Alnabru Intermodal Freight Terminal

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Multiconsult

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4-5th December 2015, University of Birmingham

About me

- Sam Paul Singh Pawar - 30 years old from Oslo, Norway
- Graduated from MSc RSEI in 2011
- Former underground train/metro driver (4 years)
- Worked 8.5 years at Multiconsult AS (Norway's 2nd largest consultant company)
  - Currently Team Leader at department for Planning and Infrastructure
  - Railway alignment design, station design, terminal logistics and capacity, system engineering, highway design, traffic safety and capacity assessments
  - Experience with mainline railway, freight railway, light railway, tram and metro

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- Project Description
- Terminal Operations
- Some Project Challenges
- Concepts

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Alnabru Intermodal Freight Terminal

- Inland intermodal terminal
- No port connection
- One of Europe's largest freight terminals of it's type
- At its peak it had 600 000 TEU (2008)
- Primarily domestic goods
- Built for shunting and wagon load operations
- Fatal accident in 2010 changed the way it was operated

20ft. Container = 1 TEU

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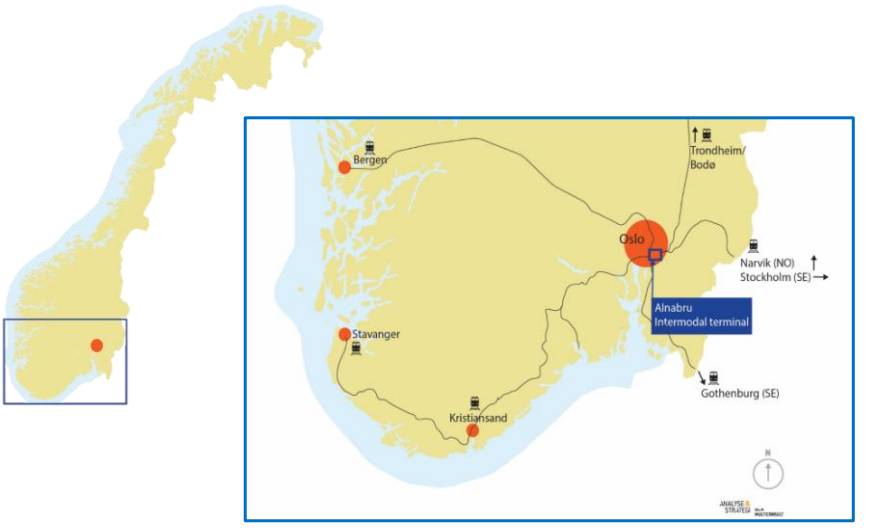
Location



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Location

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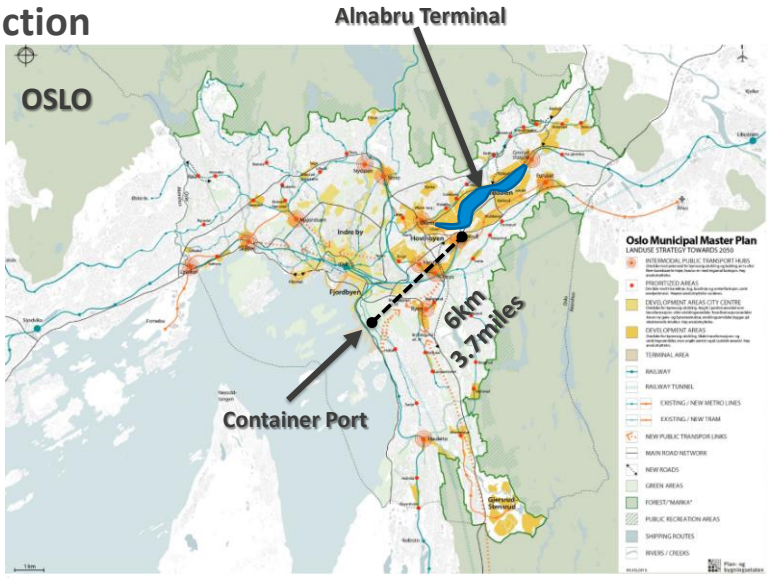
Loaction



History

- Established 1907 along Norways first main line (built in 1854 by Robert Stephenson)
- Industrial and agriculture area
- Built for shunting trains and wagon load operations

History

- Today's track layout design as hump shunting yard (1972)
- Upgraded in 1991 to accommodate container freight operations
- Partly electrified

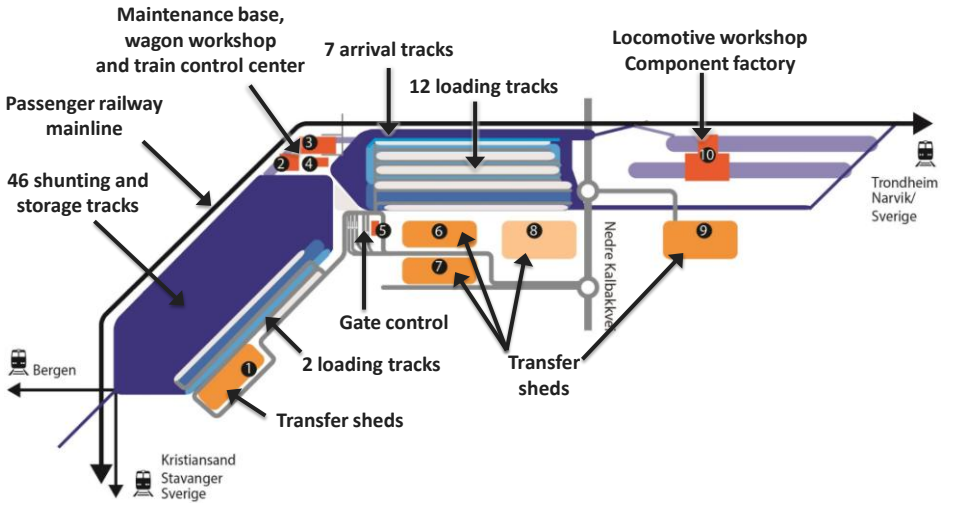
The project

DET KONGELEGE SAMFERDSELSDEPARTEMENT
(The Royal Norwegian Department of Transport)

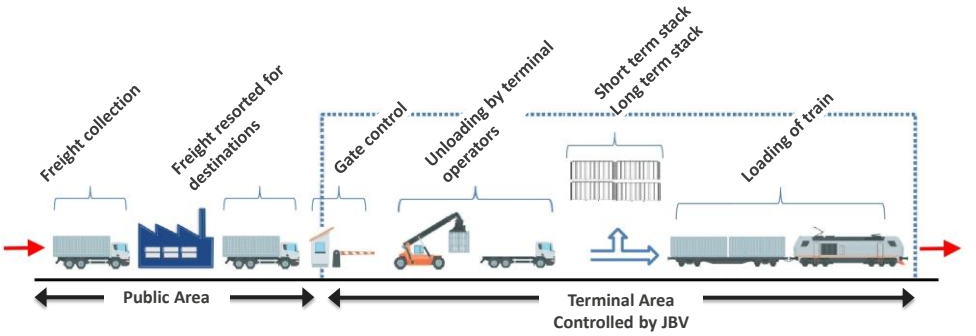
Jernbaneverket
(Network Rail)

- Design and feasibility study of Alnabru Intermodal Freight Terminal (Mk 3)
  - *Triple the terminal capacity from 430,000 TEU to 1,200,000 TEU pr. year*
  - *Increase train lengths from average 450m to 600m*
    - » *Be able to handle 750m and 1000m long trains*
  - *Terminal has to remain fully operational during construction*
  - *Reduce investment costs from approx. £1.2bn to £400m*
  - *Design for multiple terminal operators*
- All within today's track layout!!

Terminal Operations - Layout



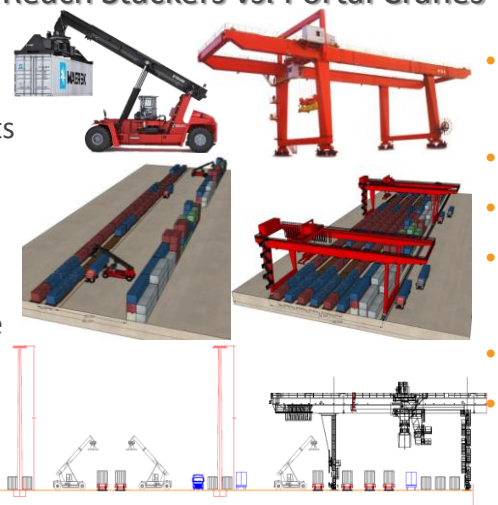
Terminal Operations – Freight Handling



Terminal Operations – Loading and unloading

Reach Stackers vs. Portal Cranes

- Lower investment costs
- Flexible operations
- Curved tracks
- Easy to upgrade
- Area inefficient
- 20 TEU per h.



- High investment costs
- Rigid operations
- Straight tracks
- High number of tracks per m²
- 27.5 TEU per h.
- Environmentally friendly

Examples of Typical Transport Units…

20ft. Container = 1 TEU

45ft. container

Pressurized tanks/silos

25ft. Swap bodies

Road trailers

Thermo trailers

Lift time increased by 80%

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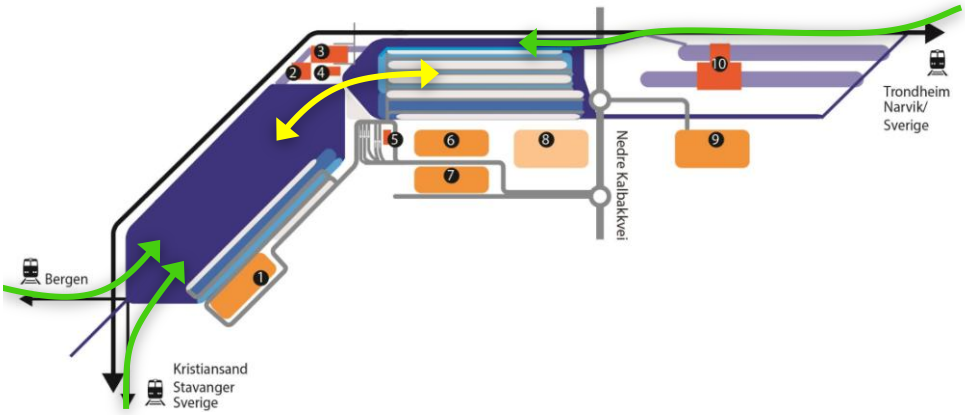
Terminal Operations – Train movements



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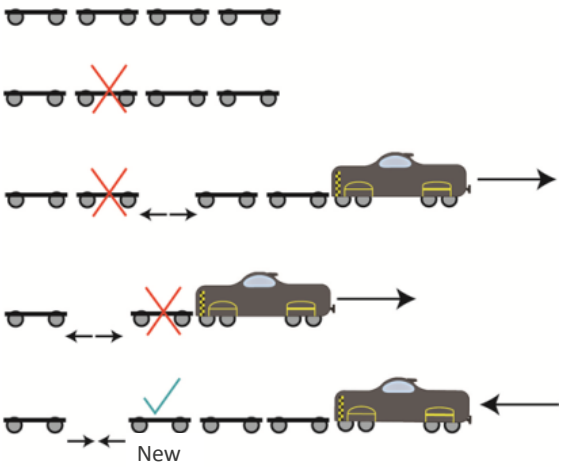
Terminal Operations - shunting



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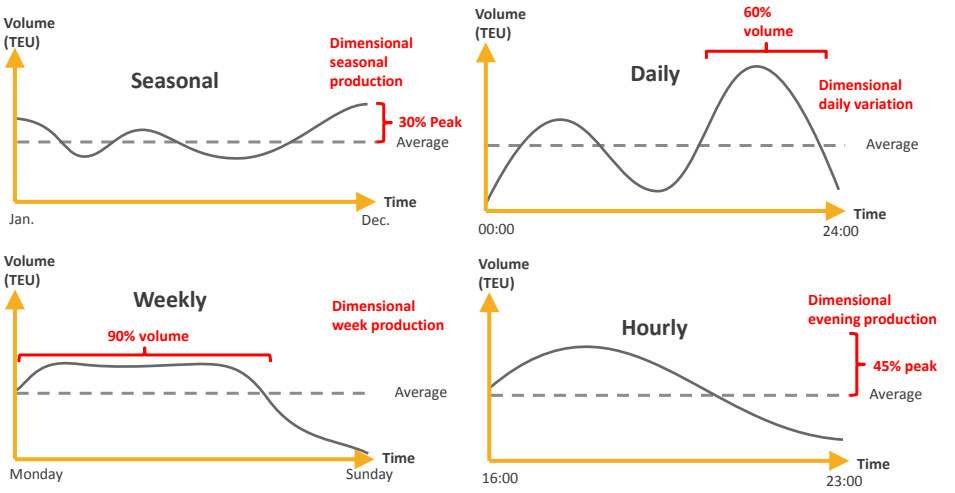
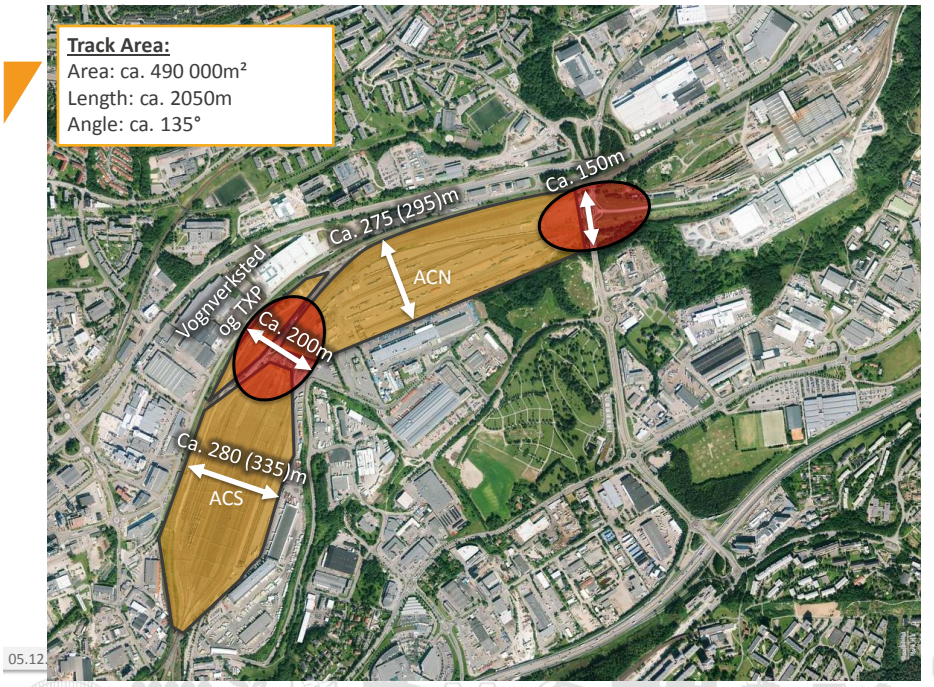
Some Project Challenges

Freight Production Flow – Very Peaky




Track Area:
Area: ca. 490 000m²
Length: ca. 2050m
Angle: ca. 135°
Ca. 150m
Ca. 275 (295)m
ACN
Vognverksted og TXP
Ca. 200m
Ca. 280 (335)m
ACS
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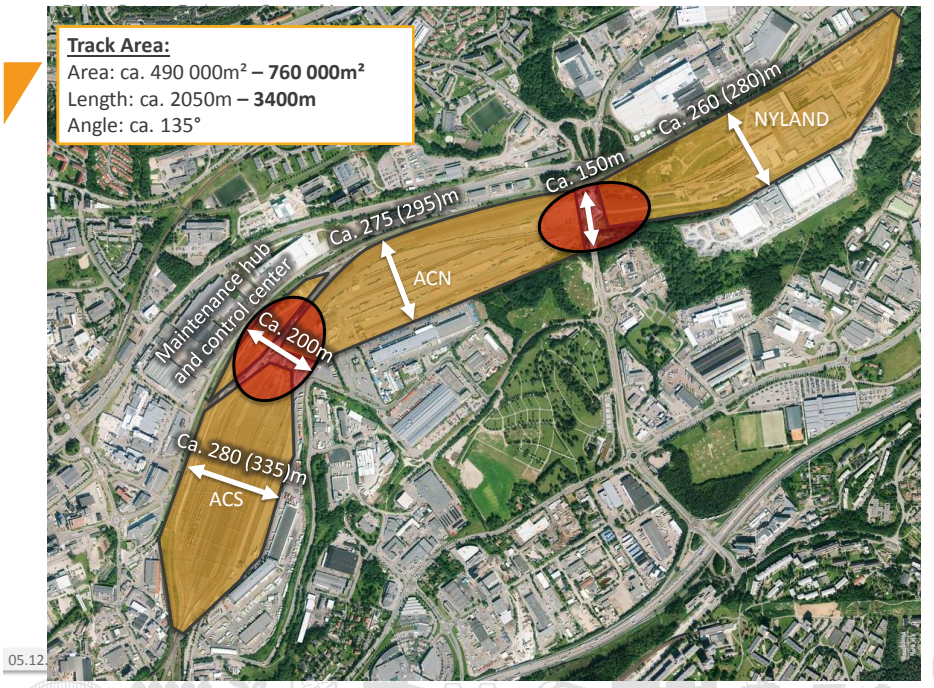
Track Area:
Area: ca. 490 000m² – 760 000m²
Length: ca. 2050m – 3400m
Angle: ca. 135°
Ca. 260 (280)m
NYLAND
Ca. 150m
Ca. 275 (295)m
ACN
Maintenance hub and control center
Ca. 200m
Ca. 280 (335)m
ACS
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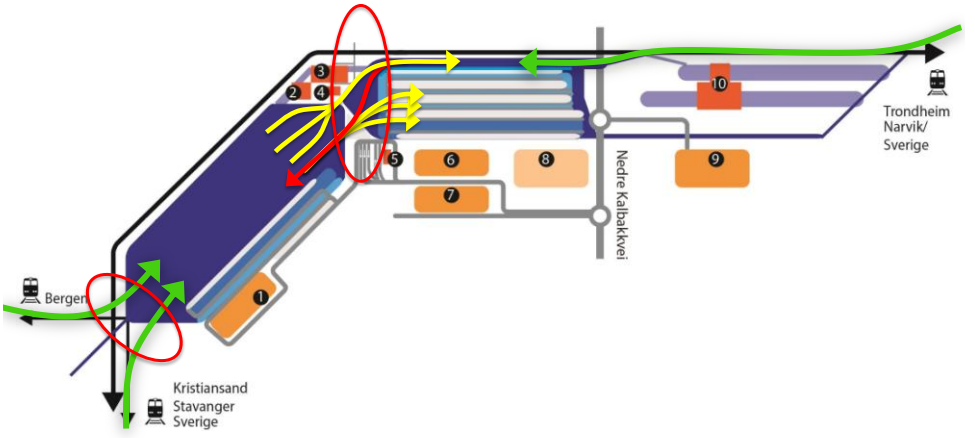
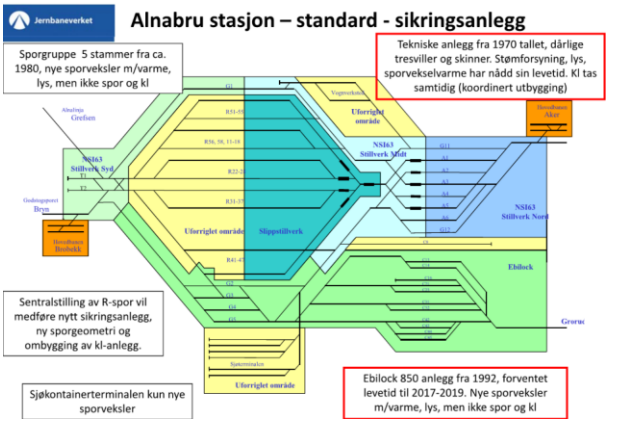
Road traffic through gate – 1 every 8 sec.

Terminal Operations – Capacity Challenge



Operational Risks

- 3 different types of obsolete signaling systems
- No spare parts available
- Locations without any signaling at all
- Signaling system must be upgraded independently of the main project

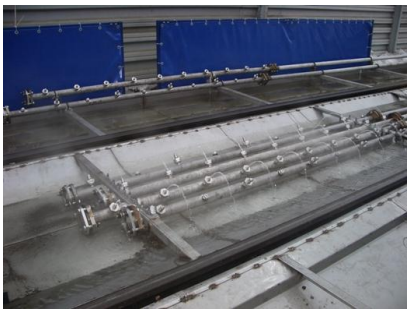


Operational Risks

- Points are operated locally by hand by operators
- 55 trains arriving and departing per day
- 650 shunting movements per day
- Heating system only on new switches

Operational Risks – Snow and Ice Build-up

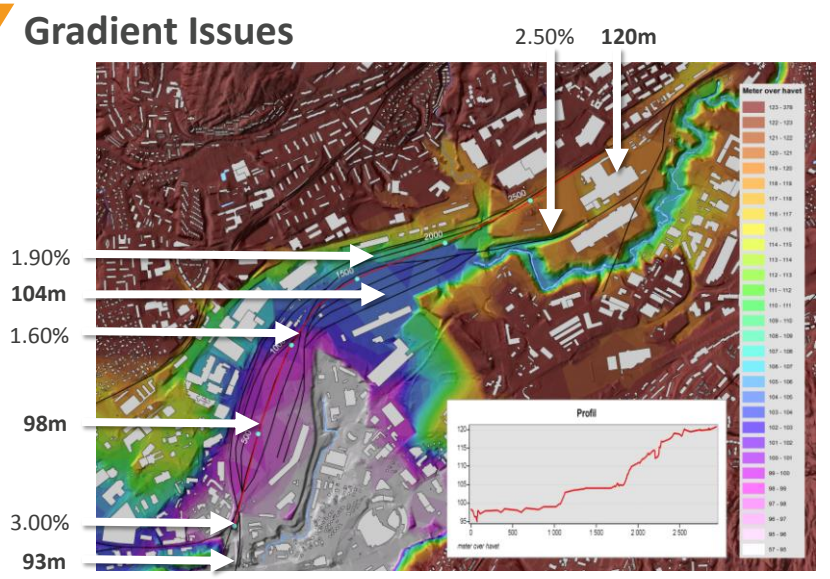
- Packs up underneath wagons
- Brake freezes
- Wheel flats
- Manually removed or carefully with digger



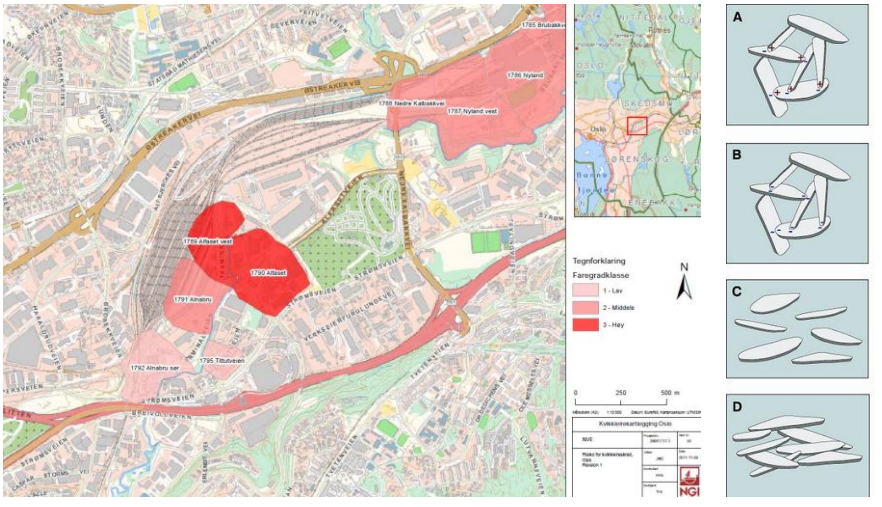
- De-Icing system
- Only preventative
- Location
- Accessibility
- Costs

Operational Issues

Gradient Issues



Ground conditions – quick clay area



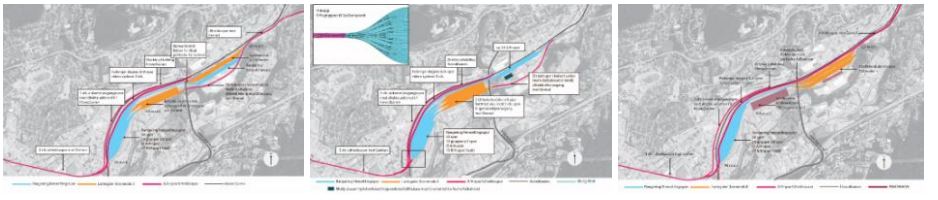
Switch Design & Alignment

Stricter technical regulations

- Switches
  - Requires standard switches “off-shelf”
  - No “switch in switch”
  - No curved switches
  - No symmetrical switches
- Alignment
  - No gradient changes allowed within switches
  - Standard requirement 300m radius
  - Minimum allowed 190m radius
  - High risk of derailment due to string behavior of empties

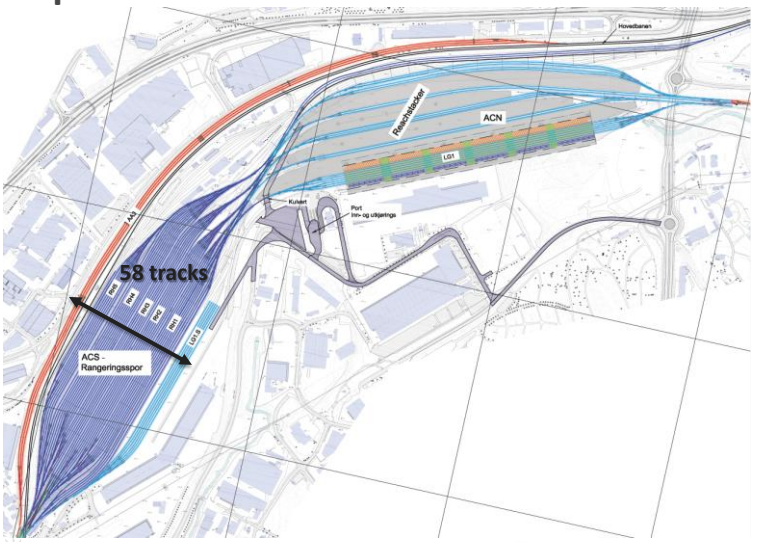
Concepts

- Concepts to make principal decision for further detailing
  - Concept zero – to be able to operate (signaling)
  - Concepts level 3 – major adjustments
  - Concepts level 4 – total redesign to reach targets
- However, detailed designed necessary to confirm concept

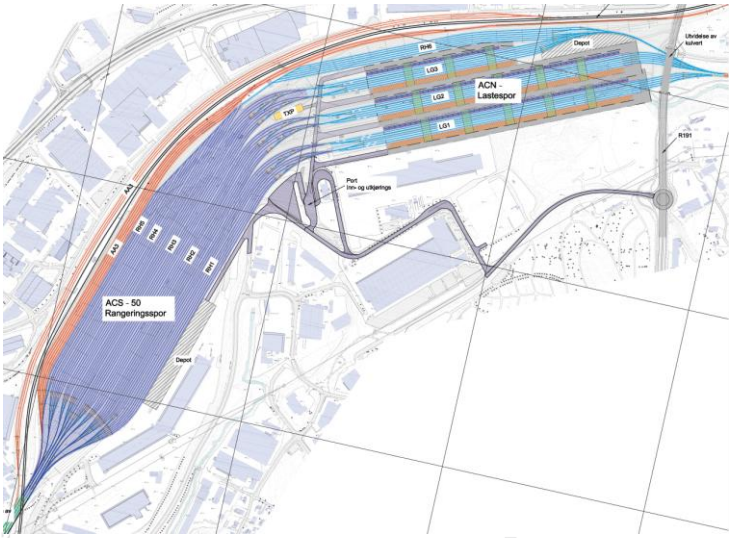


Concept 0 - Details

Concept 3.6 - Details



Concept 4.1 - Details



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Thank you for you attention!

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