PITFALLS & RISKS IN ENGAGING GEOTECHNICAL CONSULTANTS

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This paper provides information and comments on the various pitfalls & risks [both professional and commercial] that engineers and managers can either fall into, or incur when engaging a geotechnical consultant. The pitfalls discussed include unintended assumption of risk, limitations on the scope of geotechnical advice, unresolved ambiguities in geotechnical reports and structural / civil engineers advising outside their expertise. Risk management issues including geotechnical report limitations & commercial matters are also discussed. Several examples of projects where structural / civil engineers have found themselves in difficult situations are also presented, together with a risk management 'checklist' of the suggested items to consider when appointing a geotechnical consultant for a particular project.

1. INTRODUCTION

The engagement of a suitable specialist engineer to assist on a particular project is a usually a difficult issue for clients, engineers & managers with many engineers and managers being uncertain as to how to go about engaging a geotechnical consultant, or the differences between the various geotechnical consultants.

As a result, the geotechnical advice received by some engineers and managers has been less than suitable for their particular purposes; also, in some cases the advice provided has been misinterpreted by the engineer, or manager receiving the advice, and as a result, problems have emerged for the client.

Also, and as some of you may know the work that I do in the forensic field, I have been involved in many legal cases in which various allegations have been made against a number of engineers, civil, structural, geotechnical and others. This has given me considerable insight into what structural and civil engineers think of geotechnical engineers; consequently, I will address some of the issues that arise in employing a geotechnical engineer in this paper and explain:

1. Some of the differences that exist between the various geotechnical companies / consultants.
2. The pitfalls that an engineer can fall into when employing a geotechnical consultant.
3. The risks to which engineers may, unwittingly or unknowingly expose themselves.

At the end of this talk, I will provide you with a simple 'risk management' checklist which I hope you might find helpful when considering, or recommending the engagement of a geotechnical consultant.

Also, whilst several examples are provided in this paper, the projects will only be identified by the general geographic area in which they took place, with the various individuals, or companies not being identified.

2. REASONS FOR EMPLOYING A GEOTECHNICAL ENGINEER

When considering the employment of a geotechnical consultant, it is important to decide what you want geotechnical advice for. Engineers often have good and bad reasons.

In this regard, the following questions are pertinent:

1. Is it to provide design information for the particular project you have in mind?
2. Do you really want to know what is under the ground, or do you simply want a person to go to a job site, drill some holes and tell you what they think is under the ground?
3. Do you think a geotechnical report is simply a 'form filling' exercise to comply with a particular Council requirement?
4. Do you want geotechnical engineering advice?
5. Do you want a 'team player' to assist you on the project, or just an 'add on' who you can sue when the project goes wrong?
6. Can you rely on, **or trust,** a consultant who may go broke during or after the project, because of the low fees they charge?

7. Do you want someone who will entice you to give them the job by quoting a 'low fee', to only take you to the cleaners later by some sort of 'drip feed' process?

It is very important to make a rational decision as to the reasons for employing a geotechnical consultant at the very outset; this is because if you are not clear as to why you need the consultant, then there is simply no way in which any consultant employed by you can meet your expectations.

But What Type of Consultant?

If, for example, you simply want someone to tell you 'what is under the ground', then there are many drillers, soil technicians, geologists and similar persons who are associated with companies that own drill rigs that could probably, and very capably, fulfil your needs and do the work for a low fee.

By contrast, if you are involved in a major project or complex legal matter, then the last geotechnical person you want is one with minimal geotechnical qualifications; what you really need is someone with considerable expertise and experience.

In other words, if the project needs specialist 'engineering advice', then you need to find and use a specialist engineer, NOT another 'allied' professional.

These comments are made with some seriousness, as in each of the five case studies to be presented:

a) There was a structural / civil engineer, and geotechnical consultant engaged.

b) The prime cause of the site's problems and the resultant failure was 'geotechnical'.

c) The structural & civil engineers lost lots of money and reputation; and in one case the engineer lost everything.

Also, in 4 of the 5 cases, the geotechnical consultant had no liability.

3. THE MOREE EXAMPLE

Let me start with what I have called 'the Moree example'. For some of you may be thinking that you are 'well versed' in employing geotechnical consultants and your projects cannot really go very wrong because you have so much experience in employing geotechnical consultants.

Figure 3.1: Overall view of house at Moree.

I have selected this particular case as the first one because it involved:

- the investigation, design and construction of a very large house [approximately 900 m²] in the black soil country of Moree;
- a project for a wealthy cotton farmer who employed a project manager / architect, a structural engineer and a geotechnical consultant.

The house was also built on a very substantial concrete raft slab on a gravel mound. The slab also had edge beams nearly 1 m deep and the structural engineer used well-regarded computer software to design it.

The raft footing system failed dramatically, with the amount of edge heave of the slab as compared to the centre part of the slab exceeding 230 mm.

The house was seriously bent in the middle and as a consequence suffered serious internal damage. Here are some of the damage photographs.

Figure 3.2: Separation of cornice from ceiling.

Figure 3.3: Separation of cornice from ceiling.

Figure 3.4: Separation of cornice from ceiling.

Figure 3.5: Detail of separation of cornice from ceiling.

Figure 3.6: Diagonal, step-wise cracking on external brickwork of house.

When it all went wrong, the farmer was naturally very upset and decided to sue the various parties. He did this by suing the project manager / architect and the builder, in the belief that these persons would then subsequently join any other guilty party. In the event, the architect joined the structural engineer and the geotechnical consultant.

As a result of the ensuing litigation, costs of approximately $1,800,000 were awarded against the architect and structural engineer, with the builder bearing some blame and the geotechnical consultant effectively escaping liability.

In addition, because the PI insurer of the structural engineer had gone into liquidation, both the architect and structural engineer lost all their assets.

But how did this occur?

Although the geotechnical advice provided at the site was simply wrong, the structural engineer took over liability for the site's geotechnical issues because he said he thought the geotechnical advice was wrong and made up his own mind as to what value of a critical geotechnical parameter, y_s [or the characteristic surface movement] he should use in the design.

You see the geotechnical consultant grossly underestimated the amount of soil shrinkage, or y_s value, as 50 mm instead of the likely value of about 125 mm. The structural engineer recognised the geotechnical consultant's error and made up his own mind that the correct value of y_s was about 100 mm.

The geotechnical consultant also escaped liability because the large multi-state corporation that provided the geotechnical advice had been sold to an overseas corporation with certain declared liabilities, well prior to the commencement of the litigation involving the house at Moree. As such, despite a high court appeal, it was found that the continuing, large multi-state geotechnical corporation had no liability to the farmer, structural engineer or architect.

What did the Structural Engineer do that was wrong?

Many views were expressed during the litigation, but the principle reasons were:

1. The structural engineer identified that the geotechnical consultant's advice was wrong, but did not go back to the geotechnical consultant and tell him so. In essence, the engineer rejected the wrong advice and designed the slab for much greater characteristic soil movement [viz: y_s] than recommended by the geotechnical consultant.
2. When asked by the farmer if instead of putting the gravel mound on top of the soil, he could use a gravel mound constructed within the surface soil, the structural engineer agreed.
3. The architect / project manager was drawn into the whole mix because the engineer ran out of money, including both his personal and his insurer's assets. As such, under the joint & several liability situation in New South Wales, the architect had to contribute over $1,000,000 which meant that he too lost all his assets.

I think you will agree with me that this was a very sorry outcome, with one of the seriously guilty parties in the matter escaping all liability.

4. PITFALLS IN EMPLOYING A GEOTECHNICAL CONSULTANT

So now we come to the various pitfalls that you can fall into when employing a geotechnical consultant, and in summary, I think these can be grouped as follows:

1. Selecting the wrong geotechnical consultant.
2. Not regarding Geotechnical Reports as important and useful documents.
3. Thinking you are 'half a geo' and at liberty to, or have the competence to, adjust and vary geotechnical recommendations as you see fit.
4. Taking over the project geotechnical risks [wittingly or unwittingly].
5. Not seeking clarification of any ambiguities in a geotechnical report.
6. Not fully / appropriately involving the geotechnical consultant in the design and construction processes.
7. Ignoring the various limitation clauses and notes in the geotechnical report.

I also want to remind you that the statistics are such that the only person who will suffer by you falling into one of these pitfalls is you, no-one else. For I think we all need to be reminded that most engineers will at some stage of their careers be sued, justly or unjustly, for professional negligence with resultant very large personal and financial costs.

4.1 Selecting the Wrong Geotechnical Consultant

I have heard it said that many structural and civil engineers regard geotechnical advice and reports as 'waffle', non-specific, hard to follow and not relevant to the issues for which the geotechnical consultant was engaged.

Whilst in some instances this may be true, I think that many of these complaints arise from the consultant selection processes; that is, the structural / civil engineer selects the wrong geotechnical consultant. In this regard I think it necessary that the structural engineer consider carefully:

- what sort of advice is needed?
- what qualifications should the consultant have?

and then ensure that the person providing you that advice is qualified to give the advice.

In other words:

1. If you want engineering advice, then you should go to an engineer, don't go to a soil technician, soil scientist, hydrogeologist or geologist.
2. If on the other hand you want geological advice, then go to a geologist.
3. If you just want a hole in the ground, then go to a driller.

Go to the person / organisation that specialises in the problem you need advice on, or solve. Don't expect sound engineering advice from an organisation that is not 'engineering based', or a group of 'consulting engineers'!!!

I think you would all be aware that there are a number of geotechnical consulting firms in Australia that operate either locally, or on a multi-state basis that in fact employ very few engineers, with the majority of their advice being provided by engineering geologists, environmental scientists, soil scientists, hydrogeologists and the like. I have also been to sites where a Client has introduced me to his 'geotechnical engineer', who was in fact an engineering geologist.

Another issue associated with using an engineering geologist to provide you with geotechnical engineering advice, is the language they speak; for are you aware that geologists and engineers speak different languages?

I know this may not be a revelation to some of you, but perhaps many of you here do not recognise that the training and inherent character of geologists is very different to engineers.

An example of this is the way in which a geologist will describe rocks.

While most of you have probably been down the south coast and seen the problems of the Stanwell Park Claystone and the Wombarra Shale, then you could be forgiven for thinking that the Stanwell Park Claystone in actual fact was a rock unit made up predominantly of claystone. In this you are quite wrong, for the Stanwell Park Claystone is in fact predominantly sandstone.

Again, if you go north to the Central Coast and look at that very difficult bedrock material around Wamberal and Bateau Bay called the Patonga Claystone, you could be forgiven for thinking that:

1. The bedrock exposed was predominantly a sandstone.
2. It was not a Claystone.

But have a look at this photo of the Patonga Claystone.

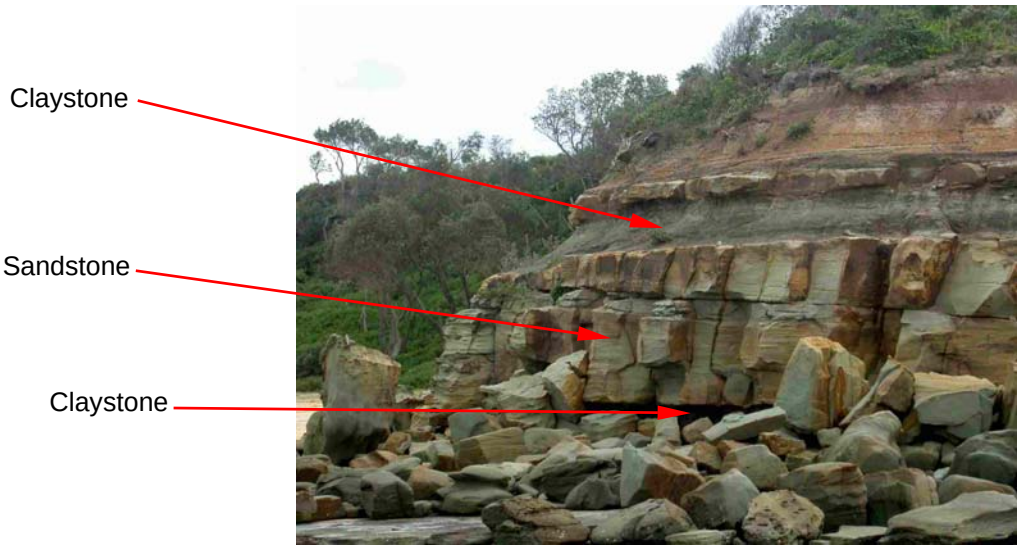

Figure 4.1: This SANDSTONE with *minor* claystone is called a CLAYSTONE.

From an engineering perspective, it is predominantly a sandstone, not a claystone. In this we need to see that an engineer describes a rock or soil by its mechanical properties, whereas a geologist classifies rock formations by their geological origin.

Another language issue is that many geologists call the 'footings' of a structure the 'foundation', whereas the various Australian Standards [written by engineers] use the term 'footing' to describe the structure that is supported by the 'foundation' [soil or rock].

I would however like to express my great admiration for geologists, and I greatly value and respect their advice; also, my company has also employed a number of extremely competent engineering geologists over its corporate history and will continue to do so in the future.

So in the consultant selection process, it is simply a matter of selecting the right person for the right job. Don't try to push square pegs into round holes.

4.2 Thinking Geo Reports are 'costly' & 'superfluous' documents

There is an attitude amongst some engineers that geotechnical advice is too costly, with much of the advice being either superfluous, or irrelevant.

This is a most dangerous pitfall, because a written geotechnical report will include things that may later convict you of being an engineer who practices outside of his, or her expertise.

So whilst the cost of geotechnical advice may sometimes be considerable, particularly if extensive drilling and laboratory testing is necessary, the cost of the advice itself is usually small in relation to the overall project.

So why this view of the advice being superfluous or irrelevant?

It seems to me that this view arises from the fundamental error, or pitfall in selecting the consultant I have just discussed; for if the advice you are receiving is not relevant to your matter at hand, you have got the wrong person, or organisation for the project.

1. For how can a person, untrained in engineering, give you sound geotechnical engineering advice?
2. Or how can an engineer, not trained in geology give you sound geological advice?

So the waffle and irrelevance in many geotechnical reports stems from the consultant selected by you, no-one else!!! In other words, if you want a geotechnical report that provides relevant engineering advice, make sure the consultant you use is an engineer, and that the person actually doing the work and signing it off, is an engineer, not a soils technician.

4.3 Thinking you are 'Half a Geo'

Another pitfall is thinking that you are 'half a geo', and that you understand geotechnical matters.

This is an enormous problem for many engineers. For in my experience, many engineers think they are competent in geotechnical engineering just because they have gained some background in geotechnical engineering from their working with, or reading of geotechnical reports. As a consequence, these engineers

behave as if they are 'half a geo', and inclined to accept / reject geotechnical advice from a specialist as they see fit.

I also recall a court case many years ago in which a structural engineer, for whom I have a profound respect in structural matters, said in response to a barrister's question about geotechnical advice:

> *"Well, if I think the advice is incorrect, I reject the advice."*

This is a huge pitfall, because if the advice is wrong, then you must go back to the geotechnical consultant and say so; for if you do not go back and question the advice, then you will probably take on the liability for geotechnical problems at a site.

An example of this was a swimming pool failure at a place called Valentine, on the shores of Lake Macquarie in NSW.

Figure 4.3.1: Overall view of 'wet-edge' pool in Valentine.

Figure 4.3.2: No 'wet-edge' due to the pool settling.

The proposed construction was a large, 'wet edge' swimming pool with a spectacular view. The pool was also to be built on a hillside where soil instability had been identified.

There was geotechnical advice on the site, which in short recommended that the swimming pool should be founded upon bored, cast-in-situ concrete piles drilled to, and into bedrock.

My research as to the apparent reason for the recommendation also indicated that as conglomeritic fill had been placed on the site, the geotechnical consultant thought it was important that the wet edge pool be founded on piles to bedrock to ensure that the pool would not settle and the 'wet edge' work properly.

When the detailed design was being done, the structural engineer decided that, because of a big cost difference between timber piles & concrete piles, driven timber piles would be adequate to support the pool. Subsequently the owner and the builder accepted the structural engineer's recommendation and the pool was constructed on the timber piles without further reference to the geotechnical engineer.

However, the structural engineer's advice was flawed; the structural engineer did not realise that the nature of the fill and surficial soil over the site bedrock meant that the timber piles could not be driven into the bedrock, rather the timber piles would 'refuse' on a clayey gravel layer above the bedrock – which in fact they did.

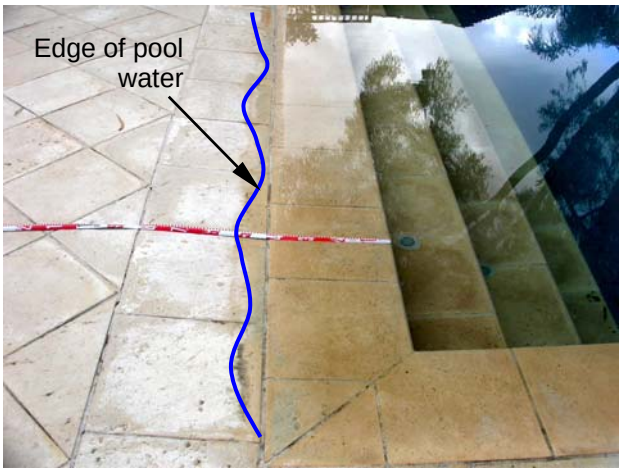

Figure 4.3.3: Water level of the pool now flows over the steps.

Figure 4.3.4: Timber was substituted for concrete piles and then founded on a conglomeritic material.

Thus, when the rains came, the pool settled differentially and moved a small amount downslope, with resultant damage and client aggravation.

As a consequence, litigation was instituted and the structural engineer was found negligent.

No charges were ever laid against the geotechnical engineer.

I also note that whilst I was asked to advise on possible negligence by the geotechnical engineer, there would have been problems in suing the geotechnical engineer because after being in business for about 5 years, he closed his practice and left the country.

4.4 Taking over the Project Geotechnical Risks

Another pitfall is to wittingly or unwittingly 'take over' the project geotechnical risk. Engineers often do this by 'limiting' the scope of the geotechnical advice required because their clients are often reluctant to pay for geotechnical advice, because:

1. They perceive it to be 'costly'.
2. Geotechnical reports require funding at a time when there is not much money available [viz: usually no bank finance in place] to fund the project.

As a result, many structural and civil engineers are pressured into limiting the scope of geotechnical advice to be provided. So, rather than asking the geotechnical consultant for a proposal of what the consultant thinks is necessary, the engineer in fact tells the consultant what he needs to do.

An even worse situation is where the structural / civil engineer:

- discusses the brief with the consultant, what the project involves and the work needed;
- obtains a proposal to carry out the necessary work.

and then responds to the geotechnical consultant with words to the effect:

> *"The Client wont wear this, this is too costly. Can you give me a cheaper price?"*

As a result, the geotechnical consultant will respond with a cheaper, more limited advice, which is then proceeded with.

The inherent pitfall in this approach is that the structural & civil engineer has taken on the project geotechnical risk. The engineer has in fact, limited the scope of work that the geotechnical engineer needs to do, and restricted his advice to those things that you have specifically asked him to do.

As such, the consultant may not discover some important site geotechnical feature, that may have a large impact on the project design, because there was no money in the budget to fully explore the site conditions.

The consultant will also usually write a limitation clause into their advice and when it goes wrong, you are stuck with the problem as you specifically limited his advice.

4.4.1 Apollo Bay

As some might think that this cannot really happen, I'd like you to look at this large waste water treatment plant in the south of Victoria.

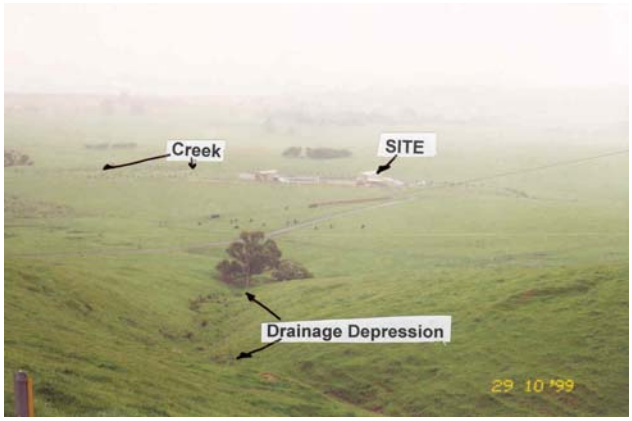

Figure 4.4.1.1: View of the local hillside area surrounding the treatment plant at Apollo Bay, Vic.

Figure 4.4.4.2: The completed treatment plant with additional remediation works.

Figure 4.4.1.3: The completed treatment plant.

At this site, a large waste water plant was proposed in an area which had significant slope stability, groundwater and reactive soil issues. The site had been investigated in a preliminary way by others, and a 'design & construct' plant was proposed.

The structural and civil engineer worked with the D&C team, and because the engineer thought that he was 'half a geo', provided initial advice [including some geotechnical advice] on the plant. Later when the detailed design was to be done, the engineer recognised the need to engage a geotechnical consultant and recommended the engagement of one.

However, in recommending the engagement of the geotechnical consultant, the engineer:

1. Limited the advice to be provided by the geotechnical consultant to what he described as 'earthworks'.
2. Did not recommend to his Client that the geotechnical engineer be engaged to advise fully on the matter, including slope stability issues.
3. Told the geotechnical engineer to limit his work to backhoe pits, after the geotechnical consultant had told him that he thought it was necessary to carry out drilling, laboratory testing and calculations on slope stability.

Thus, when the project all went wrong and serious stability & drainage issues emerged [which are apparent in these photos]:

Figure 4.4.1.4: Batter failure during construction.

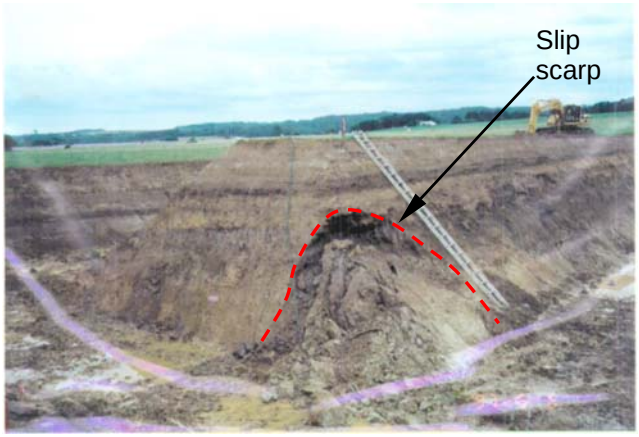

Figure 4.4.1.5: Batter failure during construction.

a) It was not possible to remedy the basic design.

b) The geotechnical engineer said his limited geotechnical advice on earthworks was correct and the slumps were not his fault as he had been restrained from advising on the slope stability issues.

Thus the main reason for the site's problems was that structural and civil engineer made the important decisions on what should be done at the site [viz: the foundations, slope angles, etc.], without reference to the geotechnical consultant. The engineer then made it even worse by advising on the initial slope failures without reference to the geotechnical consultant. It was also only after the matter became very serious that the engineer asked the geotechnical consultant for advice on how to rectify and overcome the site's problems.

The matter underwent extensive litigation, involved many parties and was finally only resolved in the Victorian Supreme Court earlier this year. In effect, the project manager and the structural engineer bore nearly all of the blame and only a small part of the blame was borne by the geotechnical consultant.

4.4.2 Beecroft

Another example of this 'taking over of the geotechnical risk' was a recent excavation collapse at Beecroft.

At this site there was an extensive geotechnical report and advice on the excavation for the original developer who obtained development consent for the project. The project was then 'flicked on' to the group who actually built the project, together with the geotechnical report. The geotechnical report had also recommended extensive geotechnical inspections and advice during the construction.

After the project was sold on, a structural engineer was asked to design and supervise the construction, which he did without reference to the geotechnical engineer.

And because of his lack of knowledge in the behaviour of the Sydney Shales, a major failure occurred with its attendant litigation and insurance claims.

Figure 4.4.2.1: Excavation failure at Beecroft.

Figure 4.4.2.2: Excavation failure at Beecroft.

4.5 Ambiguities in Geotechnical Reports

Another pitfall that you may not have thought about, is the 'ambiguities' in geotechnical reports.

In this regard, and whilst my company likes to write very 'specific' & 'definitive' reports, not all consultants share this view. In fact, some geotechnical consultants have become so practised in writing reports that can mean all things to all people, you can read into them almost whatever you like.

As a result, when you claim that their advice was wrong, they say you just misread their report!!!

Some consultants also write their reports in this way as a 'risk minimisation' policy.

Have a look at these examples; I, for one, do not know what any of them really mean; although I suppose you could guess what some of them may mean.

> *"Relatively straightforward conditions are anticipated";*
>
> *"As an* alternative *to anchoring support or internal propping…or contiguous pile wall, batter support and progressive excavation* should *be* considered*";*
>
> *"The types of retaining structures suited to the site are effectively limitless… with wall materials also seemingly unrestricted"*;
>
> *"…the rate of retreat obviously differs over time for any given place and the coastline that affects the subject land has been studied to explain its present shape and to predict its future";*
>
> *"Nonetheless, such recession is not expected to affect the in-situ strata that will support the proposed improvements for a long time yet";*
>
> *"…it is anticipated that foundation design will be relatively straightforward, and therefore, high level pad or strip footings would provide a suitable foundation system".*

As such, if you are unsure or do not understand what the words mean, or if you think the words are ambiguous, get a clarification, and insist on the report being clear to you before you accept it.

4.6 Not involving the geotechnical consultant in the design and construction process

Another pitfall is not asking the geotechnical consultant to carry out the necessary site inspections and construction review of geotechnical items. Whilst this is not usually very prevalent on large projects, it is a very serious concern on residential & other small projects.

In this regard, you should read carefully the various notes attached to the typical geotechnical report as these notes usually include statements that strongly advise on the need for construction review by geotechnical persons. Some of these notes also point out the limitations on the geotechnical advice. The following are examples:

> Coffey:
>
> *"Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary"*
>
> Douglas Partners:
>
> *"Geotechnical reports … must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely."*
>
> Jeffery & Katauskas:
>
> *"This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context, or for any other purpose."*
>
> Shirley Consulting Engineers:
>
> *"Subsurface conditions, including groundwater levels and soil parameters, can change over time and consequently this possibility of change should be borne in mind if the report is used after a protracted delay."*

These clauses are usually included in a report to explain to you that the advice given is limited and that there are specific constraints on the advice. The notes are also intended to explain many items that are not explained in the main report text.

Also, if you do not follow the geotechnical consultant's advice and something goes wrong, then I assure you that you will be the loser in the end, just like the engineers at Beecroft and Apollo Bay were.

5. RISK ISSUES

We now turn to questions of risk. In essence, the chief risks that arise concern:

1. Geotechnical report 'limitation' clauses.
2. Structural / civil engineers checking items that are strictly geotechnical.
3. Commercial issues & corporate structure of the geotechnical consultant.

These are discussed as follows:

5.1 Geotechnical Limitation Clauses

It is almost standard practice now for geotechnical consultants to write various limitation clauses which are **either**:

- provided at the end of the report text; **or**
- attached to the report by way of a series of standard forms and printouts.

  Note: These 'limitation clauses' are sometimes entitled:

  "important information about your geotechnical report"

Typically, these limitation clauses have been used to great effect by geotechnical consultants to escape, or at least minimise their liability in a particular situation.

In effect, the limitation clauses will say:

1. As the amount of work was limited by Client instruction, it could be wrong. Thus, if the advice is wrong, it is all the Client's fault, not the consultant's.
2. If you find something different at the site, it is not the consultant's fault, as the Client limited the work.
3. If the advice provided is incorrect, then its not the consultant's fault because you gave the consultant the wrong or incomplete information.
4. It the geotechnical consultant does not inspect the site during the construction, then they cannot accept any liability for mistakes by others about items such as the footing foundation strata.

It is thus important for you to carefully read the geotechnical limitation clauses in any report you receive; if you disagree with them, then question the clauses with the report author and ask for them to be struck out if you think they are inappropriate.

If you think they are inappropriate, do not accept the report.

5.2 Checking Items that are Strictly 'Geotechnical'

Another risk issue for structural and civil engineers is checking of items that are strictly within the skill area of geotechnical persons. One of the biggest areas where this conflict arises is in the checking of the foundation strata for footings on building sites.

The problem for many engineers is that as soon as they check the foundation strata, they become classified as a geotechnical engineer and judged by that standard, rather than being judged by the standard of a civil & structural engineer.

A recent example of this was a house in the Thornleigh area where there was a significant claim against a structural engineer as a result of house damage.

Look at these photos.

Figure 5.2.1: House in West Pennant Hills.

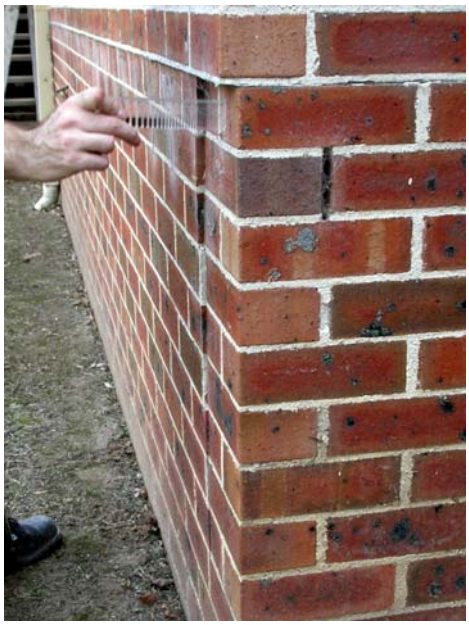

Figure 5.2.2: Horizontal separation of brickwork.

Figure 5.2.3: Horizontal separation of brickwork.

In this case, the house suffered considerable damage as a result of complex shrink / swell soil behaviour [not brick growth as some may think from the above photos], not related to the engineer's checking of the external footings. However, the engineer was sued in negligence because he had:

1. Checked the footings for a particular house.
2. Classified the footings as bearing on 'Class M' clay.
3. Acted as a geotechnical engineer by effectively classifying the site as Class M in accordance with AS 2870.

And although the legal and engineering defence team was able to minimise the financial harm to the engineer, the engineer suffered considerably over several years and lost a great deal of money & time.

5.3 Commercial Issues

The final two risks relate to the commercial practice / corporate structure of many geotechnical consultants. These risks are:

1. Changes in Corporate Structure.
2. Professional Indemnity [PI] Issues.

5.3.1 Changes in Corporate Structure

As you may well appreciate, some geotechnical companies have gone through a variety of names and corporate structures over the years, despite being large and well recognised across Australia.

One organisation has to my knowledge had at least four legal entities over the past 15 years or so; thus, whilst the public perception of the organisation is of a 'long established' large corporation, it has in fact traded under a variety of legal entities, ownerships and shareholding.

As such, the Corporations Law in Australia will prevent the corporation that gave the advice in say 1990, as now being responsible for the corporation that is providing the advice today.

As a consequence, a structural engineer who has successfully operated as a sole trader for over 30 years, can suddenly find themselves bearing the brunt of a legal action, even if the claim is a result of faulty geotechnical advice.

They face this action, not because there was any wrong doing by the structural engineer, but because the geotechnical consultant is not able to be sued because of its changes in its corporate structure.

5.3.2 PI Insurance Issues

Another issue to concern yourself with, is not checking the PI insurance arrangements of the geotechnical consultant. In this regard, you should note that:

1. Most PI policies require that all subcontractors, sub-consultants, or associated professional persons be covered by the requisite PI insurance.
2. Some geotechnical companies rapidly 'use up', or 'blow' their PI cover during a year, and leave no insurance cover for a claim late in the year.
3. Some geotechnical companies have large excesses, or unusual wording in their policies which can exclude liability to other engineers.
4. Some PI policies do not cover a geotechnical consultant against 'geotechnical engineering' work such as underpinning, excavations and the like.
5. Some PI policies are written to cover against specific engineering fields [e.g. mining] although the consultant is working in the civil and geotechnical field which is not covered by the PI insurance.

As such, it is always prudent for you to be provided with a 'certificate of currency' at the time of engaging the geotechnical consultant, for if you don't, when a claim comes along you could end up paying the bill.

6. RISK MANAGEMENT CHECKLIST

As part of this presentation, a risk management checklist has been included. I will now refer to this list and discuss some of the items. The list has three main headings and we will now discuss them in turn.

1. Client Considerations *Prior* To Engagement.
2. Client / Consultant Relations – The Project Team.
3. Commercial Considerations.
4. The Report.

I would also note that this checklist is designed to cover only my view of the principle areas of consultant selection & qualifications; the checklist should not be regarded as exhaustive and perhaps you might like to modify it to suit your own particular needs.

7. CONCLUSION

In conclusion, I would note that my experience in litigation [and with engineers on both sides of the fence] indicates the most usual pitfalls that the structural and civil engineers fall into are:

1. A failure to recognise & use the geotechnical engineer as an important member of the team.
2. Selecting the geotechnical consultant on a wrong basis [viz: lowest 'price' / wrong qualifications].
3. Thinking that they are 'half a geo', experienced in geotechnical matters and free to usurp the geotechnical engineer's role.

So if engineers avoid these prime pitfalls, they will minimise their professional risk; however, if engineers do not avoid these pitfalls, they will most probably be involved in protracted litigation, at great cost to themselves.

Also, if you, as the structural engineer or civil engineer, see the geotechnical engineer as a team player, then the optimum result for yourself and your client is the most likely outcome.

If however, you see a geotechnical consultant as another 'subcontractor' from whom you buy a product, then you run the risk of having a very rough ride and potentially lose a lot of money and reputation.