Loss of slope stability on railway tracks and its sanation

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Structure of the lecture

Case studies based on experience in situ

- Jenišov
- České Budějovice
- Veselí n. Lužnicí

Description of each case

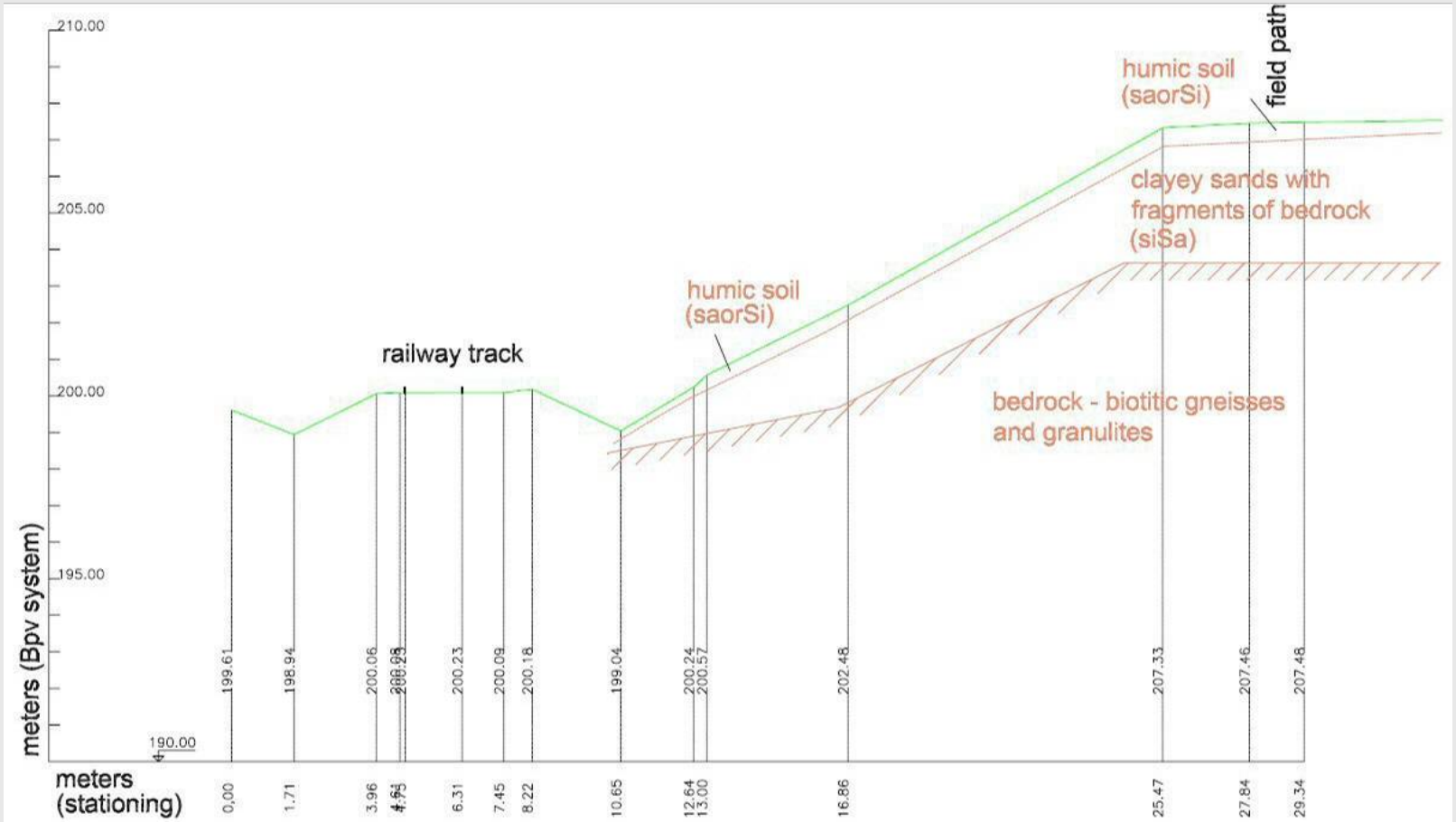
- location – map
- railway track – cutting / embankment
- geology – profile / conditions
- landslide – causes
- solution – sanation

1. JENIŠOV – location

- south west of Bohemia
- nearby border with Austria
- alongside water reservoir Lipno

1. JENIŠOV – railway track and geology

- railway track – cutting
  - 800 m long
  - 5 to 7 m deep
  - inclination approx. 45°
- geological profile – km 61.900; EC-7
  - humic soil
  - clayey sands with fragments of bedrock
  - bedrock – biotitic gneisses and granulites



1. JENIŠOV – landslide causes

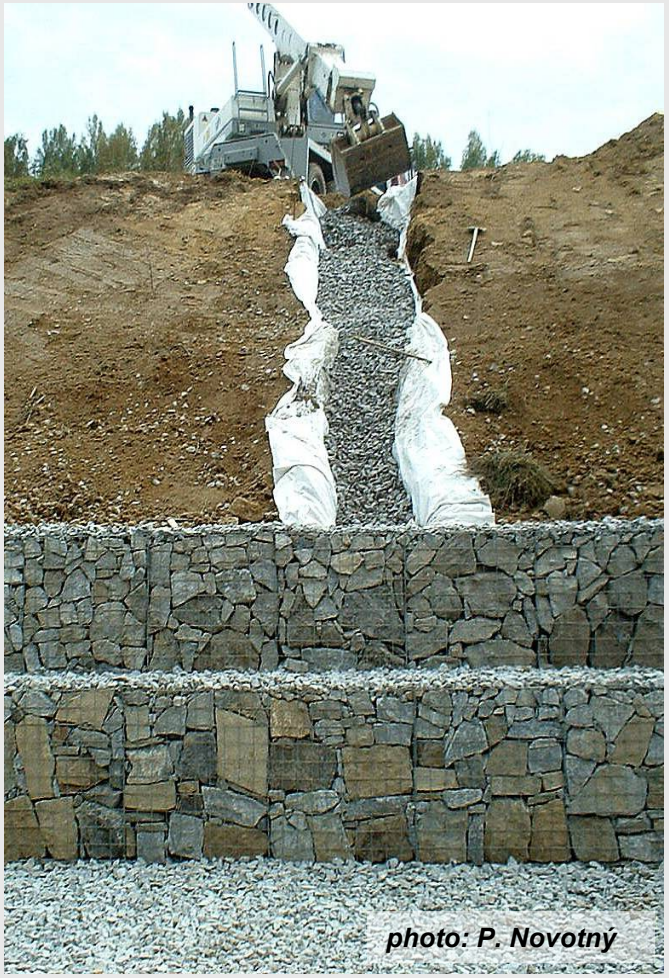
- original drainage system damaged in the course of time

- winter 2006 – heavy rains

=> water accumulation between sands and bedrock

1. JENIŠOV – sanation

- setting up a gabion retaining wall
- recovering the drainage system (drain ribs, ditch)

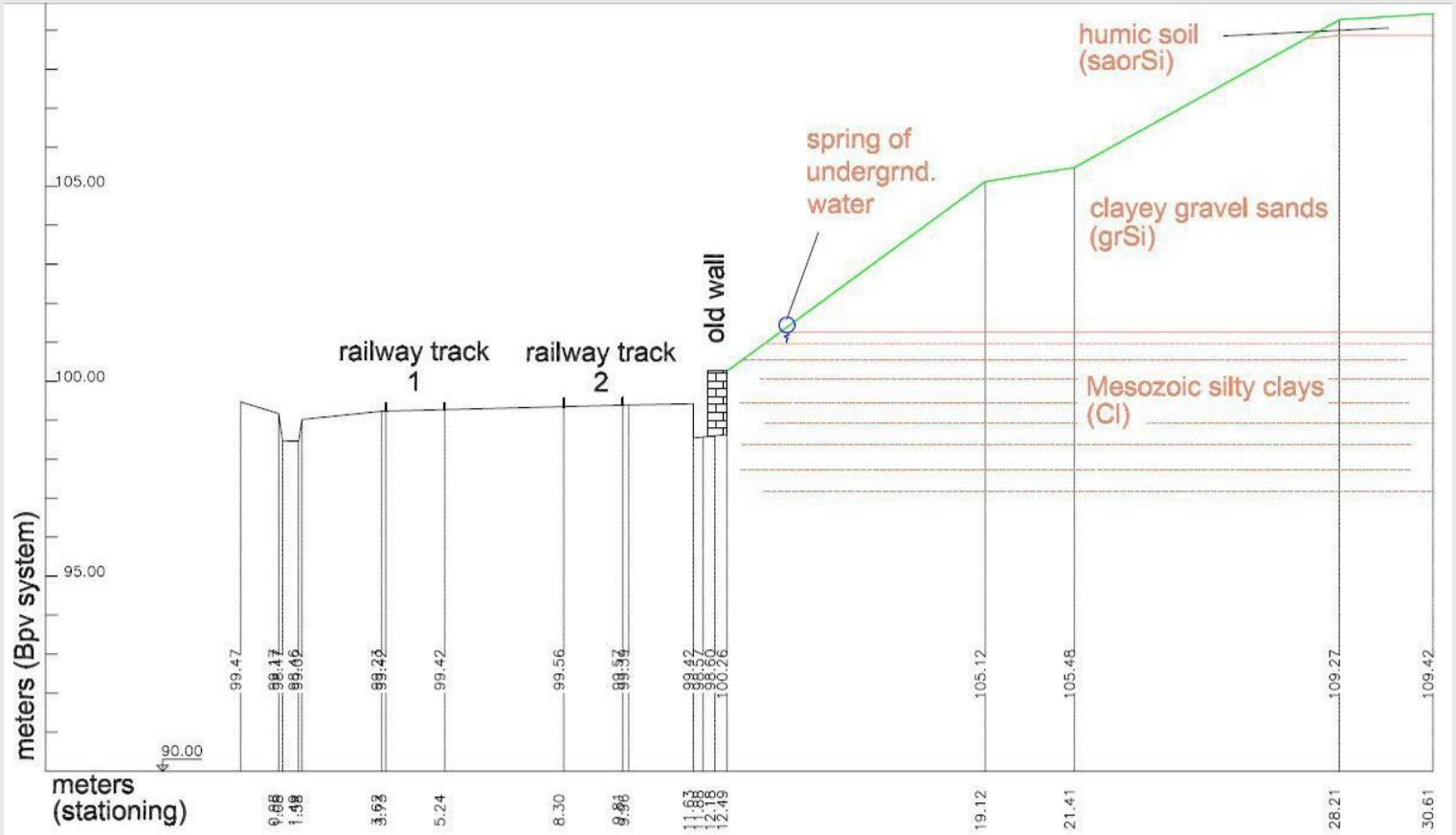


2. ČESKÉ BUDĚJOVICE – location

- south of Bohemia
- main connection between Czech Republic and Austria

2. ČESKÉ BUDĚJOVICE – *railway track and geology*

- railway track – cutting
  - 100 m long
  - 5 to 7 m deep
  - inclination approx. 45°
  - bottom – old retaining wall
- geological profile – km 211.380; EC-7
  - humic soil
  - clayey gravel sands with boulders
  - impermeable clays (stiff consistency)
  - occasional springs



2. ČESKÉ BUDĚJOVICE – landslide causes

- excavation for cable harness
  - poorly compacted

  => water ran through the slope and not on the surface

- spring 2006 – spring thaw

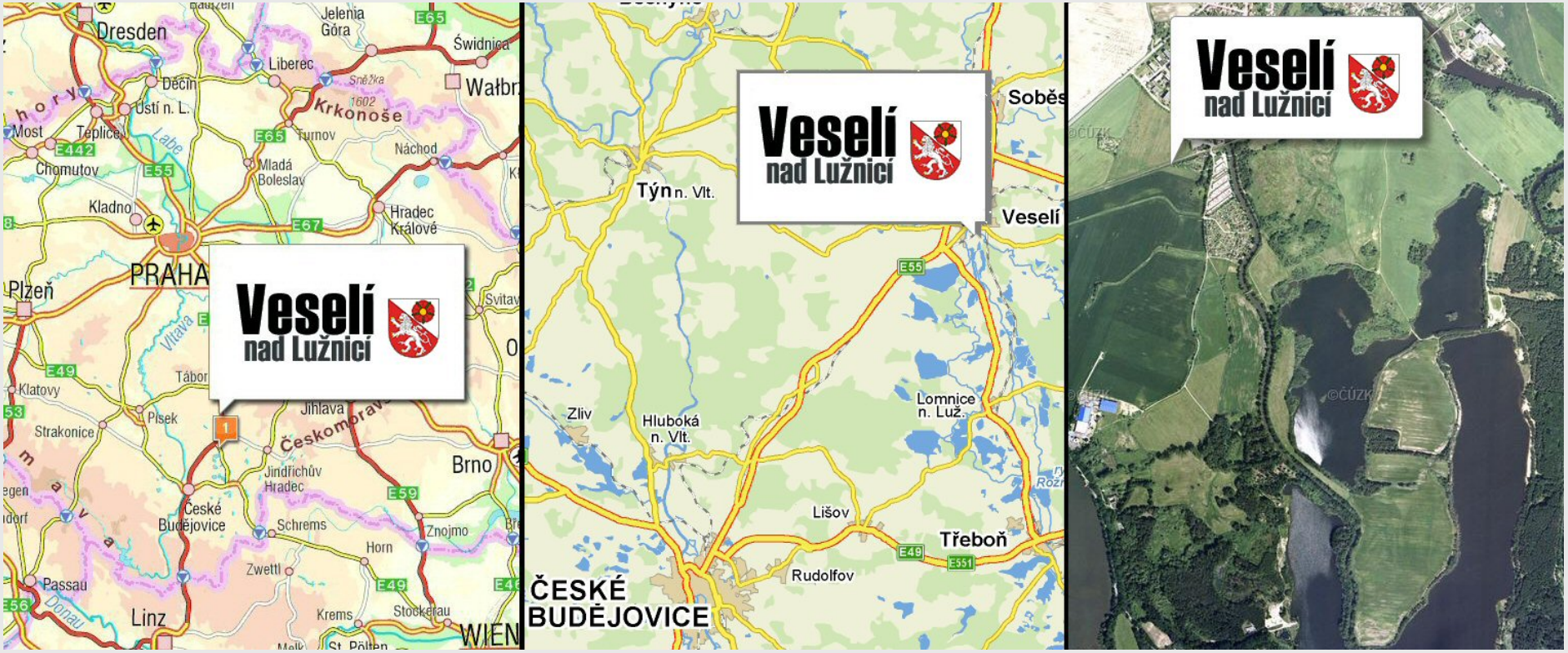
  => water accumulated above underlying impermeable layers

2. ČESKÉ BUDĚJOVICE – sanation

- substitution of the old wall by a new gabion retaining wall
- construction of a drainage system
- relocation of the cable harness

3. VESELÍ N. LUŽNICÍ – location

- south east of Bohemia
- railway track from České Budějovice to Prague
- flat landscape with rivers and ponds



3. VESELÍ N. LUŽNICÍ – railway track and geology

- railway track – embankment
  - 500 m long
  - up to 4 m high
  - approx. 35° steep
- geological conditions
  - tertiary basin – flood plain
  - sediments – kaolin clays, sands
  - covered by Qrternary sands, loams

3. VESELÍ N. LUŽNICÍ – landslide causes

- embankement body during floods
  - acts as a barrier / dam
  - water flow possible through the bridges
- in 1980s main bridge destroyed and filled up

=> during floods in 2002 and 2006 deformations appeared

3. VESELÍ N. LUŽNICÍ – sanation

- plan
  - surface water-protection
  - construction of a small culvert
- reality
  - only embankment body restoration
  - problems will probably last

Conclusions

- Loss of slope stability on railway tracks can be prevented mainly by:
  - **knowing the natural conditions based on quality geological research**
  - **designing the right technological procedures**
  - **complying with them throughout the construction**
  - **maintaining the existing drainage system**

Thank you for your attention

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