

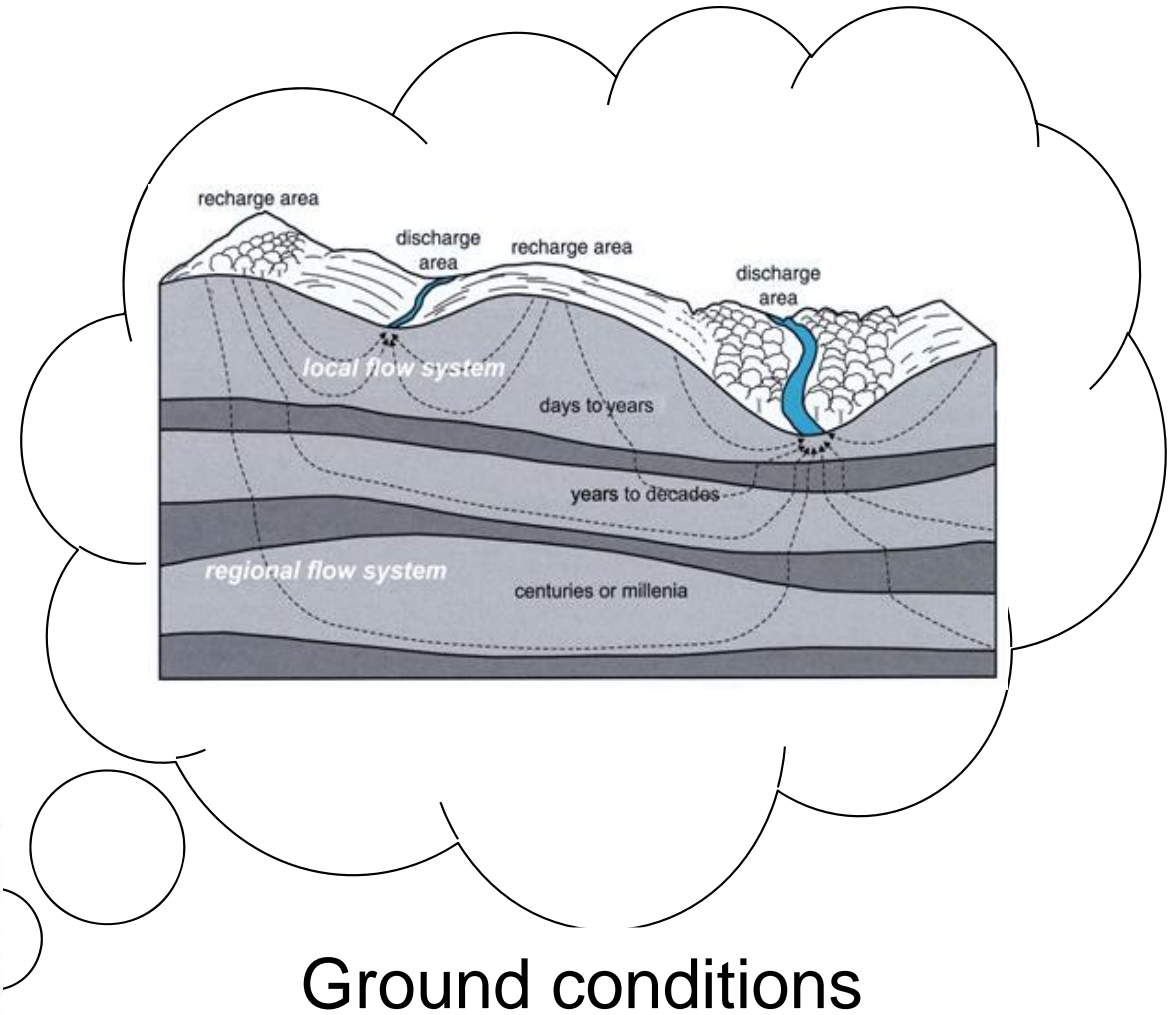


Risk Management – An Overall View of Geotechnical Baselines Report

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Raymond K.S. Au

B.Sc.(Q.S), DMS, MA, LLB(Hons), FHKIS, FRICS, FCI Arb,
FCInstCES, MACostE, MCI OB, RPS(QS)



Ground Conditions - Overview

- Unexpected ground conditions will be encountered
- Greatest risks is associated with the actual ground materials encountered and their behaviors during excavation and installation of works
- Identify and try to mitigate/de-risk during design of works
- Make appropriate allowance in design or in contingency
- Do not hide risks (Tenderer and Employer)
- If risk occurs jointly discuss way forward
- Acknowledge entitlements and strive for early settlement

Ground Conditions – Overview

- Early development of risk register during design
- Look into constructability issues
- Constantly update the risk register
- Undertake pre-tender Geotechnical Investigation, land searches and utilities investigations
- Develop an appropriate Geotechnical Interpretation
- Constantly review risks, programme and costs

Who should own the ground conditions risk?

The 3 alternatives to the Employer for dealing with unforeseen ground conditions are:-

- The Employer bears the risk;
- Transfer the risk to the Contractor; or
- Arrangement where the risk is shared.

Who should own the ground conditions risk?

- The key question is who can best manage and take responsibility for the risk and its consequences.
- Regardless of the selected alternative, the cost of ground conditions remains with the Employer, either included in the tender or paid when unforeseen conditions are encountered.

Allocation of ground conditions risk:-

Unforeseen Ground Conditions

MTRC Clause 38 of Ground Conditions of Contract for Civil Engineering and Construction works provides for the Contractor to seek additional time / money for “unforeseen physical conditions and obstructions”.

Geotechnical Engineering Report

- Extra- contractual document
Present only factual information such as bore logs, and findings from field and laboratory tests
- Interpretation and prediction of the ground conditions left to tenderers
- Necessary to distinguish between:
 - Interpretation by designer during the design process
 - Interpretation relates to design and construction methods addressed in Contract Documents
- Geotechnical Design Summary Report
 - Sets out the designer's interpretation of anticipated ground conditions and their impact on the design and construction
 - Variances of ground conditions is sometimes described:- generalized terms which might be geologically correct but which are ambiguous when considered as a baselines

Geotechnical Baselines Report - Documentation

- Contractual Document
- Technical Information
 - Presentation of geotechnical conditions that formed the basis of the design for envisaged construction methods
 - Provide key ground conditions constraints to be addressed in construction planning and method statements
 - Assist contractors in assessing the requirements for excavation and earth lateral support systems, grouting and ground water control

Geotechnical Baselines Report - Documentation

- Geotechnical Baselines Statements
 - Set out realistic measurable baselines for the ground conditions that are expected to be encountered
 - Provide all tenderers with a single contractual interpretation of ground conditions that can be relied upon in preparing their bids and form a common basis for subsequent tender evaluation

Geotechnical Baselines Report - Objectives

- Provide more precise, clear, consistent and quantifiable ground characteristics to facilitate the proper planning and execution of the works.
- Provide a risk management tool for unforeseen ground conditions

Geotechnical Baselines Report – The Challenges

- Understand the range of possible ground conditions accommodated by the design
- Realistically describe the range of anticipated ground conditions such that financial risks can be clearly allocated between the Employer and the Contractors
- The less clearly the anticipated geotechnical conditions are described, the more likely the potential for disputes and for increase in costs
- Establish contractual baselines for anticipated ground characteristics

Properly prepared GBRs can identify

- Areas where physical obstructions are likely
- Areas where geotechnical features are likely
- Areas where soil properties vary significantly
- Areas where rock properties vary significantly
- Interfaces between different soil & rock conditions
- Interfaces between soil and rock
- Ground condition variations across & along construction faces

Properly prepared GBRs can identify

- Anticipate rate of changing ground conditions along the alignment
- Anticipate rate of changing ground conditions across a single workface
- Identify areas of potential water inflow
- Estimate anticipated water inflow rates
- Estimate anticipated rock strength parameters and physical characteristics along alignments and across single workfaces
- Anticipate mixed face conditions and percentages of mixed face material components

Geotechnical Baselines Statements – Objectives

- Translate the results of geotechnical investigations and previous experience into clear contractual statements of anticipated ground conditions
- Define the limits/ranges of geotechnical conditions for which Tenderers are expected to allow
- Contractually allocate risks associated with these ground conditions
- Baselines are no guarantee against differing site condition claims
- Should not be used as a basis for design

Geotechnical Baselines Statements

- Items to be addressed in the Geotechnical Baselines Statements include:
 - Estimated amounts of different ground materials
 - Distribution of different ground materials
 - Establish contractual baselines for anticipated ground characteristics
 - Strength, permeability, size of ground mass
 - Quality and characteristics of rock mass
 - Bedrock level, boulders and corestones

Geotechnical Baselines Statements

- Contaminated /Aggressive ground
- Mixed ground condition or presence of boulders/corestones
- Ground water levels and characteristics including inflows, and ground water chemistry
- Potential or known faults, shears, dykes, faults zones and shear zones
- Artificial / man-made obstructions such as abandoned piles / utilities, buried seawalls or other geotechnical hazards

Geotechnical Baselines Statements Practices

To achieve the objectives of the Geotechnical Baselines Statements:

- Quantitative descriptions
 - capable of being measured and checked during construction
- Qualitative descriptions
 - Based industrial definitions

Geotechnical Baselines Statements Practices

- Are assumptions expressed as contractual representations of anticipated geotechnical conditions
- Should be realistic and founded on rational basis
- Not necessarily solely based on specific ground investigation results such as:
 - Volume of boulders to be encountered cannot be correctly identified purely from boring because small diameter of bored holes cannot effectively expose the extent of boulders
 - Expressed in a range of values for ground conditions characteristics such as maximum value, minimum value, average value and a histogram distribution of values or a combination of values

Geotechnical Baselines Statements Practices

- Not a warranty of ground conditions to be encountered
- Baselines statements are what are assumed to be encountered for the purpose of demarcating what are unforeseen ground conditions
- Baselines statements are regarded as a contractual commitment by the Employer insofar as the determination of unforeseen ground conditions is concerned
- Triggering the contractor's entitlements for time and cost implications as a result of the unforeseen ground conditions

GBR – Lessons Learned

- Sufficiency of Site Investigation
 - No substitute for carrying out a comprehensive site investigation
 - Ground investigation data must be sufficient for realistically describing ground conditions
 - Lack of ground investigation data will contribute to poorly written GBR, becomes a source for disputes

GBR – Lessons Learned

- Baselines Statements
 - Must be clear, simple and unambiguous self-contained statements
 - Avoid referring to other documents in the baselines statements
 - Drawings not intended to be baselined should not form part of the baselines statements
 - Do not baseline those ground conditions for which ground investigation data is unavailable
 - Information or requirements are defined in the specification or contract drawings should not be repeated in the baselines statements such as utilities schedule or as-built records

GBR – Lessons Learned

- Precise value or a range for Baselines Statements
 - Some practitioners suggest to use precise value coupled with the requirement of “Material Difference” for operation of the baselines statements
 - Defeat the purpose of definitive of baselines statements and a sources for different interpretation leading to disputes
 - Depends on the degree of variance of the ground conditions
 - The more GI data available, the more precise value or the smaller range can be used
 - The higher the range of value, the high the price the Employer has to allow in the tender bids
 - Sensitivity Analysis of the range of values should be done to optimize the selection of the values for baselines

GBR – Lessons Learned

- Baselines for rock
 - Rock head contour lines plus absolute quantities
- Baselines for Boulders and Corestones
 - Provisional quantities
- Baselines for seawalls and man-made obstructions
 - Provisional quantities

GBR – Lessons Learned

- Independent Reviewer of the GBR
 - Independent “fresh eyes” will improve the clarity of the content of GBR
 - Ensure consistency and compatibility among the Contract Document
 - Fresh eyes review should be done by construction and commercial people who have the experience in dealing construction activities
 - Allow sufficient time for independent reviews and discussions

GBR for Target Cost Contracts – Shared Approach

- Shared Risk has evolved through the use of Target Cost contracting (TST works contract C4420 pioneered this approach) further developed in WIL 703 and 704, and SIL 901 and 903
- Under or over-runs of cost & programme are shared between Contractor & Employer
- Jointly managed risks allow for early action by parties.
- MTRCL preferred route in Target Cost & Incentivisation

GBR for Target Cost Contracts – Shared Approach

- Further developed in Target Cost Tenders for SCL 1111 and 1112
- Precise values of ground conditions be allowed by tenderers in Initial target cost tender bids
- Provisional Sums allowed in the Tenders for encountering obstructions upto a pre-determined % of:
 - Corestones
 - Boulders
 - Rocks
 - Seawalls
 - Man-made obstructions
- Contractors are paid by actual quantities including those exceeding the baselined quantities

GBR - Outcome

Competitive Prices received in Tenders as:-

- Risk allocation is known and understood;
- Common base for tenderers to price;
- Simplify contractual basis assessment of variations to ground conditions when encountered



Thank you