Your Ref:
Our Ref: 1800204JD

RECEIVED
27 MAR 2017

23 March 2018

Mr John Dietz
Chief Executive Officer
Land Development Agency
GPO Box 158
CANBERRA ACT 2601

COLLAERY
— LAW —

Dear Mr Dietz

[redacted] breach of contract and misrepresentation Claim against the Suburban Land Agency in relation to Block 7 Section 12 Throsby

We act on behalf of [redacted]

We are writing to notify you that our clients have a claim against the Suburban Land Agency for breach of contract and misrepresentation by the Land Development Agency ("the LDA") in relation to their purchase of Block 7 Section 12 Throsby ("the Site"). This claim may be brought against the Suburban Land Agency as successor to the LDA pursuant to *Financial Management (Land Development Agency Transfer to Suburban Land Agency) Declaration 2017* (NI2017–343).

We strongly suggest that you forward this letter to your insurer and/or legal representatives immediately. As our clients' claim includes a claim for breach of contract we have sent a copy of this letter to Clayton Utz.

Particulars of our clients' claim are as follows:

Breach of contract

1. By a contract made in writing dated 30 April 2017 entered into between [redacted] and the LDA, [redacted] agreed to buy and the LDA agreed to sell the Site.

2. Annexure D of the Contract contained a Site Classification Report Summary for the Site. The Site Classification Report Summary stated that the soil was "Class S (slightly reactive)". A copy of the Site Classification Report Summary is attached.

3. Following exchange of the sales contract, [redacted] engaged an architect to design a two-storey family home on the Site and the building designs were drafted in reliance of the Class "S" soil classification that was contained in the Site Classification Report Summary.

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4. Contrary to the Site Classification Report Summary, the classification of soil on the Site is not Class "S".

5. An area of about 12 metres by 15 metres in the western corner of the block comprises uncontrolled fill and loose/shattered bedrock. The foundation materials would have an allowable bearing pressure of less than 100kPa required by AS2870. Therefore, the Site must be designated as Class "P".

Misrepresentation

6. At all material times the LDA contracted Luton Properties to market the Site for auction on 20 April 2017.

7. Prior to the auction date, by email dated 26 April 2017 an agent, officer or employee of Luton Properties, [redacted] forwarded [redacted] various documents relating to the Site. In the body of the email [redacted] requested that [redacted] "read this email and the attachments and the hyperlinks below".

8. One of the hyperlinks directed [redacted] to the LDA website, the address of which is http://suburbanland.act.gov.au/throsby/site-classifications. This website contained a Site Classification Report Summary.

9. As noted in paragraph 2, a copy of the Site Classification Report Summary was also contained in Annexure D of the contract.

10. At the time that the LDA published the Site Classification Report Summary, the LDA was aware, or ought to have been aware that:

    a. [redacted] would trust the LDA's special competence and position to be able to provide accurate information and advice in relation to the soil classification for the Site;

    b. It would be reasonable for [redacted] to accept and rely upon the information and advice that was contained in the Site Classification Report Summary; and

    c. It was reasonably foreseeable that [redacted] would be likely to suffer loss or damage or detriment should the Site Classification Report Summary be incorrect or be made without reasonable grounds.

11. In the premises stated above, the LDA was under a duty of care to ensure that it exercised reasonable care and skill in giving the information or advice that was contained in the Site Classification Report Summary.

12. In publishing the Site Classification Report Summary on its website, annexing the Site Classification Report Summary to the contract and arranging Luton Properties to ensure that potential buyers, including [redacted] reviewed the Site Classification Report Summary, the LDA was in breach of its duty of care in that it failed to exercise reasonable care and skill in ensuring that the Site Classification Report Summary was correct.

13. In reliance of the Site Classification Report Summary, [redacted] were induced to purchase the Site at the auction on 30 April 2017.

Damages

14. [redacted] will suffer damage as a result of the breach of contract and misrepresentation regarding the soil classification in the Site Classification Report Summary.

15. The uncontrolled fill and loose/shattered bedrock materials in the western corner of the block are unsuitable as a foundation for construction, resulting in the construction of any building on the land being more extensive and expensive than would be the case if the soil was Class "S". Details of costs that have been identified at the time of writing are outlined in the following table. These costs are approximations only.

Cost type	Description	Cost of additional work ($)_	Cost of work if the Site was Class "S" ($)	Difference/ amount claimed ($)
Geotech	As a minimum, inspections would be required for • approval that all unsuitable material has been removed • approval of material for use as compacted fill • two inspections of fill placement • two inspections of the drilling of the bored pier footing excavations. Total: 1,620 + GST. The follow-up certification report would take 3 hours, for a total of 690 + GST.	2,541		2,541
Engineer	3 x inspections.	660		660
Excavator	Complete site cut + removal of unsuitable material/fill.	32,260		32,260
	Drilling of the bored pier footing, rear footings (now 900mm+) fill placement and site cut final.	32,324	28,000	4,324
Block work	Supply and install of block work instead of dincel (due to incorrect soil classification) Initial costs were based on dincel all round.	56,995	20,000	36,995
Concreting	Supply and install of core foundation plus 2m CTS piers - rear/sides of house (due to incorrect soil classification)	TBC	25,625	TBC

Pool	Unable to install fibreglass pool shell as planned due to incorrect soil classification. Engineer advising that pool must now be made of concrete to hold structurally. Initial costs were limited to fibreglass pool shell supply and install.	79,850	30,000	49,850
Total of approximate known costs to date				**126,630**

16. Further particulars of the costs of pier construction, materials, labour and works associated with making the foundation suitable for construction will be supplied in due course.

17. In addition, [redacted] will seek reimbursement of their legal costs and disbursements, full details of which will be supplied.

In support of our clients' claim, we attach a report prepared by ACT Geotechnical Engineers Pty Ltd dated 26 February 2018 which confirms that the soil classification on the Site is Class "P".

Our clients are incurring fees and expenses for each day that their construction on the Site is delayed. For this reason, we request that you confirm within 7 days whether you admit liability in relation to the breach of contract and misrepresentations regarding the soil classification.

We understand that on 23 February 2018 a geotechnical officer from Douglas Partners visited the Site to assess the extent of the shattered bedrock. That officer will be able to assist you in verifying that the soil on the Site is in fact Class "P" so that you may provide a response within this timeframe. Should you need to conduct further tests on the Site we trust that you will be able to arrange for them to be carried out within this timeframe.

Finally, we request that you provide a copy of any Geotech reports or advice in your possession, custody and control in relation to the Site, including any reports that were prepared after 23 February 2018.

Unless we receive a response from you within 7 days we will have no choice but to take instructions from our clients to commence legal proceedings against the LDA. We hope that this will not be necessary.

Yours sincerely
Collaery Lawyers

[redacted]

cc. Clayton Utz, GPO Box 9806, Canberra City ACT 2601

Encl.
- Site Classification Report Summary
- ACT Geotechnical Engineers report dated 26 February 2018

SITE CLASSIFICATION REPORT SUMMARY

BLOCK:	7	**SECTION:**	12	**SUBURB:**	Throsby
JOB No:	77374.09			**DATE:**	January 2017
CLIENT:	Calibre Consulting (ACT) Pty Ltd				

CLASSIFICATION PROCEDURES:

EXISTING SUBSURFACE CONDITIONS:

Test Pit 36: Located on the boundary of Blocks 7 & 8 Section 12. Dry to moist topsoil filling with rootlets to 0.1 m depth, overlying medium strength, highly weathered dacite to the slow progress depth of 0.4 m.

Test Pit 43: Located on the boundary of Blocks 14 & 15 Section 12. Dry to moist topsoil filling with rootlets to 0.15 m depth overlying high strength, slightly weathered dacite to the refusal depth of 0.4 m.

SITE CLASSIFICATION: **Class S (slightly reactive)** based on limited subsurface information and determined in general accordance with the requirements of AS2870-2011 (Ref 1). If the building pad is founded entirely on weathered rock, a Class A classification may be appropriate. Therefore the classification must be reassessed should the soil profile change either by adding fill or removing soil from the block and/or if the presence of service trenches or retaining walls are within the zone of influence of the block. Reference should be made to the comments provided below.

FOOTING SYSTEMS: Reference must be made to AS2870-2011 (Ref 1) which indicates footing systems that are appropriate for each site classification. All footings must found within a uniform bearing stratum of suitable strength/material, below the zone of influence of any service trenches, backfill zones, retaining walls or underground structures. Masonry walls should be articulated in accordance with current best practice. Footing systems must be confirmed by a structural engineer taking into consideration any onsite or offsite constraints.

MAINTENANCE GUIDELINES: CSIRO Sheet BTF 18 'Foundation Maintenance & Footing Performance' (attached). Refer to comments about gardens, landscaping and trees on the performance of foundation soils.

COMMENTS/ LIMITATIONS:

The successful purchaser must make their own interpretations, deductions and conclusions from the information made available and will need to accept full responsibility for such interpretations, deductions and conclusions.

Development specific geotechnical investigations must be undertaken.

Additional topsoils / filling may have been spread subsequent to the investigation.

Site preparation prior to the construction should include removal of all vegetation, topsoil and any uncontrolled filling.

All new filling must be placed under controlled conditions (AS 3798-2007).

Some variability in subsurface conditions must be anticipated.

Moisture condition of site soils and/or the presence of groundwater may vary considerably from time of investigation compared to at the time of construction.

Hard rock excavation must be anticipated.

It is recommended that footing excavations be inspected by a geotechnical engineer.

This report must be read in conjunction with the attached notes "About this Inspection Report".

REFERENCES:

1. AS 2870-2011 '*Residential Slabs and Footings*,' Standards Association of Australia.

About this Inspection Report

Introduction

These notes are provided to amplify DP's inspection report in regard to the limitations of carrying out inspection work. Not all notes are necessarily relevant to this report.

Standards

This inspection report has been prepared by qualified personnel to current engineering standards of interpretation and analysis.

Copyright and Limits of Use

This inspection report is the property of DP and is provided for the exclusive use of the client for the specific project and purpose as described in the report. It should not be used by a third party for any purpose other than to confirm that the construction works addressed in the report have been inspected as described. Use of the inspection report is limited in accordance with the Conditions of Engagement for the commission.

DP does not undertake to guarantee the works of the contractors or relieve them of their responsibility to produce a completed product conforming to the design.

Reports

This inspection report may include advice or opinion that is based on engineering and/or geological interpretation, information provided by the client or the client's agent, and information gained from:

- an investigation report for the project (if available to DP);
- inspection of the work, exposed ground conditions, excavation spoil and performance of excavating equipment while DP was on site;
- investigation and testing that was carried out during the site inspection;
- anecdotal information provided by authoritative site personnel; and
- DP's experience and knowledge of local geology.

Such information may be limited by the frequency of any inspection or testing that was able to be practically carried out, including possible site or cost constraints imposed by the client/ contractor(s). For these reasons, the reliability of this inspection report is limited by the scope of information on which it relies.

Every care is taken with the inspection report as it relates to interpretation of subsurface conditions and any recommendations or suggestions for construction or design. However, DP cannot anticipate or assume responsibility for:

- unexpected variations in subsurface conditions that are not evident from the inspection; and
- the actions of contractors responding to commercial pressures.

Should these issues occur, then additional advice should be sought from DP and, if required, amendments made.

This inspection report must be read in conjunction with any attached information. This inspection report should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions from review by others of this inspection report or test data, which are not otherwise supported by an expressed statement, interpretation, outcome or conclusion stated in this inspection report.

Foundation Maintenance and Footing Performance:
A Homeowner's Guide

CSIRO

BTF 18 replaces Information Sheet 10/91

Buildings can and often do move. This movement can be up, down, lateral or rotational. The fundamental cause of movement in buildings can usually be related to one or more problems in the foundation soil. It is important for the homeowner to identify the soil type in order to ascertain the measures that should be put in place in order to ensure that problems in the foundation soil can be prevented, thus protecting against building movement.

This Building Technology File is designed to identify causes of soil-related building movement, and to suggest methods of prevention of resultant cracking in buildings.

Soil Types

The types of soils usually present under the topsoil in land zoned for residential buildings can be split into two approximate groups – granular and clay. Quite often, foundation soil is a mixture of both types. The general problems associated with soils having granular content are usually caused by erosion. Clay soils are subject to saturation and swell/shrink problems.

Classifications for a given area can generally be obtained by application to the local authority, but these are sometimes unreliable and if there is doubt, a geotechnical report should be commissioned. As most buildings suffering movement problems are founded on clay soils, there is an emphasis on classification of soils according to the amount of swell and shrinkage they experience with variations of water content. The table below is Table 2.1 from AS 2870, the Residential Slab and Footing Code.

Causes of Movement

Settlement due to construction

There are two types of settlement that occur as a result of construction:

- Immediate settlement occurs when a building is first placed on its foundation soil, as a result of compaction of the soil under the weight of the structure. The cohesive quality of clay soil mitigates against this, but granular (particularly sandy) soil is susceptible.
- Consolidation settlement is a feature of clay soil and may take place because of the expulsion of moisture from the soil or because of the soil's lack of resistance to local compressive or shear stresses. This will usually take place during the first few months after construction, but has been known to take many years in exceptional cases.

These problems are the province of the builder and should be taken into consideration as part of the preparation of the site for construction. Building Technology File 19 (BTF 19) deals with these problems.

Erosion

All soils are prone to erosion, but sandy soil is particularly susceptible to being washed away. Even clay with a sand component of say 10% or more can suffer from erosion.

Saturation

This is particularly a problem in clay soils. Saturation creates a bog-like suspension of the soil that causes it to lose virtually all of its bearing capacity. To a lesser degree, sand is affected by saturation because saturated sand may undergo a reduction in volume – particularly imported sand fill for bedding and blinding layers. However, this usually occurs as immediate settlement and should normally be the province of the builder.

Seasonal swelling and shrinkage of soil

All clays react to the presence of water by slowly absorbing it, making the soil increase in volume (see table below). The degree of increase varies considerably between different clays, as does the degree of decrease during the subsequent drying out caused by fair weather periods. Because of the low absorption and expulsion rate, this phenomenon will not usually be noticeable unless there are prolonged rainy or dry periods, usually of weeks or months, depending on the land and soil characteristics.

The swelling of soil creates an upward force on the footings of the building, and shrinkage creates subsidence that takes away the support needed by the footing to retain equilibrium.

Shear failure

This phenomenon occurs when the foundation soil does not have sufficient strength to support the weight of the footing. There are two major post-construction causes:

- Significant load increase.
- Reduction of lateral support of the soil under the footing due to erosion or excavation.
- In clay soil, shear failure can be caused by saturation of the soil adjacent to or under the footing.

GENERAL DEFINITIONS OF SITE CLASSES

Class	Foundation
A	Most sand and rock sites with little or no ground movement from moisture changes
S	Slightly reactive clay sites with only slight ground movement from moisture changes
M	Moderately reactive clay or silt sites, which can experience moderate ground movement from moisture changes
H	Highly reactive clay sites, which can experience high ground movement from moisture changes
E	Extremely reactive sites, which can experience extreme ground movement from moisture changes
A to P	Filled sites
P	Sites which include soft soils, such as soft clay or silt or loose sands; landslip; mine subsidence; collapsing soils; soils subject to erosion; reactive sites subject to abnormal moisture conditions or sites which cannot be classified otherwise

Tree root growth
Trees and shrubs that are allowed to grow in the vicinity of footings can cause foundation soil movement in two ways:

- Roots that grow under footings may increase in cross-sectional size, exerting upward pressure on footings.
- Roots in the vicinity of footings will absorb much of the moisture in the foundation soil, causing shrinkage or subsidence.

Unevenness of Movement

The types of ground movement described above usually occur unevenly throughout the building's foundation soil. Settlement due to construction tends to be uneven because of:

- Differing compaction of foundation soil prior to construction.
- Differing moisture content of foundation soil prior to construction.

Movement due to non-construction causes is usually more uneven still. Erosion can undermine a footing that traverses the flow or can create the conditions for shear failure by eroding soil adjacent to a footing that runs in the same direction as the flow.

Saturation of clay foundation soil may occur where subfloor walls create a dam that makes water pond. It can also occur wherever there is a source of water near footings in clay soil. This leads to a severe reduction in the strength of the soil which may create local shear failure.

Seasonal swelling and shrinkage of clay soil affects the perimeter of the building first, then gradually spreads to the interior. The swelling process will usually begin at the uphill extreme of the building, or on the weather side where the land is flat. Swelling gradually reaches the interior soil as absorption continues. Shrinkage usually begins where the sun's heat is greatest.

Effects of Uneven Soil Movement on Structures

Erosion and saturation
Erosion removes the support from under footings, tending to create subsidence of the part of the structure under which it occurs. Brickwork walls will resist the stress created by this removal of support by bridging the gap or cantilevering until the bricks or the mortar bedding fail. Older masonry has little resistance. Evidence of failure varies according to circumstances and symptoms may include:

- Step cracking in the mortar beds in the body of the wall or above/below openings such as doors or windows.
- Vertical cracking in the bricks (usually but not necessarily in line with the vertical beds or perpends).

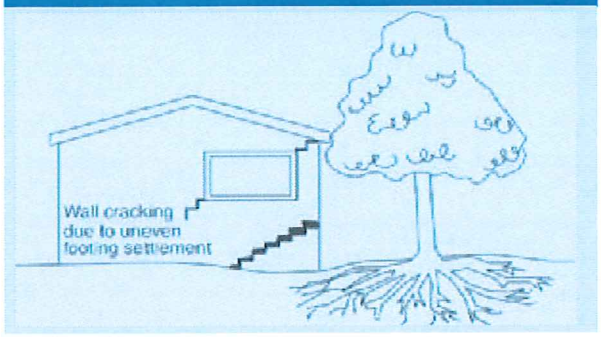
Isolated piers affected by erosion or saturation of foundations will eventually lose contact with the bearers they support and may tilt or fall over. The floors that have lost this support will become bouncy, sometimes rattling ornaments etc.

Seasonal swelling/shrinkage in clay
Swelling foundation soil due to rainy periods first lifts the most exposed extremities of the footing system, then the remainder of the perimeter footings while gradually permeating inside the building footprint to lift internal footings. This swelling first tends to create a dish effect, because the external footings are pushed higher than the internal ones.

The first noticeable symptom may be that the floor appears slightly dished. This is often accompanied by some doors binding on the floor or the door head, together with some cracking of cornice mitres. In buildings with timber flooring supported by bearers and joists, the floor can be bouncy. Externally there may be visible dishing of the hip or ridge lines.

As the moisture absorption process completes its journey to the innermost areas of the building, the internal footings will rise. If the spread of moisture is roughly even, it may be that the symptoms will temporarily disappear, but it is more likely that swelling will be uneven, creating a difference rather than a disappearance in symptoms. In buildings with timber flooring supported by bearers and joists, the isolated piers will rise more easily than the strip footings or piers under walls, creating noticeable doming of flooring.

Trees can cause shrinkage and damage



As the weather pattern changes and the soil begins to dry out, the external footings will be first affected, beginning with the locations where the sun's effect is strongest. This has the effect of lowering the external footings. The doming is accentuated and cracking reduces or disappears where it occurred because of dishing, but other cracks open up. The roof lines may become convex.

Doming and dishing are also affected by weather in other ways. In areas where warm, wet summers and cooler dry winters prevail, water migration tends to be toward the interior and doming will be accentuated, whereas where summers are dry and winters are cold and wet, migration tends to be toward the exterior and the underlying propensity is toward dishing.

Movement caused by tree roots
In general, growing roots will exert an upward pressure on footings, whereas soil subject to drying because of tree or shrub roots will tend to remove support from under footings by inducing shrinkage.

Complications caused by the structure itself
Most forces that the soil causes to be exerted on structures are vertical – i.e. either up or down. However, because these forces are seldom spread evenly around the footings, and because the building resists uneven movement because of its rigidity, forces are exerted from one part of the building to another. The net result of all these forces is usually rotational. This resultant force often complicates the diagnosis because the visible symptoms do not simply reflect the original cause. A common symptom is binding of doors on the vertical member of the frame.

Effects on full masonry structures
Brickwork will resist cracking where it can. It will attempt to span areas that lose support because of subsided foundations or raised points. It is therefore usual to see cracking at weak points, such as openings for windows or doors.

In the event of construction settlement, cracking will usually remain unchanged after the process of settlement has ceased.

With local shear or erosion, cracking will usually continue to develop until the original cause has been remedied, or until the subsidence has completely neutralised the affected portion of footing and the structure has stabilised on other footings that remain effective.

In the case of swell/shrink effects, the brickwork will in some cases return to its original position after completion of a cycle, however it is more likely that the rotational effect will not be exactly reversed, and it is also usual that brickwork will settle in its new position and will resist the forces trying to return it to its original position. This means that in a case where swelling takes place after construction and cracking occurs, the cracking is likely to at least partly remain after the shrink segment of the cycle is complete. Thus, each time the cycle is repeated, the likelihood is that the cracking will become wider until the sections of brickwork become virtually independent.

With repeated cycles, once the cracking is established, if there is no other complication, it is normal for the incidence of cracking to stabilise, as the building has the articulation it needs to cope with the problem. This is by no means always the case, however, and monitoring of cracks in walls and floors should always be treated seriously.

Upheaval caused by growth of tree roots under footings is not a simple vertical shear stress. There is a tendency for the root to also exert lateral forces that attempt to separate sections of brickwork after initial cracking has occurred.

The normal structural arrangement is that the inner leaf of brickwork in the external walls and at least some of the internal walls (depending on the roof type) comprise the load-bearing structure on which any upper floors, ceilings and the roof are supported. In these cases, it is internally visible cracking that should be the main focus of attention, however there are a few examples of dwellings whose external leaf of masonry plays some supporting role, so this should be checked if there is any doubt. In any case, externally visible cracking is important as a guide to stresses on the structure generally, and it should also be remembered that the external walls must be capable of supporting themselves.

Effects on framed structures
Timber or steel framed buildings are less likely to exhibit cracking due to swell/shrink than masonry buildings because of their flexibility. Also, the doming/dishing effects tend to be lower because of the lighter weight of walls. The main risks to framed buildings are encountered because of the isolated pier footings used under walls. Where erosion or saturation cause a footing to fall away, this can double the span which a wall must bridge. This additional stress can create cracking in wall linings, particularly where there is a weak point in the structure caused by a door or window opening. It is, however, unlikely that framed structures will be so stressed as to suffer serious damage without first exhibiting some or all of the above symptoms for a considerable period. The same warning period should apply in the case of upheaval. It should be noted, however, that where framed buildings are supported by strip footings there is only one leaf of brickwork and therefore the externally visible walls are the supporting structure for the building. In this case, the subfloor masonry walls can be expected to behave as full brickwork walls.

Effects on brick veneer structures
Because the load-bearing structure of a brick veneer building is the frame that makes up the interior leaf of the external walls plus perhaps the internal walls, depending on the type of roof, the building can be expected to behave as a framed structure, except that the external masonry will behave in a similar way to the external leaf of a full masonry structure.

Water Service and Drainage

Where a water service pipe, a sewer or stormwater drainage pipe is in the vicinity of a building, a water leak can cause erosion, swelling or saturation of susceptible soil. Even a minuscule leak can be enough to saturate a clay foundation. A leaking tap near a building can have the same effect. In addition, trenches containing pipes can become watercourses even though backfilled, particularly where broken rubble is used as fill. Water that runs along these trenches can be responsible for serious erosion, interstrata seepage into subfloor areas and saturation.

Pipe leakage and trench water flows also encourage tree and shrub roots to the source of water, complicating and exacerbating the problem.
Poor roof plumbing can result in large volumes of rainwater being concentrated in a small area of soil:

- Incorrect falls in roof guttering may result in overflows, as may gutters blocked with leaves etc.
- Corroded guttering or downpipes can spill water to ground.
- Downpipes not positively connected to a proper stormwater collection system will direct a concentration of water to soil that is directly adjacent to footings, sometimes causing large-scale problems such as erosion, saturation and migration of water under the building.

Seriousness of Cracking

In general, most cracking found in masonry walls is a cosmetic nuisance only and can be kept in repair or even ignored. The table below is a reproduction of Table C1 of AS 2870.

AS 2870 also publishes figures relating to cracking in concrete floors, however because wall cracking will usually reach the critical point significantly earlier than cracking in slabs, this table is not reproduced here.

Prevention/Cure

Plumbing
Where building movement is caused by water service, roof plumbing, sewer or stormwater failure, the remedy is to repair the problem. It is prudent, however, to consider also rerouting pipes away from the building where possible, and relocating taps to positions where any leakage will not direct water to the building vicinity. Even where gully traps are present, there is sometimes sufficient spill to create erosion or saturation, particularly in modern installations using smaller diameter PVC fixtures. Indeed, some gully traps are not situated directly under the taps that are installed to charge them, with the result that water from the tap may enter the backfilled trench that houses the sewer piping. If the trench has been poorly backfilled, the water will either pond or flow along the bottom of the trench. As these trenches usually run alongside the footings and can be at a similar depth, it is not hard to see how any water that is thus directed into a trench can easily affect the foundation's ability to support footings or even gain entry to the subfloor area.

Ground drainage
In all soils there is the capacity for water to travel on the surface and below it. Surface water flows can be established by inspection during and after heavy or prolonged rain. If necessary, a grated drain system connected to the stormwater collection system is usually an easy solution.

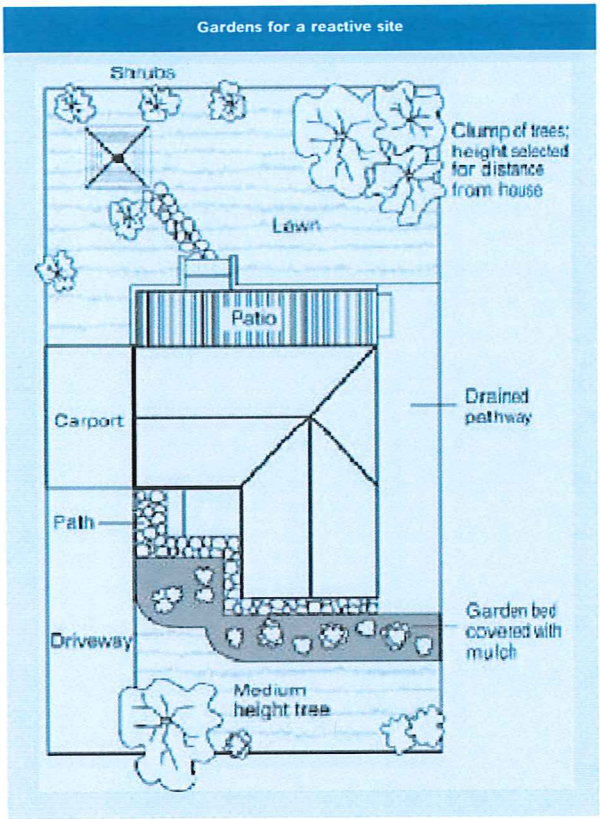
It is, however, sometimes necessary when attempting to prevent water migration that testing be carried out to establish watertable height and subsoil water flows. This subject is referred to in BTF 19 and may properly be regarded as an area for an expert consultant.

Protection of the building perimeter
It is essential to remember that the soil that affects footings extends well beyond the actual building line. Watering of garden plants, shrubs and trees causes some of the most serious water problems.

For this reason, particularly where problems exist or are likely to occur, it is recommended that an apron of paving be installed around as much of the building perimeter as necessary. This paving

CLASSIFICATION OF DAMAGE WITH REFERENCE TO WALLS

Description of typical damage and required repair	Approximate crack width limit (see Note 3)	Damage category
Hairline cracks	<0.1 mm	0
Fine cracks which do not need repair	<1 mm	1
Cracks noticeable but easily filled. Doors and windows stick slightly	<5 mm	2
Cracks can be repaired and possibly a small amount of wall will need to be replaced. Doors and windows stick. Service pipes can fracture. Weathertightness often impaired	5–15 mm (or a number of cracks 3 mm or more in one group)	3
Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Window and door frames distort. Walls lean or bulge noticeably, some loss of bearing in beams. Service pipes disrupted	15–25 mm but also depend on number of cracks	4



should extend outwards a minimum of 900 mm (more in highly reactive soil) and should have a minimum fall away from the building of 1:60. The finished paving should be no less than 100 mm below brick vent bases.

It is prudent to relocate drainage pipes away from this paving, if possible, to avoid complications from future leakage. If this is not practical, earthenware pipes should be replaced by PVC and backfilling should be of the same soil type as the surrounding soil and compacted to the same density.

Except in areas where freezing of water is an issue, it is wise to remove taps in the building area and relocate them well away from the building – preferably not uphill from it (see BTF 19).

It may be desirable to install a grated drain at the outside edge of the paving on the uphill side of the building. If subsoil drainage is needed this can be installed under the surface drain.

Condensation

In buildings with a subfloor void such as where bearers and joists support flooring, insufficient ventilation creates ideal conditions for condensation, particularly where there is little clearance between the floor and the ground. Condensation adds to the moisture already present in the subfloor and significantly slows the process of drying out. Installation of an adequate subfloor ventilation system, either natural or mechanical, is desirable.

Warning: Although this Building Technology File deals with cracking in buildings, it should be said that subfloor moisture can result in the development of other problems, notably:

- Water that is transmitted into masonry, metal or timber building elements causes damage and/or decay to those elements.
- High subfloor humidity and moisture content create an ideal environment for various pests, including termites and spiders.
- Where high moisture levels are transmitted to the flooring and walls, an increase in the dust mite count can ensue within the living areas. Dust mites, as well as dampness in general, can be a health hazard to inhabitants, particularly those who are abnormally susceptible to respiratory ailments.

The garden

The ideal vegetation layout is to have lawn or plants that require only light watering immediately adjacent to the drainage or paving edge, then more demanding plants, shrubs and trees spread out in that order.

Overwatering due to misuse of automatic watering systems is a common cause of saturation and water migration under footings. If it is necessary to use these systems, it is important to remove garden beds to a completely safe distance from buildings.

Existing trees

Where a tree is causing a problem of soil drying or there is the existence or threat of upheaval of footings, if the offending roots are subsidiary and their removal will not significantly damage the tree, they should be severed and a concrete or metal barrier placed vertically in the soil to prevent future root growth in the direction of the building. If it is not possible to remove the relevant roots without damage to the tree, an application to remove the tree should be made to the local authority. A prudent plan is to transplant likely offenders before they become a problem.

Information on trees, plants and shrubs

State departments overseeing agriculture can give information regarding root patterns, volume of water needed and safe distance from buildings of most species. Botanic gardens are also sources of information. For information on plant roots and drains, see Building Technology File 17.

Excavation

Excavation around footings must be properly engineered. Soil supporting footings can only be safely excavated at an angle that allows the soil under the footing to remain stable. This angle is called the angle of repose (or friction) and varies significantly between soil types and conditions. Removal of soil within the angle of repose will cause subsidence.

Remediation

Where erosion has occurred that has washed away soil adjacent to footings, soil of the same classification should be introduced and compacted to the same density. Where footings have been undermined, augmentation or other specialist work may be required. Remediation of footings and foundations is generally the realm of a specialist consultant.

Where isolated footings rise and fall because of swell/shrink effect, the homeowner may be tempted to alleviate floor bounce by filling the gap that has appeared between the bearer and the pier with blocking. The danger here is that when the next swell segment of the cycle occurs, the extra blocking will push the floor up into an accentuated dome and may also cause local shear failure in the soil. If it is necessary to use blocking, it should be by a pair of fine wedges and monitoring should be carried out fortnightly.

This BTF was prepared by John Lewer FAIB, MIAMA, Partner, Construction Diagnosis.

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26 February 2018
Our ref: JM/C9165

[redacted]

Attention: [redacted]

PROPOSED RESIDENCE - BLOCK 7, SECTION 12, THROSBY

GEOTECHNICAL ASSESSMENT OF FOUNDATION

1 Introduction

At the request of [redacted] ACT Geotechnical Engineers Pty Ltd are pleased to provide an assessment of the foundation of a proposed residence on Block 7, Section 12, in Throsby, ACT.

It is understood that the development comprises the construction of a two-storey residence, and requires excavation of up to 3m depth into the sloping site. The site cut is located on the rear, downhill (SW) half of the block, and had been mostly dug at the time that the assessment was carried out.

2 Background

Douglas Partners conducted a geotechnical site classification of the block in January 2017 (Job Number 77374.09). That report indicated that medium to high strength dacite bedrock was present below 0.1m/0.15m depth. Douglas Partners designated the block at Class "S" (slightly reactive) in accordance with AS2870 "Residential slabs and footings".

3 Subsurface Conditions

ACT Geotechnical Engineers conducted a site inspection on 26 February 2018. The inspection was conducted by [redacted] a senior geotechnical engineer, and was carried out during the site excavation works. At the time of inspection, the site excavation on the rear, downhill half of the site was over 50% completed. The excavation was between 1m and 2.8m deep, and exposed the following subsurface conditions:

Souther Corner & NE Half of the Block

0m - 0.2m	- TOPSOIL
0.2m - 1m	- HW/MW & MW DACITE BEDROCK

The cut in the southern corner and NE half of the block exposed medium strong dacite bedrock. This subsurface profile matches the conditions indicated in the Douglas Partners site classification report.

Western Corner of the Block

0m - 0.2m	- TOPSOIL
0.2m - 1m	- UNCONTROLLED FILL
0.2m/1m to >2.8m	- LOOSE/SHATTERED BEDROCK

The subsurface profile exposed on the western corner of the block was markedly different to the rest of the site, and does not match the conditions indicated in the Douglas Partners site classification report.

This area includes loose, shattered bedrock that extends to >2.8m depth. The loose and shattered nature of the bedrock appears to be from previous blasting activities in the area. It has been indicated that during the subdivision development works, some excavation works required the use of pre-blasting to break the rock up, prior to bulk excavation. The pre-blasting has shattered and loosened the bedrock to at least 2.8m depth below groundsurface level in this area of the site.

Calibre Group grading plans for the development of the Throsby 3 Residential Estate, show that the entire block to be in an area of cut. Despite this, there was uncontrolled fill exposed in some parts in the western corner. The uncontrolled fill is loose, and extends to a maximum of about 1m depth. A sewerage easement is present along the SW boundary of the site, and this uncontrolled fill could be part of the sewer trench backfill. Alternatively, it could be where over excavation occurred during estate development works, and the area backfilled back up to the design levels.

The affected area appears to be about 12m x 15m in the western corner of the block, as shown in the attached Figure 1. The attached photos show the uncontrolled fill and loose/shattered bedrock that was exposed during the site inspection on 26 February 2018.

4 Foundation Assessment & Site Classification

It is assessed that the uncontrolled fill and loose/shattered bedrock materials in the western corner of the block are unsuitable as a foundation for the proposed residence. These conditions were not indicated to the owners prior to purchase of the block, and were not indicated in the Douglas Partners site classification report. This will require a re-design of the footings for the proposed residence, and advice for footings is provided in Section 5.

These foundation materials in their present state would have an allowable bearing pressure of less than 100kPa required by AS2870. Therefore, the site must be designated as a Class "P" (problem) site.

5 Footing Advice

The uncontrolled fill and loose/shattered bedrock materials in the western corner of the block are unsuitable as a foundation for the proposed residence. Given that the majority of the residence will be founded on competent bedrock, it is recommended that all footings for the entire structure be founded on competent bedrock to preclude differential movement. Normally, this could be achieved in the western corner by constructing piers that extend through the unsuitable material, to be founded in competent bedrock below. However, it will be very difficult or impossible to construct piers through the shattered bedrock.

Therefore, this will require all uncontrolled fill and loose/shattered bedrock to be removed from below the foundation of the house. Finer material (clayey/sandy soils) must be imported to the site and placed as compacted fill back up to design foundation levels. Bored piers can then be drilled back through the new fill, to be founded in the competent bedrock below. The following procedure is recommended.

1 Strip off/remove all existing uncontrolled fill and loose/shattered to its full depth. The unsuitable material is expected to extend to at least 2.8m depth below existing groundsurface levels. The Geotechnical Engineer should supervise this process to ensure that all unsuitable material is removed from the foundation area, exposing only competent bedrock. This bouldery material is unsuitable for re-use as controlled fill, and should be disposed of.

2 A well-graded sandy/clayey material should be imported to site to be used as compacted fill. This should ideally be a sandy clay or clayey sand of low/medium plasticity, with no rock particles >60mm size. Suitable materials would classify as CL or SC in accordance with the USCS. The Geotechnical Engineer should inspect and approve this material prior to use.

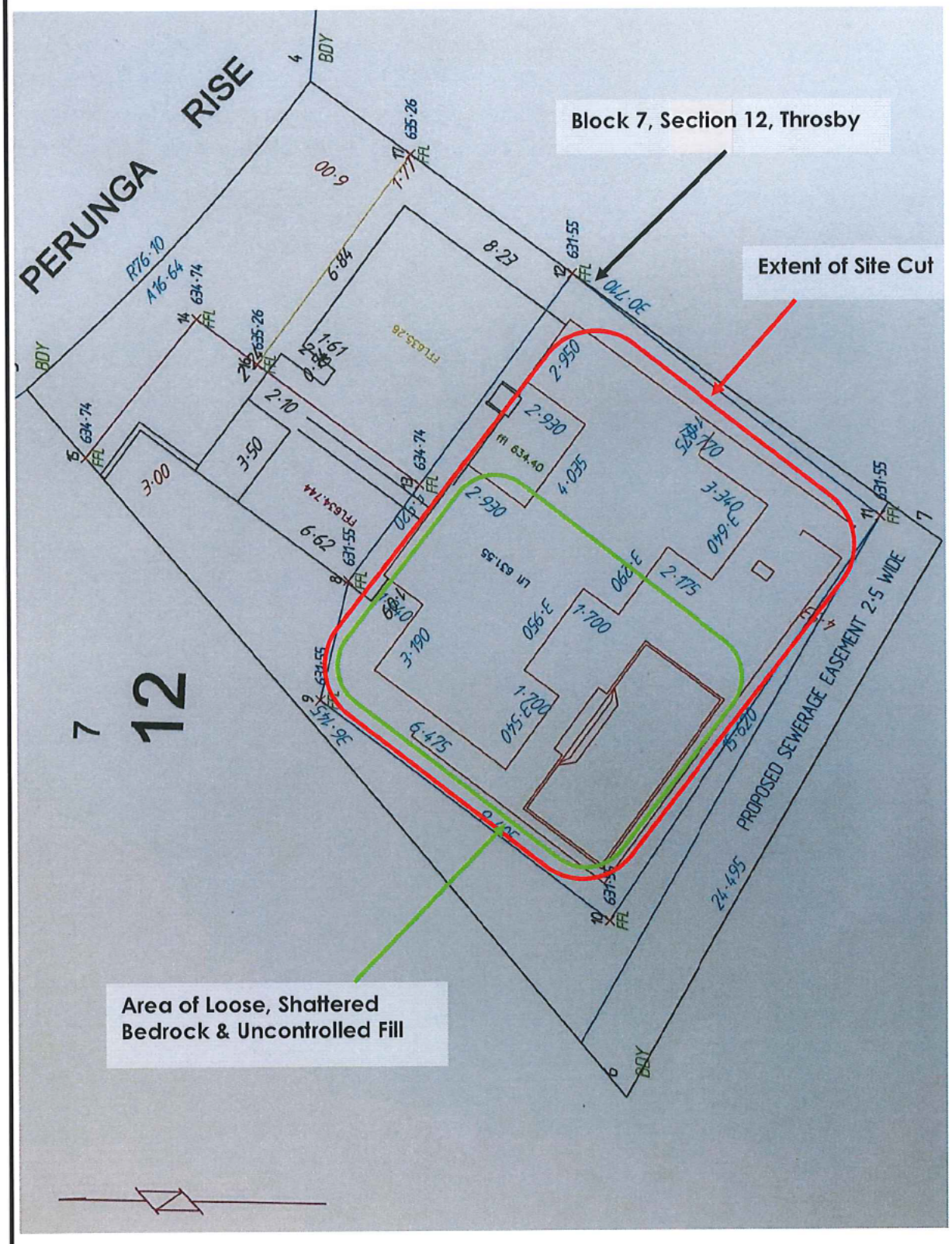
3 The imported fill should be placed in not thicker than 200mm layers and compacted to not less than 90%ModMDD. The fill placement should be supervised on a part-time basis be the Geotechnical Engineer.

4 Bored pier footings can then be drilled through the newly placed compacted fill, founded in competent bedrock. Pier footings founded in competent bedrock can be proportioned using an allowable bearing pressure of 2000kPa. Provided all footings are founded in competent bedrock, the footing system for the house (stiffened raft, raft slab, waffle raft, etc.) can be designed for a Class "S" (slightly reactive) site.

Yours faithfully
ACT Geotechnical Engineers Pty Ltd

[redacted]

Director - Senior Geotechnical Engineer
MIEAust CPEng EngExec RPEQ NER APEC Engineer IntPE(Aust)



[redacted]

PROPOSED RESIDENCE – BLOCK 7, SECTION 12, THROSBY
SET OUT PLAN

ACT Geotechnical Engineers Pty Ltd	C9165	FIGURE 1

[redacted]

PROPOSED RESIDENCE – BLOCK 7, SECTION 12, THROSBY

SITE PHOTOGRAPHS

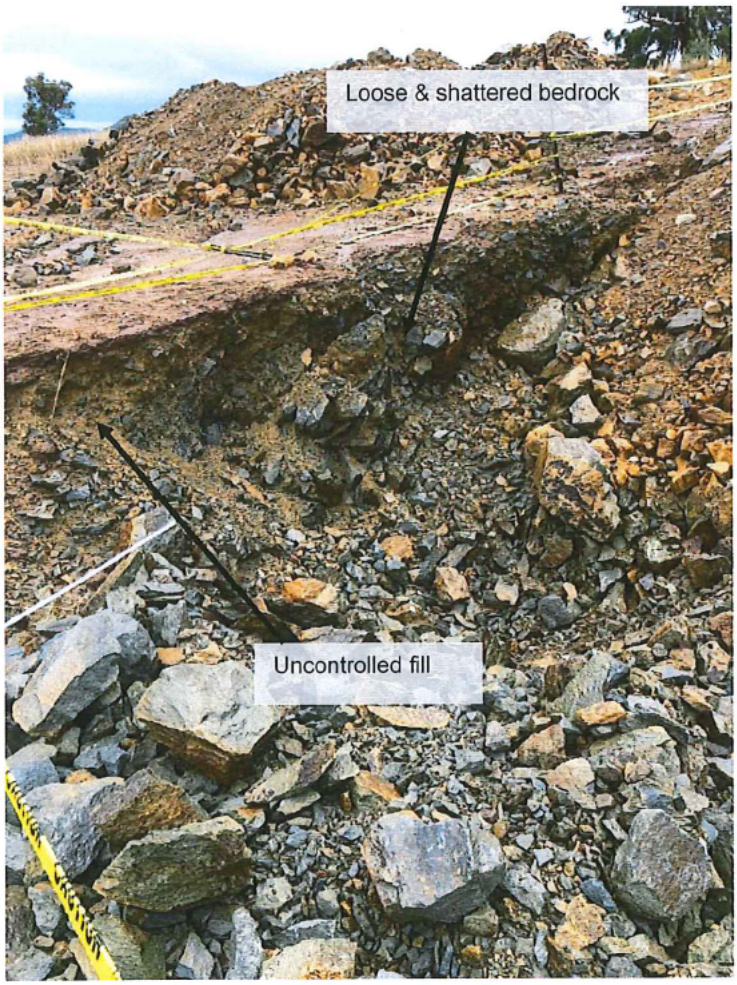


Photo 1 (left) – 26/2/2018 – View of the site cut in the western corner of the site, showing the loose, shattered bedrock extending to >2.8m depth.

Photo 2 (right) – 26/2/2018 – View of the site cut in the western corner of the site, showing the loose, shattered bedrock extending to >2.8m depth.

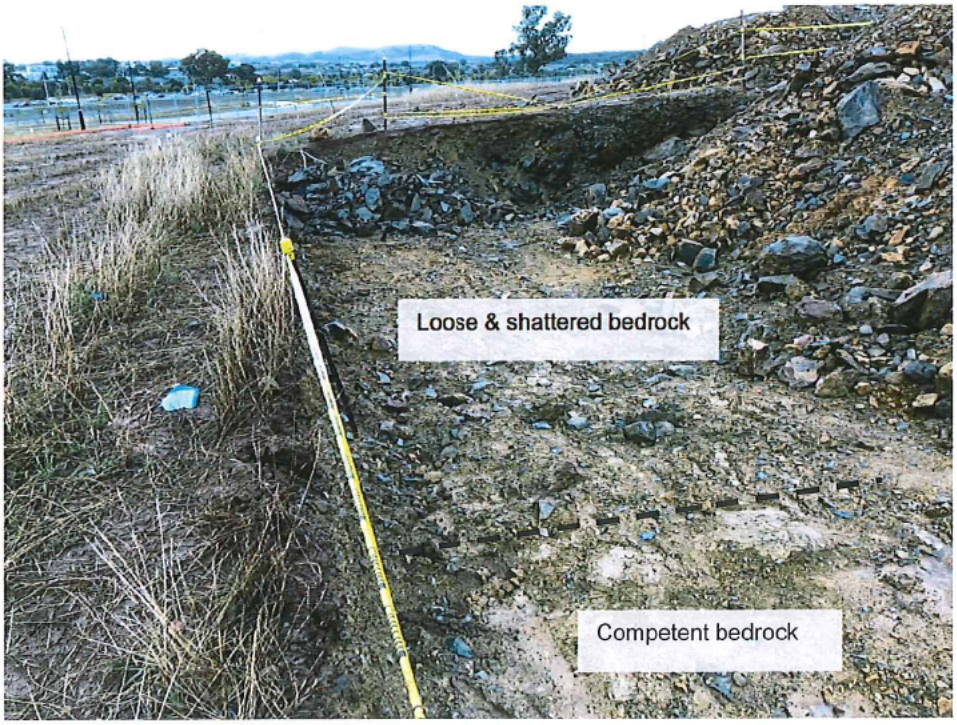
[redacted]

PROPOSED RESIDENCE – BLOCK 7, SECTION 12, THROSBY

SITE PHOTOGRAPHS

Photo 3 (above) – 26/2/2018 – Close up view of the loose & shattered bedrock.

Photo 4 (right) – 26/2/2018 – View of the site cut in the western corner of the site, showing the loose, shattered bedrock extending to >2.8m depth. The transition between the competent bedrock, and loose, shattered bedrock can be seen in the foreground.



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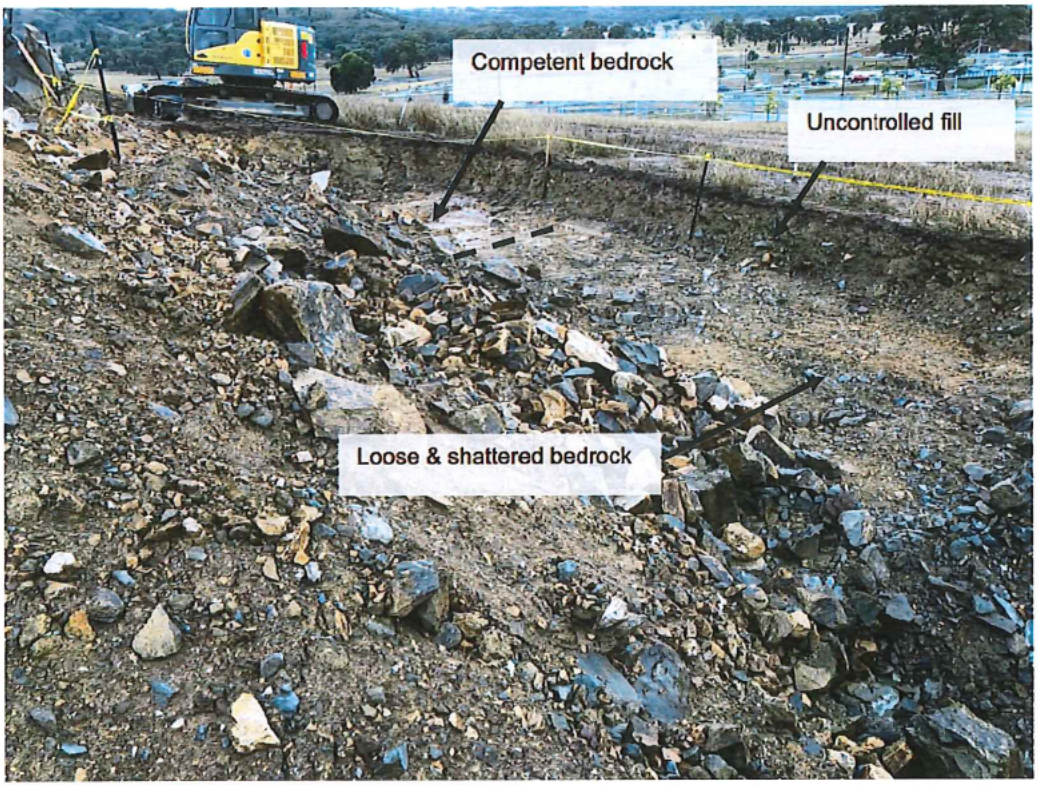
PROPOSED RESIDENCE – BLOCK 7, SECTION 12, THROSBY

SITE PHOTOGRAPHS



Photos 5 & 6 (above and below) – 26/2/2018 – View of the site cut in the western corner of the site, showing the loose, shattered bedrock extending to >2.8m depth. The transition between the competent bedrock, and loose, shattered bedrock can be seen in the rearground.