Views and Opinions from the Underworld:

How to Better Understand & Collaborate with the Project Geotechnical Engineer of Record

Matthew J. Cramer, P.E.
President
GEOMAT Inc.

Presentation Topics

- Backgrounds
  - Personal/Company
  - Geoprofessional Business Association (GBA)
- Understanding geotechnical engineering and what the geotechnical report really is?
  - Two Phase Process
  - Contractual Examples of the Geotechnical Engineer
- Who is the Geotechnical Engineer of Record?
- Current Project Delivery Flaws
- Project Improvements (Idealized Project Work Flow)

Personal Background



- Education
  - Farmington High School, 2000
  - B.S. Civil Engineering, NMSU, 2004
  - M.S. Civil Engineering, NMSU, 2005
- Experience
  - With GEOMAT since 2010
  - Chavez-Grieves Consulting Engineers 2005-2010
- Mentors
  - Geotechnical:
    - George Madrid, P.E. (35 years experience)
    - Lyle Tweet, P.E. (40+ years experience)
    - Larry Cynova, P.E. (35+ years experience)
  - Structural:
    - David Grieves, P.E.
    - Victor Chavez, P.E.
    - Chris Romero, P.E.

Company Background

- GEOMAT Inc.
  - Established 2004
  - Currently Two Offices (approx. 30 employees)
    - Farmington (Headquarters)
      - Four Corners Region of NM, AZ, CO, and UT
    - Rio Rancho
      - Entire State of New Mexico and SW TX







- Members of Geoprofessional Business Association (GBA) since 2006

Purpose of Presentation

In current practice, it is very rare for a pre-construction geotechnical engineering site investigation/report to not be undertaken and yet for decades foundation and earthwork related claims have continued to be the single greatest risk and led to the most construction related litigation claims.

WHY?

Opinion

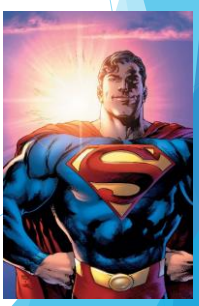
- Misunderstandings and misinterpretations (by all parties) as to the role of the Geotechnical Engineer on a project, what their findings/deliverables are meant to entail, and what responsibilities that a properly scoped and delivered Geotechnical Engineer of Record project is to look like.

Purpose of Presentation

Opinion

- Misunderstandings and misinterpretations (by all parties) as to the role of the Geotechnical Engineer on a project.
- What the geotechnical findings/deliverables are meant to entail.
- Inadequate engagement of project geotechnical engineer at crucial project stages.
- What a properly scoped and delivered project by the Geotechnical Engineer of Record project looks like.

Why is this important to structural engineers?



Presentation Resources

- Geotechnical Business Association (GBA)
  - Important Information about this Geotechnical-Engineering Report document.
  - National Practice Guideline for the Geotechnical Engineer of Record
- ASCE Geo-Institute (GI)
- The California Geotechnical Engineering Association
  - Recommend Practice – Transfer of Responsibilities/Projects between Consultants

Geotechnical Engineering Practice

Geotechnical Engineering is at a minimum a

Two Phase Process.

- Phase 1 – Site Characterization and Preliminary Recommendations
- Phase 2 – Finalization of recommendations during construction based upon the actual conditions encountered.



POLL

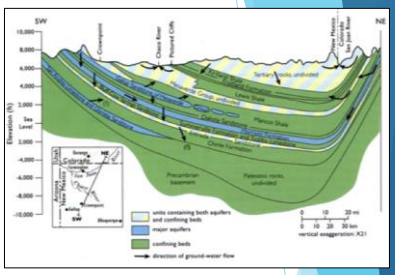
- You are asked to design an elevated 2nd floor in an elementary school. The floor is comprised of approximately 3,000 beams and girders. The owner is looking to save money and wants to order their steel from China. Based upon brief research you find that the typical yield stress of Chinese steel varies from 25 ksi to 75 ksi although rare anomalies as low as 5 ksi are sometimes found. Because of the variability, the owner allows for 3 of the 3,000 beams to be tested. Of those beams the yield stresses as tested are 18 ksi, 36 ksi, and 39 ksi. What yield stress will you use in design?
  A. 31 ksi (average of those tested)
  B. 18 ksi
  C. 25 ksi
  D. 5 ksi
  E. Other?

Possible Procurement Scenarios

Scenario	Phase 1	Phase 2
1	Architect	Owner/Agency
2	Owner/Agency	Owner/Agency
3	Architect	Contractor
4	Owner/Agency	Contractor
5	Contractor	Contractor
6	Architect	Architect
7	Structural	Contractor
8	Structural	Owner/Agency
9	Owner/Agency	Architect
10	Structural	Structural

Geotechnical Engineering Practice

The adequate practice of geotechnical engineering is a two-phased approach whereby:



Phase 1:

- The geotechnical engineer preliminarily characterizes a site to acquire the information necessary to provide confirmation dependent recommendations to be used by other disciplines for project design.
  - Geological review, site exploration, laboratory testing, and an interpretive report based upon inferred assumptions.
  - Characterization is based upon less than 0.1% of subsurface materials to be encountered during construction.



Geotechnical Engineering Practice

Phase 1 (cont.):

- Development or review of earthwork specifications.
- Review of final drawings to verify interpretations of the interpretative report.



Geotechnical Engineering Practice

The adequate practice of geotechnical engineering is a two-phased approach whereby:

Phase 2:

- Construction Phase services to finalize confirmation dependent recommendations based upon actual subsurface conditions.



What happens when two different geotechnical firms provide Phase 1 and Phase 2 services?

Who is the Geotechnical Engineer of record?

Who are geotechnically related questions asked of during construction?



What do the Codes say?



AASHTO LRFD Bridge Design Specification:

Phase 1 (Chapter 10):

- 10.4.1 - *Informational Needs.*
- 10.4.2 - *Subsurface Exploration.*
- 10.4.3 - *Laboratory Tests.*
- *Remainder of Chapter 10 is a comprehensive review of design parameters, settlement, limit states, etc...*
- *Bridge Phase 1 services generally more comprehensive.*

Phase 2:

- Phase 2 services are generally entity led or specified (i.e. FP-14, NMDOT Specs, etc…).
  - Contractor Quality Control
  - Owner Quality Assurance
  - If FHWA or DOT is not the Phase 1 geotechnical engineer, the Phase 1 consultant is generally retained for construction phase consultation services.

Greatest disconnect occurs in that the geotechnical engineer has often not reviewed the final loads or been involved with the final drawing review.

What do the Codes say?

International Building Code:

Phase 1 (Chapter 18 – IBC 15):

- 1803.1 – *Where required by the building official or where geotechnical investigations involve in-situ testing, laboratory testing or engineering calculations, such investigations shall be conducted by a registered design professional.*
- Remaining chapter 18 prescriptive boiler plate……..

Phase 2 (Chapter 17 – IBC 15):

- 1705.6 – *Special Inspections and test of existing site soil conditions, fill placement, and load-bearing requirements shall be performed in accordance with this section and Table 1705.6.*

Table 1705.6 Required Special Inspections and Tests of Soils

	Type	Continuous Special Inspection	Periodic Special Inspection
1.	Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	———	X
2.	Verify excavations are extended to proper depth and have reached proper material.	———	X
3.	Perform classification and testing of compacted fill materials		X
4.	Verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill.	X	———
5.	Prior to placement of compacted fill, inspect subgrade and verify that site has been prepared properly.	———	X

What others are doing/saying?

CalGeo (The California Geotechnical Engineering Association):

Transfer of Responsibilities between Consultants Document. Applies when:

- Projects where the preliminary or initial geotechnical, geologic, or environmental investigation for a specific project has been completed and no other work by the previous consultant is in progress;
- Projects in progress at the time the transfer of a job is initiated, either by the consultant, the owner, or authorized parties. In all cases, there is an existing contract between client and consultant.
- Projects where the client requests that the work of a previous consultant be used for the analysis of the new project.

CalGeo
The California Geotechnical Engineering Association

What others are doing/saying?

CalGeo (The California Geotechnical Engineering Association):

In 2019 CalGeo developed a Transfer of Responsibilities between Consultants Document (specific to their members).

The document applies when:

- Projects where the preliminary or initial geotechnical, geologic, or environmental investigation for a specific project has been completed and no other work by the previous consultant is in progress;
- Projects in progress at the time the transfer of a job is initiated, either by the consultant, the owner, or authorized parties. In all cases, there is an existing contract between client and consultant.
- Projects where the client requests that the work of a previous consultant be used for the analysis of the new project.

In my opinion, this is one of the better documents of an appropriate process be done in these situations and should be considered by the professionals in NM.

CalGeo
The California Geotechnical Engineering Association

What others are doing/saying?

Transfer of Responsibilities (CalGeo):

GENERAL PROCEDURE

A CalGeo member consulting firm, upon being contacted by the owner or authorized party requesting assumption of a project on which another consulting firm has provided professional services, shall, prior to acceptance of the project:

- Inform the owner or authorizing agent verbally, with a follow-up in writing, that he will need a confirmation from the original consultant that:
  - (a) all fees have been paid or the original consultant authorizes the use of the data, and
  - (b) the project will be discussed by the two consultants.
- Inform the previous consulting firm that the second consultant has been requested to provide services on the project. This will allow a discussion of conditions surrounding the project, a review of unpaid fees, and provide the first consultant an opportunity to issue statements regarding his previous reports, opinions, or advice, as well as his non-responsibility for future work on the project.
- Inform the owner or authorizing agent that all previous reports and recommendations that are proposed for use in the project will have to be reviewed immediately.

Following this review, he shall inform all interested parties requiring such information that the previous consultant's reports have been reviewed and that there either is concurrence with the previous reports or, if upon review of the previous consultant's reports the new consultant is not in agreement with the findings of the reports, he should so state his opinion, propose a new investigation, or refuse further involvement in the project.

What others are doing/saying?

Transfer of Responsibilities (CalGeo):

If the circumstances are such that the previous contractual relationship is not in the best interests of both contracting parties, the new consultant should consider accepting the job only after an on-site meeting with all interested parties, including both consultants, to establish the status of the project.

The original consultant should be paid in full for his services and should provide a written report with test results for work completed to date.

If the project is accepted, the following guidelines should be utilized after acceptance:

- The new consultant must decide which recommendations from the original consultant that they will adopt and what additional investigation and evaluation will be required.
- The new consultant should notify the original consultant in writing and clearly state that they assume all responsibility for any recommendations made by original consultant that are adopted by the new consultant.
- The new consultant should notify the local Building Official that they:
  - (a) have taken over the project
  - (b) have assumed all responsibility for recommendations made by the original consultant, and
  - (c) are now the Geotechnical Engineer of Record.

CalGeo
The California Geotechnical Engineering Association

Summary of Suggestions for Better Geotechnically related project Deliverables

1. Insist that a Phase 1 preliminary geotechnical site investigation and report be conducted. *Encourage the Owner/Architect to make the selection based upon:*
   - *Qualifications*
   - *project understanding*
   - *your recommendation*
   - *some other selection methodology other than based solely on price.*

If possible, ask that the geotechnical engineer include a price for review and commenting on structural/civil drawings and specifications at the 100% DD and 100% CD phases.



Summary of Suggestions for Better Geotechnically related project Deliverables

2. Send earthwork drawings/specifications to the geotechnical engineer for review at the 100% DD and 100% CD. Include the following:
   - *General Foundation Notes.*
   - *Foundation Plans.*
   - *General Foundation Details.*
   - *Earthwork for Building Specifications.*
   - *Final maximum allowable loads used in design of foundations.*
   - *Civil grading plans to verify assumed elevations.*

DO NOT BE SURPRISED WHEN THEY SAY THIS ISN'T IN THEIR SCOPE OF SERVICES!

If this is not in their scope, present the value of these services to owner/client/Architect and request that they be contracted to do so.

Summary of Suggestions for Better Geotechnically related project Deliverables

3. Upon delivery of the 100% drawings:
   - *Inquire as to the methodology of the Phase 2 (Construction Services) geotechnical consultant procurement.*
   - *Encourage that the same firm be procured.*
   - *If the procured firm is different, ask for a written statement of acceptance of the Phase 1 (preliminary geotechnical recommendations) or recommendations for subsequent services.*

It is a crucial to understand who is going to be consulted and confirm the subsurface conditions during construction.

Questions/Discussions