Tunnel Workshop
Invited Professionals

- “Tunneling Professionals,” combined experience in excess of 200 years
- Geologists familiar with California and Illinois Geology
  - Bauer, Frame, Neil
- Tunnel Designers and Builders
  - Babendererde, Hilton, Lachel, Wightman
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Agenda Items

• Technical Requirements for the Underground Facilities
• Subsurface Ground Conditions
• Construction Issues
• Tunneling Research and Development
• Close-Out Recommendations
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Technical Requirements

• Similar to a Rail or Metro Tunnel, except for possibly the needs for:
  – Watertightness, and
  – Stability.

• Need to raise the awareness of conventional and technical designers relative to the possible criticality of these issues.
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Ground Conditions

• No site-specific investigations have been performed.
• Some ground units, geo-structural, and geo-hydrological regimes encountered along the proposed alignments have not been extensively investigated or “worked” before (foundation, excavation, tunnel).
• In particular, there are significant uncertainties relative to the ground behavior of excavations in:
  – Expansive shales in California and Illinois
  – Saturated, weak and abrasive sandstone in Illinois, and
  – Overstressing of rock excavations in Illinois.
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Construction Issues

- Site conditions vary widely
  - Construction methods and means change
    - Soft ground and hard rock TBMs and drill and blast
  - Multiple layout options considered
    - Cut and Cover, Tunnel (side-by-side and vertically offset) and Combinations

- Layouts and construction assumptions have not been subjected to review for:
  - Constructability - do layouts allow for standard practice?
  - Value Engineering - can needs be met more cheaply?
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Research and Development

• In the tunneling industry R&D products gain acceptance very slowly (expect a time lag of 10+ years).
• The harsh underground environment can be unfavorable to innovation - takes time to "iron-out" the problems.
• Some on-going R&D projects might provide cost-saving products (equipment or materials) in the future. Continue to monitor R&D programs world-wide.
• Know where R&D products are and go see them in action.
• Show contractors that it works before they bid a job.
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Recommendations

- **Site Investigation** to address key geo-technical questions.
- **Site Selection Criteria** - to help select preferred sites and give added focus to further investigation and design work.
- **Constructability and Value Engineering Reviews** - to integrate into the design process for cost-savings.
- **Research and Development** - to continue to monitor.
- **An Underground Technology Advisory Panel** - to help guide project planning for site investigation, design, construction, R&D and other related efforts.