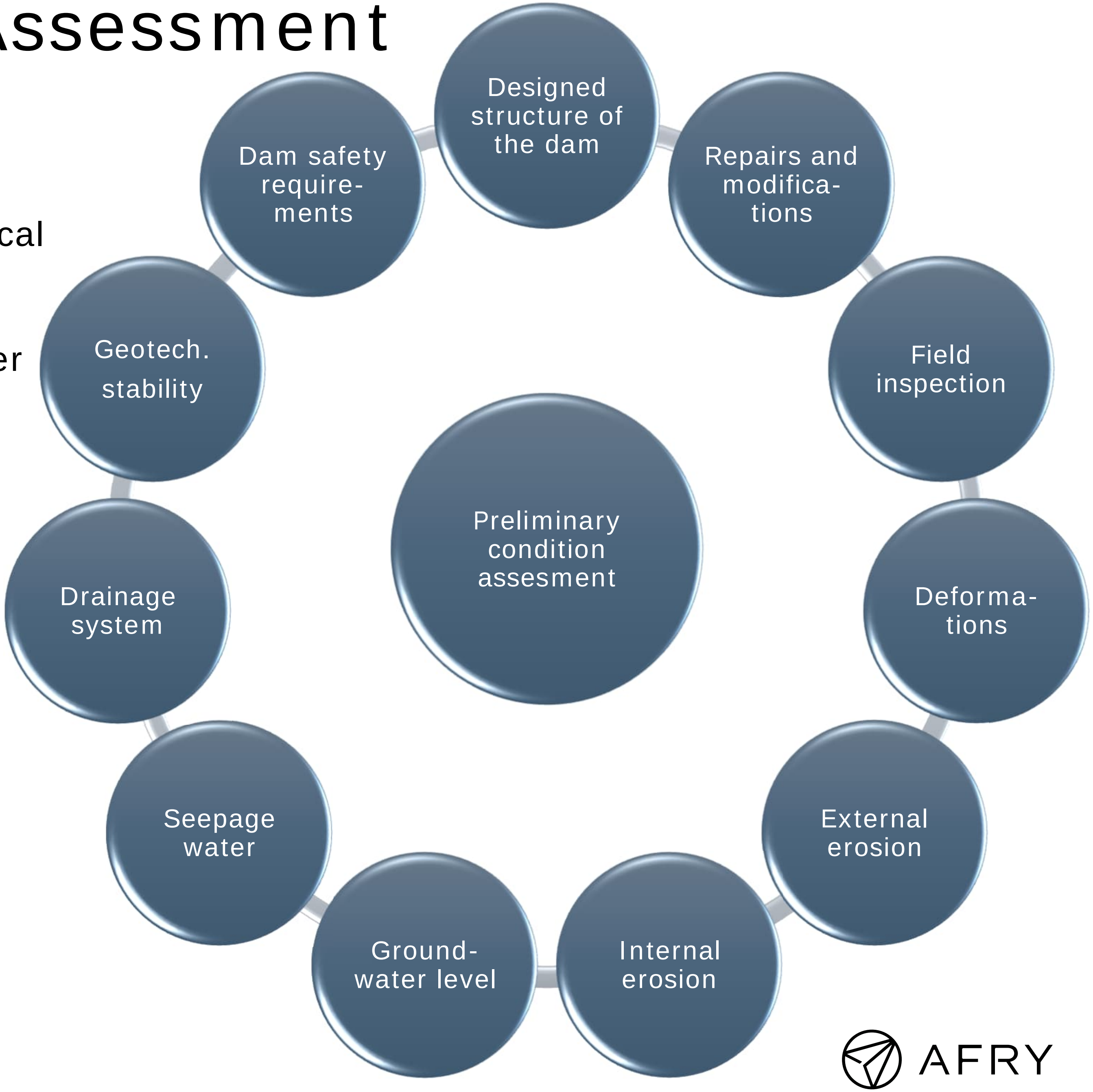
Preliminary Condition Assessment

Initial data

- Construction plans, ground surveys, geotechnical calculations, bedrock grouting, construction method (during summer/winter, dry work/water construction)
- Repairs made after dam construction
- “Dam Safety File” containing monitoring data (dam crest, groundwater wells, seepage water, drainage, underwater structures)
- Changes in loads (water level, traffic)
- Disturbances
- Other studies and investigations (soil samples, geophysical investigations, etc.)



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Preliminary Condition Assessment

Field Inspection

- Interview with dam inspector
- Internal erosion, quantity and quality of seepage water, drainage system
- External erosion, cracks, erosion layer
- Vegetation and trees
- Access routes to the dam, maintenance roads

Process Model

Additional investigations, geotech. calculations

3. Additional investigations and analysis of the results
4. Calculations (seepage flow, Geotech. stability)

2.

Additional Investigations

- Test pits were dug on dam's crest and downstream slope to verify the structural parts and its compliance with the dam design
- The height level of structural parts were measured
- Soil samples were taken of different structural parts

Additional Investigations

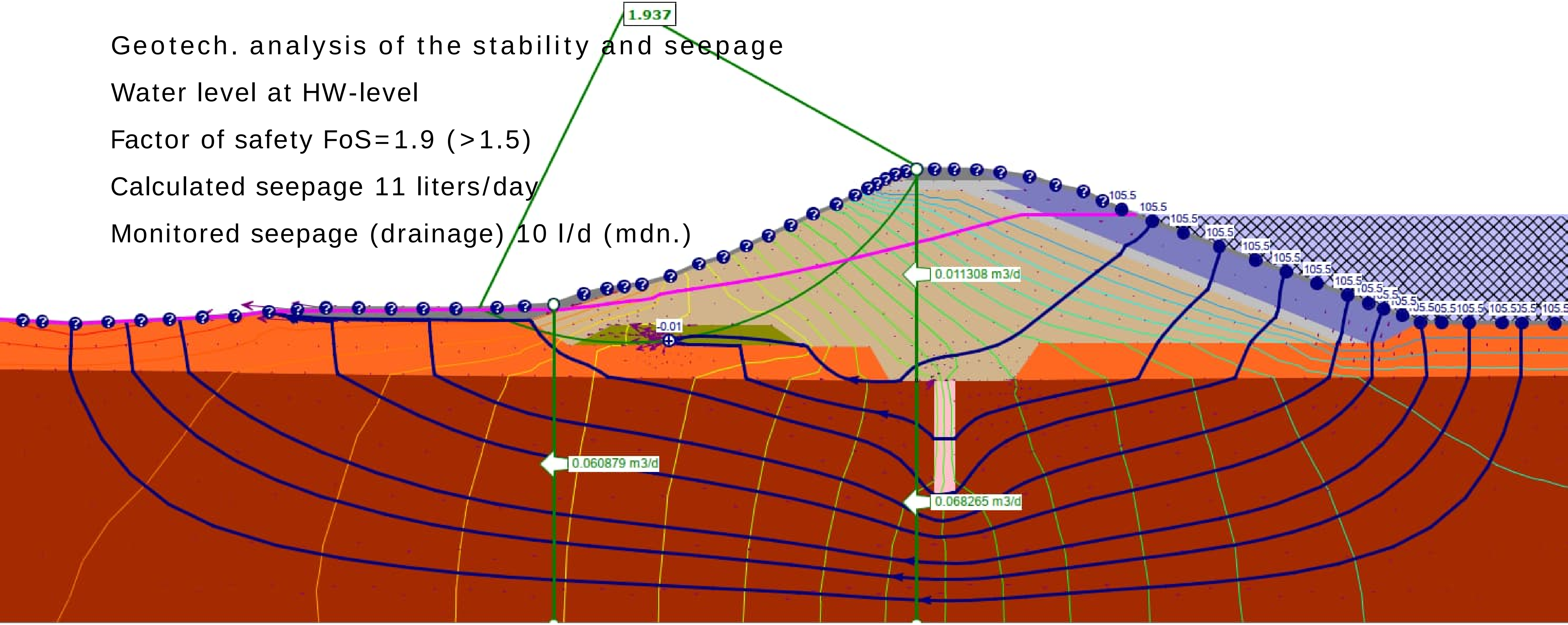
Geotech. analysis of the stability and seepage

Water level at HW-level

Factor of safety FoS=1.9 (>1.5)

Calculated seepage 11 liters/day

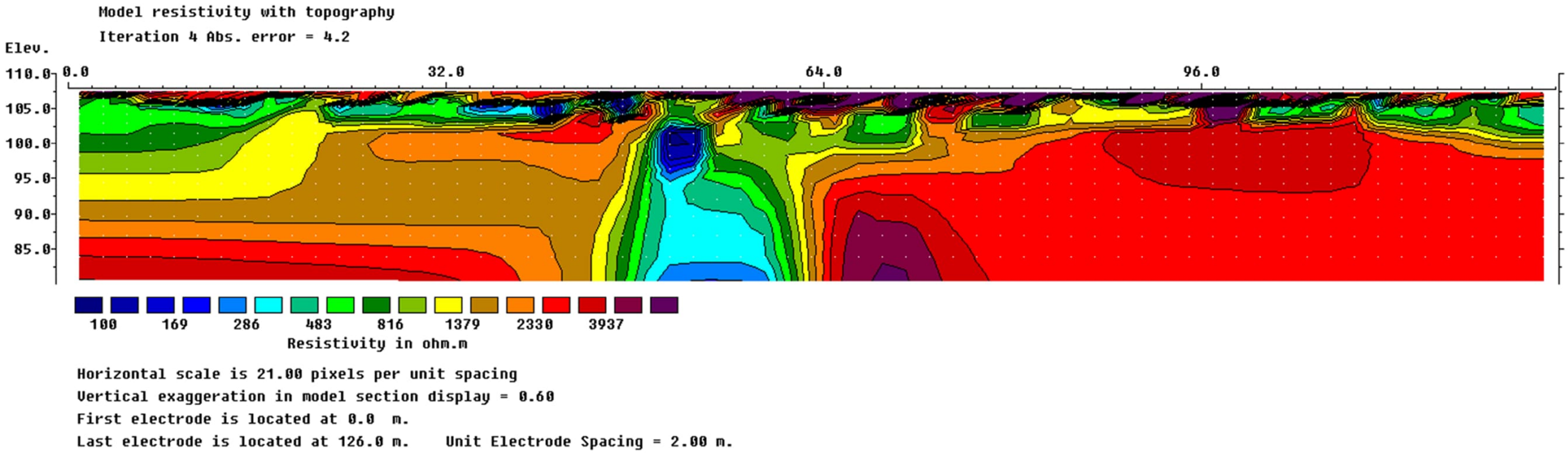
Monitored seepage (drainage) 10 l/d (mdn.)



Additional Investigations

Geophysical survey

- Longitudinal section from the crest of the dam
- Length 126 meters



Process Model

5. Compliance of the dam with technical safety requirements
6. Recommendations for further actions and proposed schedule

Recommendation for futher actions

3.

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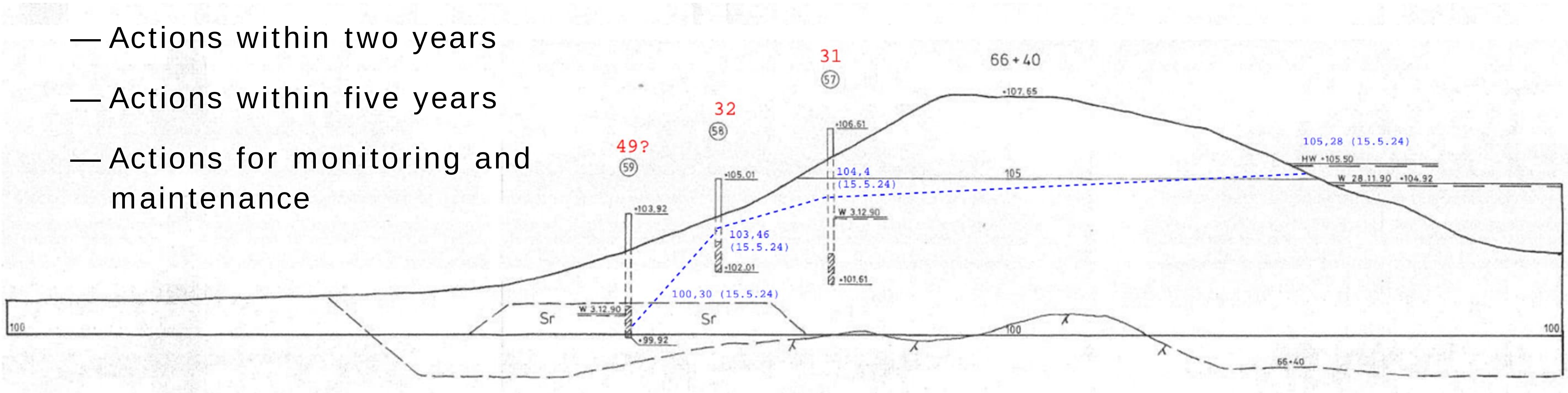
Recommendations for Further Actions

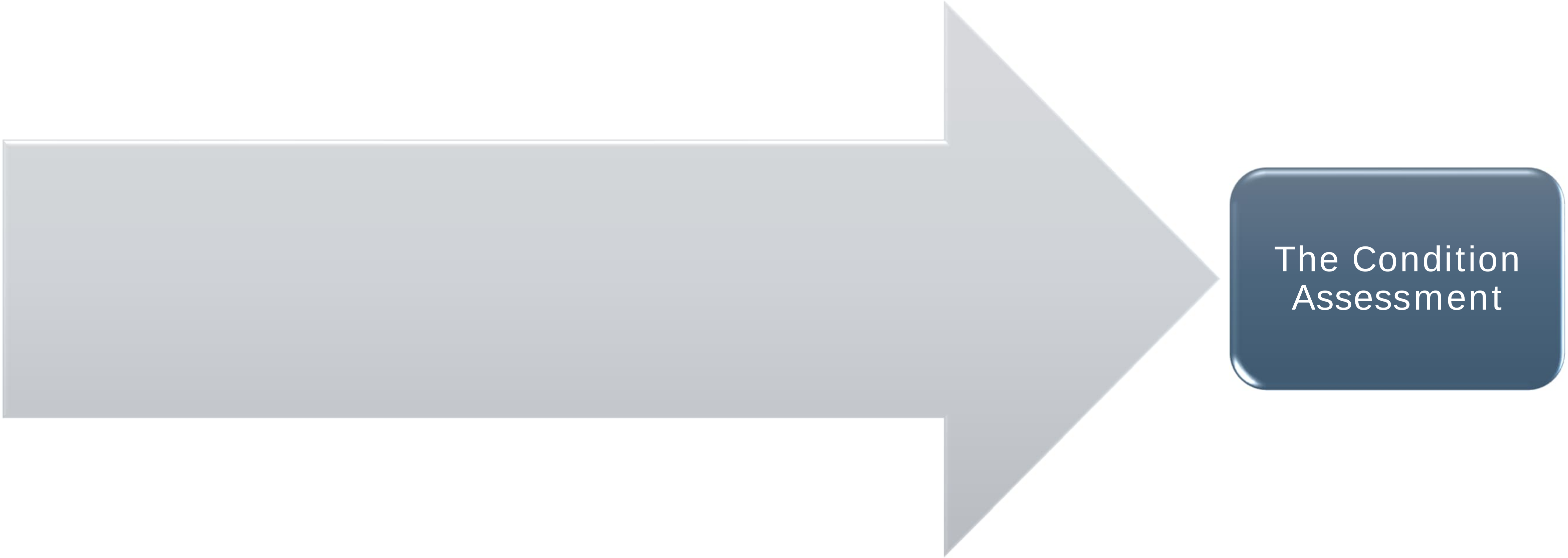
- Technical safety requirements
  - Geotechnical stability
  - Freeboard
  - Safety margin
  - Dam crest
  - Access and traffic routes on the crest
  - Vegetation
  - Wet slope facing
  - Filtering structures and drainage system
  - Spillway gates

Recommendations for Further Actions

- Immediate actions
- Actions within two years
- Actions within five years
- Actions for monitoring and maintenance



Process Model



The Condition Assessment

- The condition assessment provides an estimate of the current condition of the dam(s)
- Presents recommendation for necessary actions to ensure safety of the dam in the future
- Urgency and a schedule is assessed for the recommended actions

- ❑ The dam is in good condition
- ❑ The dam needs further actions
- ❑ The dam needs immediate actions

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