The Stad Shipping tunnel

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INTRODUCTION

- Onno Musch

- Section manager for Norconsult's coastal engineering team in Trondheim
- 13 employees with varying expertise:
  - Harbour construction
  - Dredging
  - Floating structures
  - Wave/wind/current analysis and modelling
  - Breakwater design
  - Fairways
  - Offshore wind turbines
  - Aquaculture structures
A. Historical and justification
B. Current status
C. Ongoing and planned investigations
D. Technical details
The intracoastal waterway
The open coastline
2003: Close to a major disaster with 161 passengers

Benefits of the shipping tunnel:

A. More reliable schedules for coastal traffic  
B. Less damage to goods and cargo  
C. Less discomfort for passengers  
D. Increased safety; lives saved  
E. Increased traffic of pleasure craft  
F. Enables transfer of goods from road to water-born transport modes
The Stad «short-cut» has been used since the Viking Age. Realistic plans for a tunnel have been made since late 1800
CURRENT STATUS

A. Concept study (KVU 2010) has been made by The Coastal Administration (Kystverket), who will be the «owner» of the installation.

B. Step 1 Quality Assurance (KV1) has been made by an external consultant. Large tunnel is recommended, the project has a positive benefit/cost ratio (>1.0).

C. The Pre-Engineering (PE) is now being carried out, Olav Olsen AS & Norconsult.

D. When finished, the PE will be subjected to Step 2 Quality Assurance (KV2).

Current activities:
- Full-scale bridge simulation of approaching and transiting the tunnel (Force Technologies, Copenhagen).
- Laboratory model testing in scale 1 : 20 – 1 : 30 of transiting the tunnel (MARINTEK, Trondheim).
- CFD simulation of navigation inside the tunnel (Force Technologies, Copenhagen).

E. Construction on site may begin in 2018.

F. It is now included in the national transport plan for the period 2018-2029 with a significant investment in the first part of the plan from 2018-2023.
More than just a hole in the mountain …

- Some issues that need planning
  A. Construction base location, both sides
  B. Disposing of the rock produced (8 million tons)
  C. Rerouting existing roads, construction of new roads
  D. Fire prevention and fighting; escape routes
  E. Ventilation shafts
  F. Landscaping and zoning around the tunnel openings
  G. Preparing new shipping lanes
  H. Biodiversity issues
Key figures

- Length: 1700 m
- Total height: 49 m
- Total width: 36 m
- Sailing width: 26.5 m
- X-sectional area: 1625 m²
- Volume in cut: 3 mill m³; 7.5 – 8.0 mill tons
- Cost estimate ≈ 2.7 Bn NOK
- Total construction time: 5 years
- Assumed transit speed, large vessel 5 knots; transit time ≈ 12 – 15 min
- Fast passenger craft: close to full speed
Challenges in simulation and modelling

- Bridge simulation: challenging entry and exit especially on Northern end
- Physical modelling: excessive squat and large forces on tunnel walls
A unique construction?

A. The Stad tunnel:
B. Built for speedy transit, not docking
C. Ships will transit under their own power, no towing or assistance
D. A wide range of vessels may use the tunnel, not limited to Navy craft
Thank you for your attention

1946.
Livet er en cirkus, man kommer ind og bukker, reader rundt, bukker igen og går ud.

Life is a circus show, you come in, bow your head and do your tricks, then bow your head again and leave.
Storm P.