

Aitik TMF – monitoring and control



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Monitoring and control – an overview

Focus

- Large areas
- Long distances
- Time and resources
- Optimisation



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Monitoring and control – an overview

Operational monitoring

- ❑ Ronds/visual inspections
 - ❑ Deposition round-the-clock
 - ❑ Dams/spillways 3 times/day
- ❑ Measurements (appr. 200 meas.points)
 - ❑ Pore pressure
 - ❑ Seepage
 - ❑ Water levels
 - ❑ Temperature
 - ❑ Automatic
 - ❑ Manual
 - ❑ Frequency



Automation is the future



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Automatic measurements – challenges

- ❑ Before: system with cable connections
- ❑ Problems
 - ❑ Cables run over
 - ❑ Lightning in cables destroy sensors
 - ❑ Animals destroys the cables
 - ❑ Unnecessary maintenance
 - ❑ "False Alarms" – confidence in the instruments weakened
- ❑ Difficult terrain
 - ❑ Difficult place cabling
 - ❑ Difficult to use automation in areas that often change

No sustainable solution



Wireless technique – solution?

- WirelessHART
 - Adapters sends signals to a gateway which communicates with a superior system
- Advantages
 - No time consuming and expensive cable laying
 - Easy and fast installation
 - Flexiblity (easy to move instrument)
 - Simple communication to our superior system (ABB system)
 - Easier with remote maintenance, good monitoring of the communication protocol
 - Adapters are made for harsh environments
 - Power supply via battery

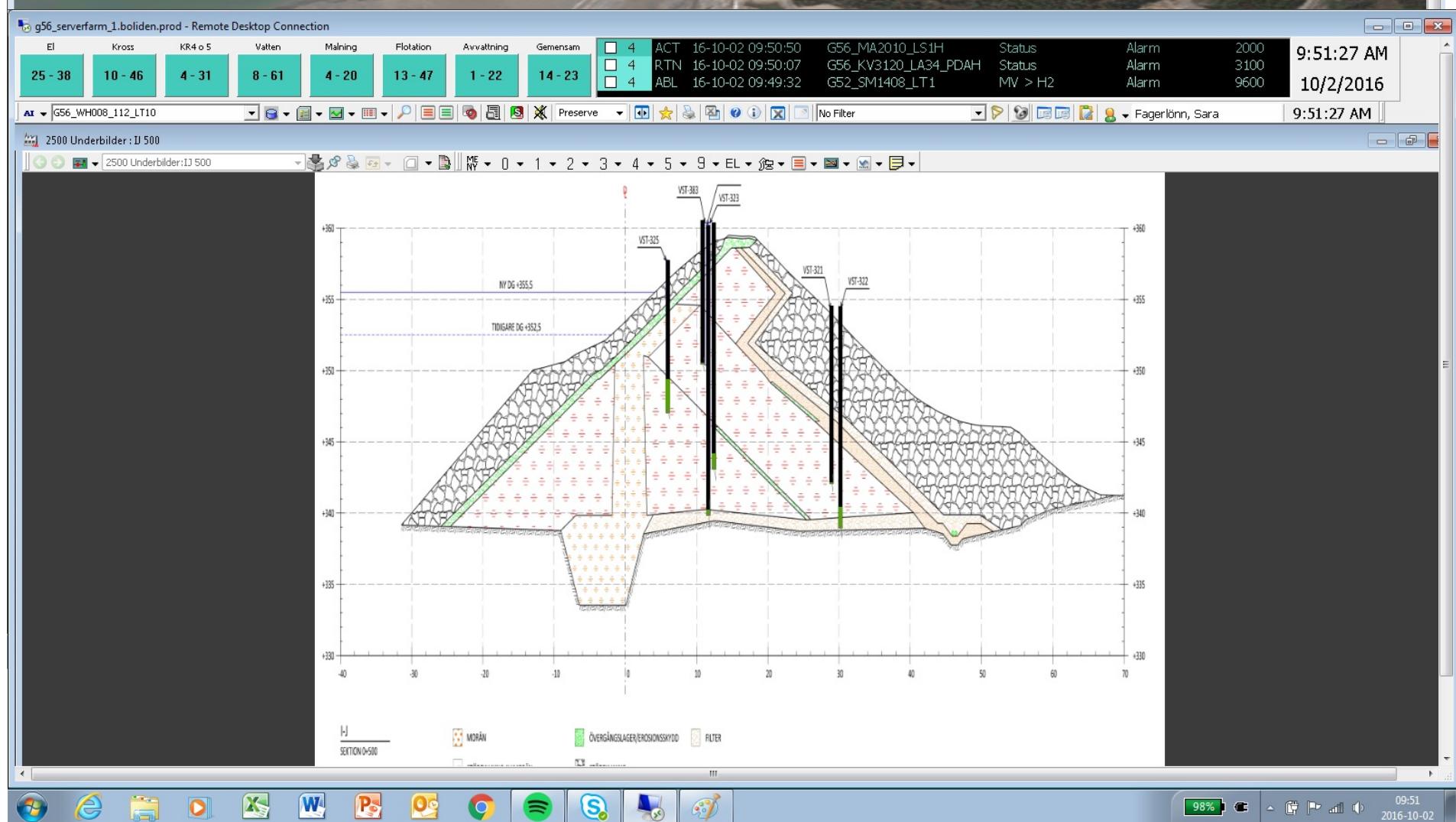
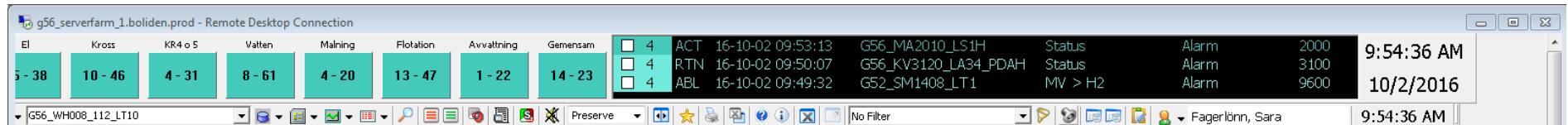


WirelessHART today

- ❑ WirelessHART installed at the clarification pond
- ❑ Good overview in the ABB-systemet
 - ❑ Monitoring round-the clock
 - ❑ Alarm with instructions



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WirelessHART today and in the future

- ❑ Great opportunities to expand and develop automated measurements with WirelessHART
- ❑ Possible implementation
 - ❑ Downstream dams of tailings pond where we have continuous change due to yearly raising the dams and support bank.
 - ❑ Wells for seepage monitoring
 - ❑ Areas inaccessible for example during winters



Monitoring and control – strategy

- ❑ What and why are we measuring?
 - ❑ Every measurement should have a clear purpose
- ❑ What do we want to get out of measurements?
 - ❑ Immediate action for example via alarm
 - ❑ Gather information
- ❑ How should the results be evaluated?
- ❑ Important in daily operation
 - ❑ Simplicity, easy to measure, evaluate och take actions
 - ❑ Trust in the system



Failure mode analysis

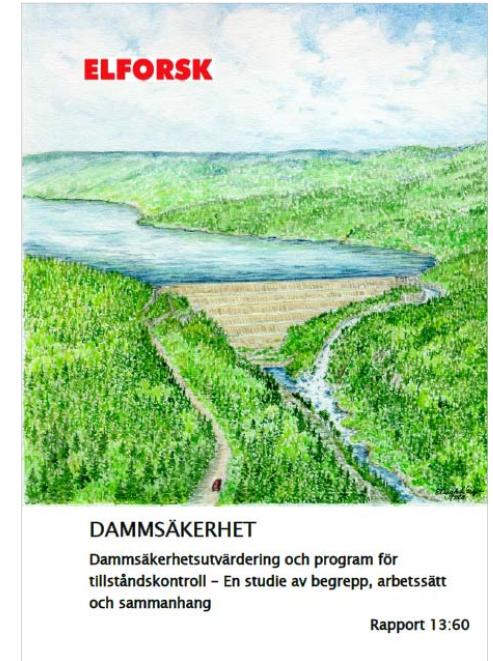


Inspiration from **ELFORSK** rapport 13:60

... failure mode based method as a part of evaluation of dam safety work. Purpose is i.a. to adapt the program for monitoring and control to the conditions for the specific site.

- What could cause a dam failure?
- What are the consequences?
- How can the events be monitored/detected?
- How can the probability for a dam failure or the consequences be reduced?

The philosophy is that you do not find what you are not looking for and e.g. every measurement should have a clear purpose.



Syfte



Långsiktig förbättring och utveckling av dammsäkerhetsarbetet

- Aktivt arbeta med dammsäkerhet
- Medvetenhet
- Skapa förståelse och engagemang i hela dammsäkerhetsorganisationen från beslutsfattare till drift
- Upptäcka fel/brister
- Effektivisera
- Förbättra



Workshop?

Tacksamt format som främjar diskussion och öppenhet

- Delaktighet
- Engagemang
- Öppenhet
- Bredd på erfarenheter/kunskap



Dam failure scenarios



Identification of failure mechanisms for the specific site and the sequences of events that are linked to each mechanism and from that adapt the safety work to the site specific conditions.

Failure mechanisms:

- What would it take for dams and spillways to break?

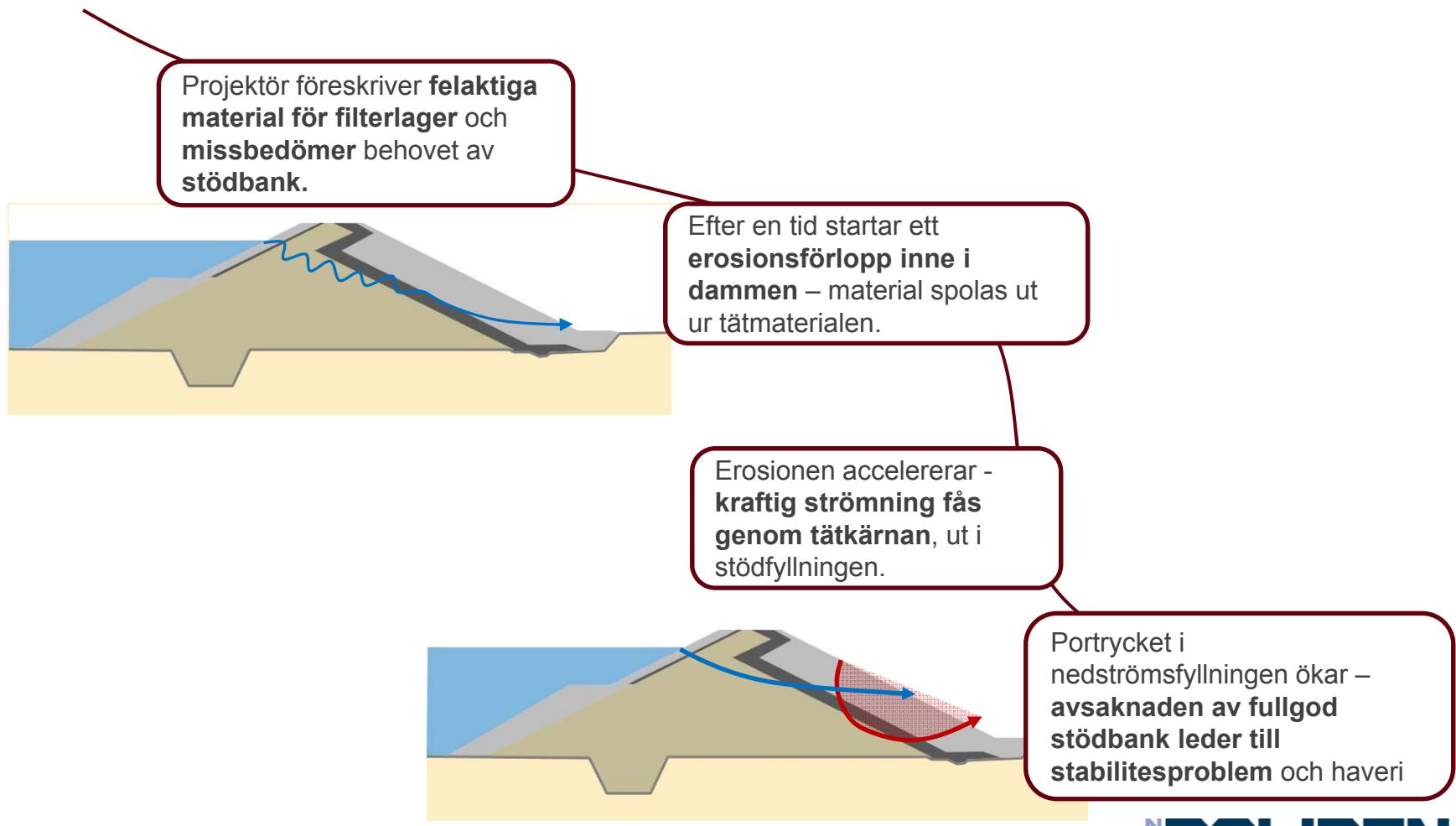
Sequences of events:

8 scenarios how the dam could fail...

... and why it does not happen.

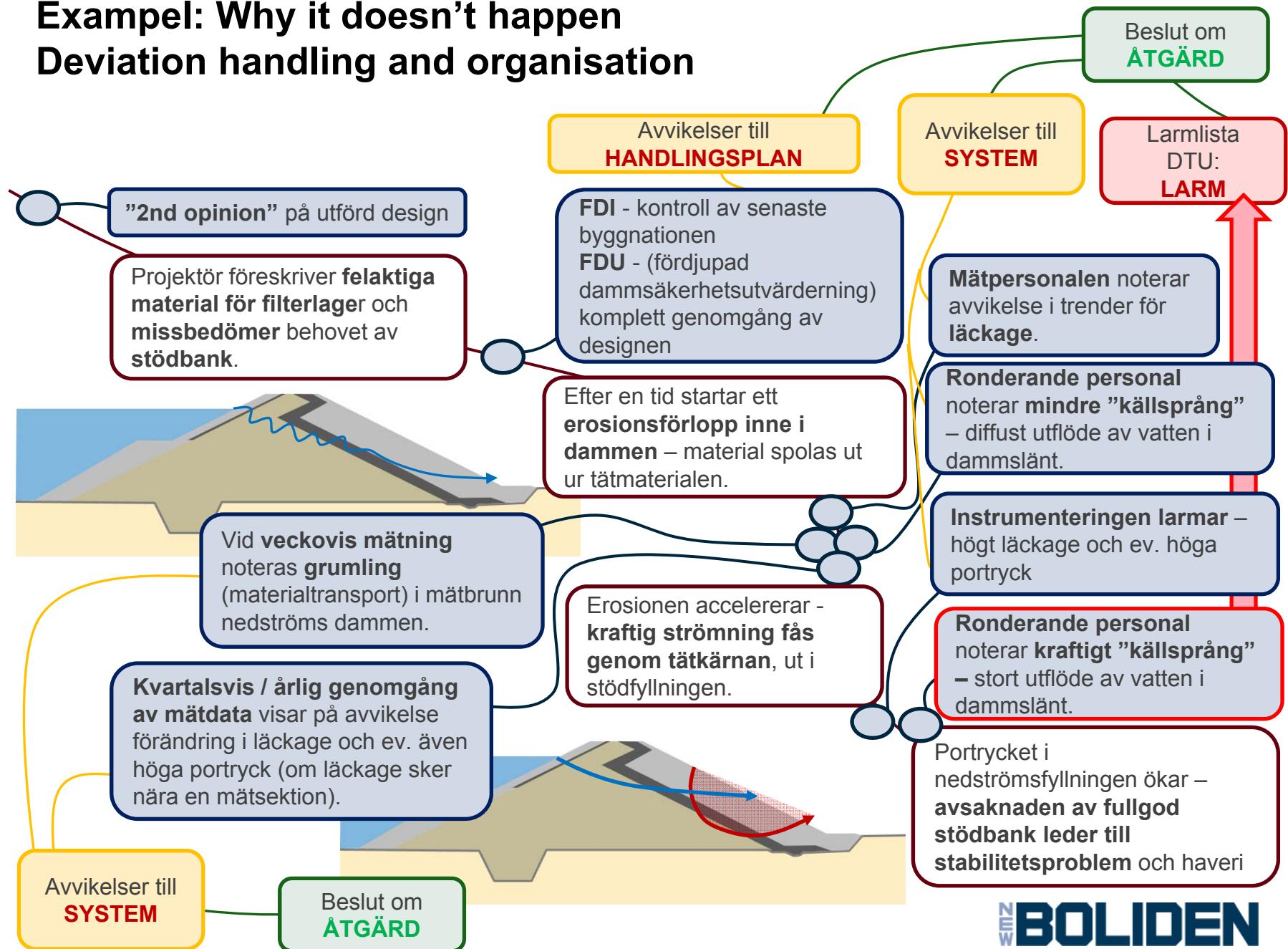


Example scenario: Inaccurate dam construction, with wrong filter material and not enough support bank, lead to inner erosion och failure




Exempel: Why it doesn't happen

Deviation handling and organisation



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More efficient dam safety work

This will give us a more efficient organisation that uses time and resources on the right measures and monitoring

Create a trust from the operation personnel when they more clearly understand the purpose of the measurements and monitoring they perform.

Johanna vill rädda liv. Det vore omöjligt utan metaller.

Medicinsk forskning och avancerad sjukvård gör att allt fler kan leva ett längre och friskare liv. Kunniga och hängivna mäniskor ligger bakom utvecklingen, som i sin tur är beroende av metaller. Johanna är redo att göra sin insats. Precis som våra metaller.



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