Engineer of Record – an Owner’s perspective

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Types of TSF’s

Existing / Historic Facilities / Acquisitions

- Often had no or little formal design (U/S construction)
- Geotechnical Investigations / assessments completed

New Facilities

- A firm or individual engineer leads design effort
- Evolution of a firm completing geotechnical work to individual point of contact

In both cases, the Ownership RISK needs to be managed.
Timeline

- 1970-80’s:
  - Many TSF’s did not have thorough geotechnical design evaluations

- 1980’s
  - Initiation of high(er) quality static and seismic evaluations

- 1990’s
  - Well qualified consultants providing detailed geotechnical assessments (design engineer identified)

- 200x
  - EoR is evident, but not formalized

- 201x
  - EoR become formalized in Corporate Std & Guidance documents
Kennecott TSF – an example

North Tailings Embankment
1996 – present
Centerline cyclone embankment
3000 + acres

South Tailings Embankment
1906 – 2003
U/S construction
5000 + acres
12+ mi circumference
~ 200 ft high
Kennecott Tailings - example

- Pre-1940’s – A Casagrande reviews isolated dike failures
- 1950’s – IECO completes geotech inv @ two sections
- 1960’s – WWC completes remedial investigation of decant failure
- 1970’s – internal designs by KES
- 1980’s –
  - D&M 1983 tailings modernization
  - Klohn Crippen – seismic evaluation
- 1990’s
  - South Tailings - Significant internal / external investigation, design, mitigation
  - North Tailings Facility design by WWC
- 2000’s
  - Design Engineer / EoR clearly identified
Role Definitions

Role Descriptions / definitions are not uniform throughout industry:

- Engineer of Record / also termed the “Design Engineer”
  - These may not be the same definition with all groups
  - Former “design engineer” may not be the EoR
- Tailings Manager: overall responsibility for making sure “things get done”
- Qualified Site Representative / Tailings Superintendent
- Technical Representative
Organizational Structure (example)

Owner’s structure
- President / GM
  - Responsible Manager
    - Tailings Manager
      - Geotechnical Engineer
      - Tailings Survey
      - Contracts Manager
    - Tailings Op Superintendent
      - Tailings Civil (earthwork, pipes, pumping)
      - QC / QA (consultant)

Independent Review Panel
- Individual
- Or Review Panel

EoR Structure
- Engineer of Record
  (individual)
  - Seismology
  - Hydrology
  - Geotechnical
  - Hydrogeology
  - Civil
    - earthwork
    - pumps/piping
    - electrical

Supporting team
- Size depends on risk

Corporate Tailings support
- findings
Elements of EOR Qualifications

- Education
  - Advanced degree (usual)
  - Specialty
- Training and Certifications
  - Professional Registration
  - Society Membership / participation
  - Experience (10+ years)
Responsibilities

• Assurance for physical integrity, safety, behavior
• Approval / Technical Oversight of sub-discipline work
  • Site Characterization / seismicity
  • Geotechnical
  • Hydrologic
  • Hydraulic
• Approval of Design Modifications (MOC)
• Compliance / Preparation of OoM Manuals
• QA/QC review or acknowledgement
• Instrumentation Review
• Seismic Characterization
• Storm water management and controls
Typical Deliverables

• Design Report and Analyses
• Drawings / Specifications
• Inspection Reports
• Instrumentation Reviews
• Annual Reviews
• Emergency Action Plans
• Compliance with OoM Manuals

Exclusions

• Environmental Compliance
• Groundwater Hydrology
• Air Quality and Emissions
Conclusions

• The EOR is the lead for the number of disciplines needed for design and operation
  • Knowledgeable on all aspects of design
  • Relies on specific discipline leaders to technical input / advice
  • Communication with the Owner’s team
• The EOR is one leg of risk management, that includes:
  • The EOR
  • The Owner’s team
  • Independent review
• The concept of the EoR has evolved over time and is still evolving
  • depending on company, location, regulations