

## REMEDIAION DUE TO CREOSOTE CONTAMINATION IN WETLANDS IN RÅDE, NORWAY

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Multiconsult AS

## Content of this presentation

- Who is Multiconsult
- Location of site
- History of plant and investigations
- Contamination and remediation at the plant site
- Contamination, risk assessment and remediation in the wetlands
- Conclusion

## MULTICONSULT

MULTICONSULT is a leading multi-disciplinary company within consulting engineering. The main office is located in Oslo.

### Services

MULTICONSULT is working with all project stages, from the first idea to implementation and operation.

### Business areas

MULTICONSULT has competent professionals within our fields of activities, and offers specialist services and complete planning and design within the following business areas: Buildings and Property, Industry, Oil and Gas, Infrastructure, Energy, Natural Resources and Environmental Engineering.

### Branch offices in Norway

Bergen, Drammen, Egersund, Fredrikstad, Halden, Kristiansand, Moss, Narvik, Oslo, Sandnes, Sarpsborg, Ski, Skien, Stavanger, Steinkjer, Tromsø, Trondheim, Tansberg and Ålesund.

### International business

MULTICONSULT is working abroad through NORPLAN. We also have branch offices in Sweden, Uganda and Tanzania.

### MULTICONSULT's business areas



## MULTICONSULT

Branch offices at 18 locations in Norway and one in Sweden.

Two branch offices is located in Africa: Kampala, Uganda and Dar es Salam, Tanzania



# MULTICONSULT

MULTICONSULT offers specialist services and integrated planning within the business areas:

- Buildings and Property
- Industry
- Oil and Gas
- Transportation and Infrastructure
- Energy
- Environmental Engineering and Natural Resources

MULTICONSULT's business areas



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Site map

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## History of the plant

- Operated by NSB from ca. 1900 to 1943
- Mainly impregnating railway beams
- Creosote initially stored in three tanks under plant
- Unloading of creosote from railway carriage west of plant
- No knowledge of amount of beams impregnated or creosote used



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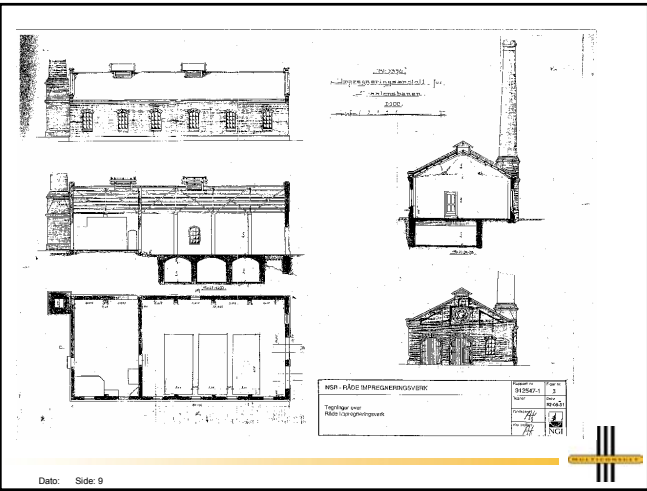


September 1993 (looking north)

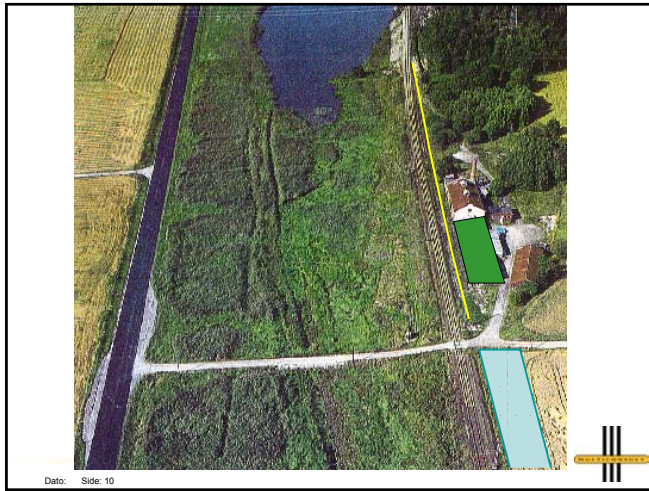
November 2003 (looking south)



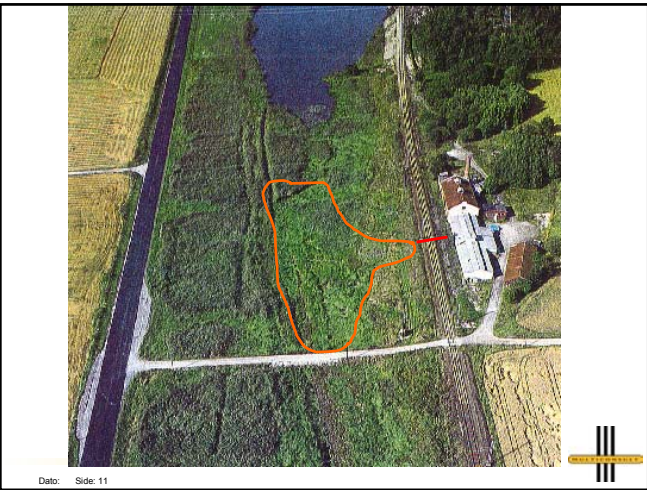
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## History of investigations

- NGI 1992: 18 test pits, 15 drillings, 7 wells, 14 sedimentsamples (channel), 6 soundings, seismic surveying
- Jordforsk 1994-95: soil-, sediment- and porewatersampling, microtox, effect studies (plants, earthworms, mouse, snail), nitrification studies
- SCC 2001: channel water monitoring, 5 soil samples
- Multiconsult 2004: 35 test pits at plant site
- Multiconsult 2003 - 2006: water monitoring program

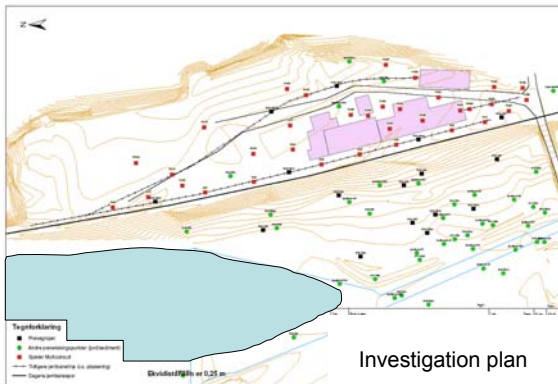
First application of remediation permit sent SFT in 1997

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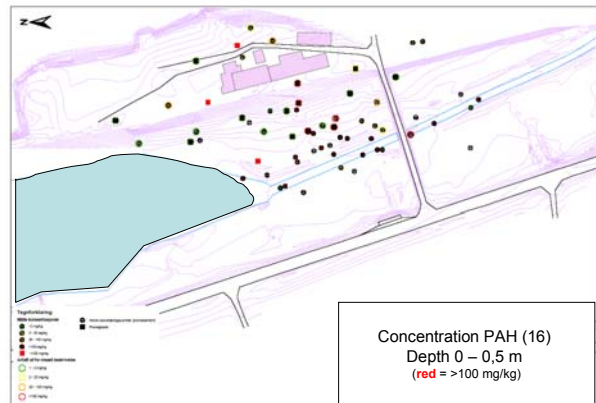
## Multiconsults involvment in the project (from 2003)

- Risk assessment and remediation plan
- Water monitoring (channel)
- Registering water level fluctuations
- Additional investigations of plant site
- Detailed remediation design and tender documents
- Meeting with contractor as needed during remediation
- Final report to SFT

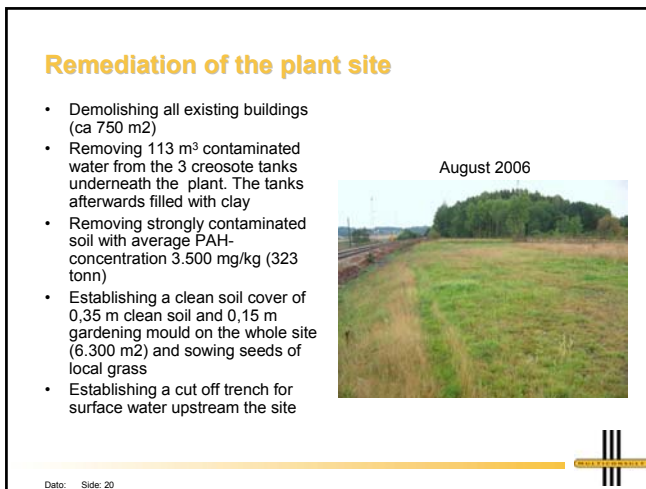
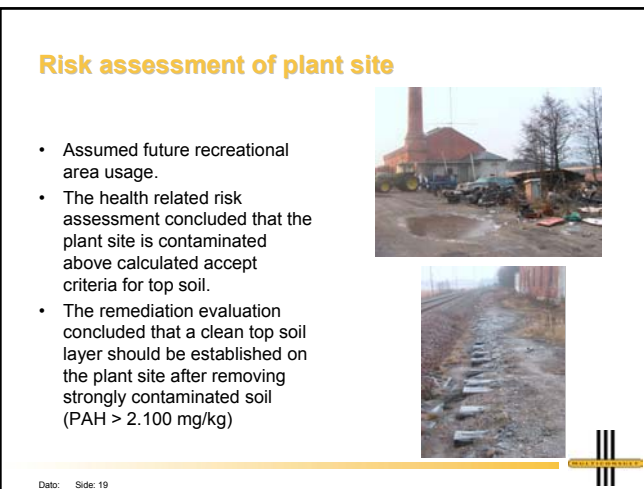
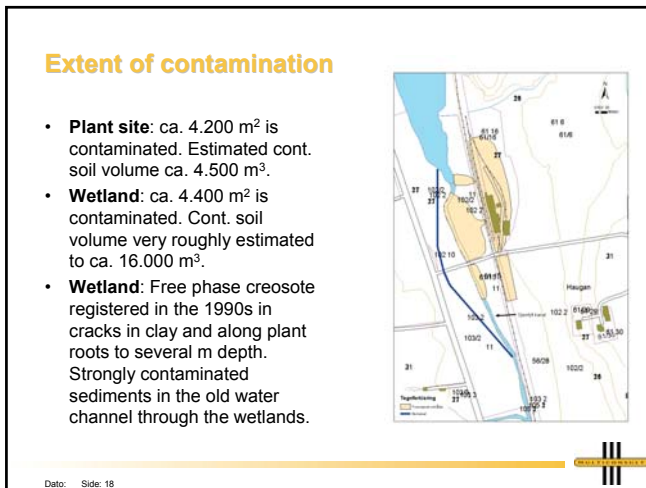
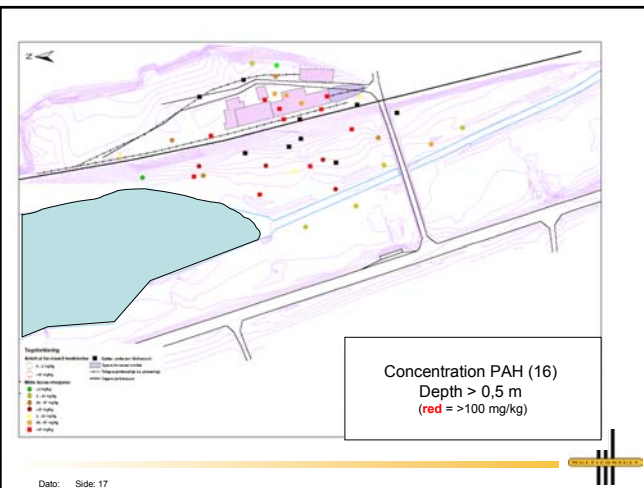
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## Monitoring program

- Regular water sampling since November 2003
- Monthly, weekly (during remediation) or bimonthly
- Analyses on PAH and partly oil and nutrients
- Generally steady and low concentrations
- With few exceptions well below Canadian Water Quality Guidelines



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## Risk assessment wetlands

- **Health:** the wetland contaminated above calculated accept criteria for top soil
- **Environment:**
  - Risk assessment based on a series of biological effect studies in the 1990s (microtox, plants, fish, earthworms, mouse, snails) and pore water sampling
  - The monitoring of the water in the channel has not documented any unacceptable migration of PAH / oil towards downstream areas
  - Sudden flush of contaminants may be possible during heavy rains
  - The effect studies are not conclusive
  - However no doubt that soil in some parts of the wetlands is poisonous, may locally affect certain plants and cause increased PAH-concentrations in earth worms etc (being food for birds and small mammals)
- **Conclusion:**
  - The ecosystem in the wetlands is probably not in general negatively affected
  - The existing water channel passing the contaminated wetlands should be relocated (preventive remediation)
  - At the same time the water level in the Aubergølet lake should be stabilised

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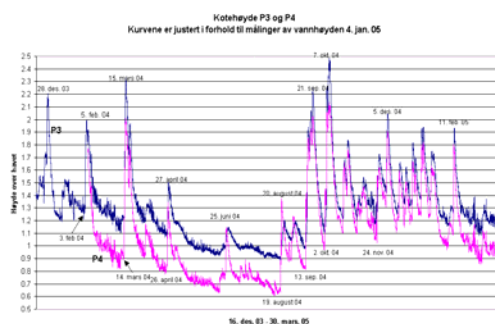
## Assessing remediation alternatives

- Strong local and environmental interests in avoiding any permanent damage or alteration of the wetlands
- Cost – benefit analyses of the following alternatives:
  - Relocation of channel, permanent high water level
  - Relocation of channel, permanent "normal" water level
  - Removing contaminated soil
  - A new, thick cover of clean soil
- Conclusion: Relocation of channel, permanent "normal" water level



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## Water level fluctuations



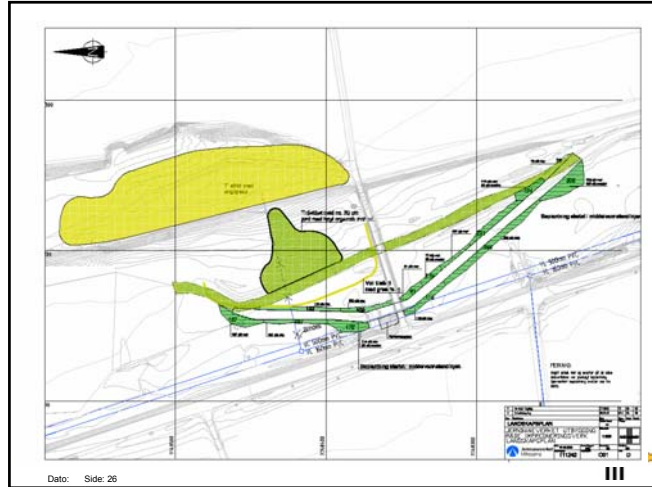
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## Remediation of the wetlands

- After SFT in April 2004 accepted the remediation plan with minor adjustments, detailed design and tender preparation was carried out.
- The remediation was then carried out from May – August 2005.
- There was a strong focus during the remediation of not damaging the wetlands permanently.
- An emergency plan and a monitoring plan was prepared.



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August 2005

August 2006



August 2006

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October 2005

August 2005

August 2006

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## August 2006 – towards covered area



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## Remediation of the wetlands - summary

- A new water channel (length 270 m)
- Widening the down stream part of the existing channel
- A new culvert on the water channel under a local road with an adjustable wier (to stabilise the water level in the lake)
- A fish ladder so fish > ca. 7 cm may bypass the wier
- Existing channel that had been replaced (230 m) backfilled with clay.
- Covering the strongest contaminated part of the wetlands (1.700 m<sup>2</sup>) with 20 cm soil with high organic content, after cutting down but not removing existing vegetation of common reed.
- Planting black alder (ca 260) and willow (ca 1850) along the new channel.

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## Conclusion

- No unforeseen contamination occurred.
- The water level in the lake has been stabilised, fish is observed to easily move past the water ladder (and people fishing there)
- The continued water monitoring show no contaminant migration.
- The ground underneath parts of the wetlands will however also in the future be strongly contaminated.
- In late August 2006 SFT and Jernbaneverket made a 1 year site inspection. SFT expressed their satisfaction with the project.
- It may take several years before it can be concluded that the wetlands has not been altered

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