

# Memo

<b>To:</b>	<b>Marie Gudopp</b>	<b>Job No:</b>	<b>1000057</b>
<b>From:</b>	<b>Emilia Stocks</b>	<b>Date:</b>	<b>27 July 2020</b>
<b>cc:</b>	<b>Dejan Kirbis (WCC), Andrew Kennedy (T+T)</b>		
<b>Subject:</b>	<b>Shelly Bay Shed 8 July 2020 Update</b>		

## 1 Background

Tonkin & Taylor Ltd (T+T) undertook an initial inspection of the Shed 8 foundations visible from beneath the adjacent wharf structure in December 2014. The inspection revealed extensive deterioration of timber piles and undermining of pile caps and perimeter foundation beams over a large area along the building's western edge. The pile caps and beams appeared to be in sound condition. However, many of the timber piles were either substantially degraded or completely disconnected from the pile cap.

Emergency remedial works were commissioned by Wellington City Council (WCC) in December 2015 to reinstate support to pile caps. Remedial works included the installation of temporary steel props to provide some additional support to pile caps and installation of plywood boards to replace damaged timber rails to protect the foundations from further erosion due to wave actions.

A monitoring regime was then implemented and is ongoing at the time of writing this memo.

As an indication of when WCC should be seeking to complete permanent repair works, T+T provided initial guidance for works to be in place within 1 year of installing the temporary propping, i.e. by December 2016. Because of uncertainty in the future development of the area WCC has held off on implementing robust permanent remedial works.

## 2 Summary of observations from monitoring

To date, 43 inspections have been undertaken since our inspection in December 2015. The key observations are:

- Significant damage to the adjoining wharf structure now means that further inspections of the foundations are considered by T+T to be unsafe without additional controls that we will need to discuss with you (refer Section 4).
- There has been progressively more damage to the plywood facing installed in December 2015. New plywood facing was installed in September 2017. Since this repair, no further significant degradation was observed, but a failure of the plywood is likely to be a brittle failure at some point in the future with repairs works required.
- No evidence of any further undermining of the foundations except for damage observed in Void D as indicated in T+T Shelly Bay Shed 8, August 2016 Update and T+T Figure 1 Foundation Plan dated 25 August 2016 – both attached. New props were not installed by WCC and this recommendation should be considered by WCC depending on the timeframes to any repairs and on the proposed building use/ access.

- No evidence of any further undermining to concrete pads / acro props. Re-grouting was completed in September 2017.
  - No evidence of any further damage to the concrete seawall.
  - No evidence of an increase in the load being transferred to the piles, although a detailed structural assessment has not been undertaken since December 2016.
  - No evidence of any cracking or other damage to the foundations based on observations from underneath the foundation. No inspection was undertaken inside the building to our knowledge since the Hampton Jones Ltd building survey in December 2016 commissioned by WCC. We do not have access to this report.
- Other than some minor surface corrosion, there is no evidence of any damage to the temporary props that have been installed.

### 3 Permanent remedial works options

In May 2015, T+T prepared permanent remedial works options (attached). These options will need to be reassessed to consider investigation completed in July 2015 (attached) and the learnings from monitoring inspections over the years.

### 4 Conclusions

We conclude that the risk to the building is currently the same (or with negligible change) as our assessment in December 2015. However, giving the temporary nature of the repairs undertaken in 2015, we consider permanent occupancy of the building as an unacceptable risk without remedial works completed.

To allow for ongoing temporary (brief periods of) access to the building we consider that some monitoring is necessary to identify any deterioration of the foundations and seawall. WCC could consider one of the following options:

- i Repair or partial demolition of the wharf structure to make this area safe to allow the physical monitoring that has been undertaken to date to continue.
- ii Introduce, a remote monitoring system such as automated cameras installed at selected locations under the wharf structure. Some additional controls may need to be implemented to safely install these camera.

In addition to the above WCC should consider an inspection by a professional Structural Engineer within 5 years of the last internal structural inspection.

As for all of WCC's properties a robust procedure for evacuating the building in the event of an earthquake will be required.

Please indicate your preferred option to proceed with. We can develop this further following your instruction.

Yours sincerely,



Emilia Stocks

Senior Geotechnical Engineer

Reviewed by Andrew Kennedy, Project Director

**Attachments:**

- 1 Shed 8 Building, Shelly Bay, Wellington Geotechnical Completion Report - Temporary Repairs Works dated 30 January 2015
- 2 Shelly Bay, Shed 8 Remedial Works Options dated 22 May 2015
- 3 Geotechnical investigation logs dated July 2007 and July 2015
- 4 Shelly Bay Shed 8 August 2017 Update dated 22 August 2017
- 5 T+T Figure 1. Foundation Plan dated 25 August 2016

28-Jul-20

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Wellington City Council  
101 Wakefield Street  
Wellington

Attention: Carrie Guthrie

Dear Carrie

## **Shed 8 Building, Shelly Bay, Wellington Geotechnical Completion Report - Temporary Repairs Works**

### **1. Introduction and description of works**

In December 2014 Tonkin & Taylor Ltd (T&T) undertook a seawall condition inspection of the seawall supporting the Shed 8 Building. As part of this inspection significant damage was observed to several exposed building piles. Full details of this inspection have been previously discussed with WCC and will be recorded in a separate report.

Following identification of damaged piles Wellington City Council (WCC) requested that T&T undertake design and construction monitoring of geotechnical aspects of temporary propping under critical foundations at Shed 8 Building, Shelly Bay, Wellington. This letter provides a record of the temporary propping work undertaken. The scope of work and terms and conditions of engagement are set out in T&T engagement letter dated 12 December 2014.

### **2. Design of temporary works**

Following the site inspection, T&T proposed to temporarily underpin two critical foundations (refer attachment B for location plan) with acro-props to provide the necessary vertical capacity to resist compression loading from the building in the immediate term (<1year). Temporary works design did not consider tension or lateral loading i.e. the temporary works are for static loading only. Temporary support design was based on observations from our site visit in December 2014.

The temporary construction works were undertaken by Retaining & Civil Construction (RCC) in December 2014. The design arrangement is set out in T&T Memo dated 15 December attached.

### **3. Geotechnical construction observations**

T&T undertook two construction monitoring visits to observe and review geotechnical aspects of temporary works comprising:

- Review of founding material for acro-props.
- Review of the position of acro-props at the two critical foundations.

On the basis of our inspections we concluded that RCC constructed the temporary acro-props as per T&T's design intent. Loose fill was locally excavated to expose suitable founding material and acro-



props were placed on timber boards (top and bottom) and secured by cement grout (refer photographs in Attachment C).

#### 4. Further Site Inspections Required

Because of the temporary nature of the repair, the temporary propping works and adjacent pile foundations should be inspected by a chartered Engineer after any moderate storm event or earthquake and at a maximum of 6 month intervals starting in June 2015.

The extent of our foundation inspection was limited to the areas where timber facing was missing from above the lower concrete seawall. It is possible that there could be additional areas of undermining that are obscured at the time of our inspection. Therefore an inspection of adjacent pile foundations should be undertaken at each site visit.

#### 5. Building Act considerations

With completion of the temporary stability works and continued monitoring, as set out in Section 4, we consider that in the immediate term (<1year from construction) the building meets Section 121 of the Building Act 2004.

However, the building is still an earthquake prone building under Section 122 of the Building Act 2004.

To meet the building act in the longer term (ie greater than approximately 1 year) and to meet seismic design requirements, further work will be required to construct more robust foundation support.

#### 6. Applicability

This report has been prepared for the benefit of Wellington City Council with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

Tonkin & Taylor Ltd

Environmental and Engineering Consultants

Report prepared by:

Authorised for Tonkin & Taylor Ltd by:



Emilia Belczyk

Geotechnical engineer



Andrew Kennedy

Project Director

Attachments.

Attachment A: T&T Memo dated 15 December 2014

Attachment B: Figure 1. Foundation Plan

Attachment C: Photos

EBB

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**Attachment A: T&T Memo dated 15 December 2014**

# Memo

<b>To:</b>	<b>Hans Andersen</b>	<b>Job No:</b>	<b>85856</b>
<b>From:</b>	<b>Emilia Belczyk</b>	<b>Date:</b>	<b>5 December 2014</b>
<b>cc:</b>	<b>Anthony Taylor, Carrie Guthrie, Emilia Belczyk, Holly Le Heux</b>		
<b>Subject:</b>	<b>Shelly Bay Shed 8 Emergency Repair Work</b>		

## 1. Introduction

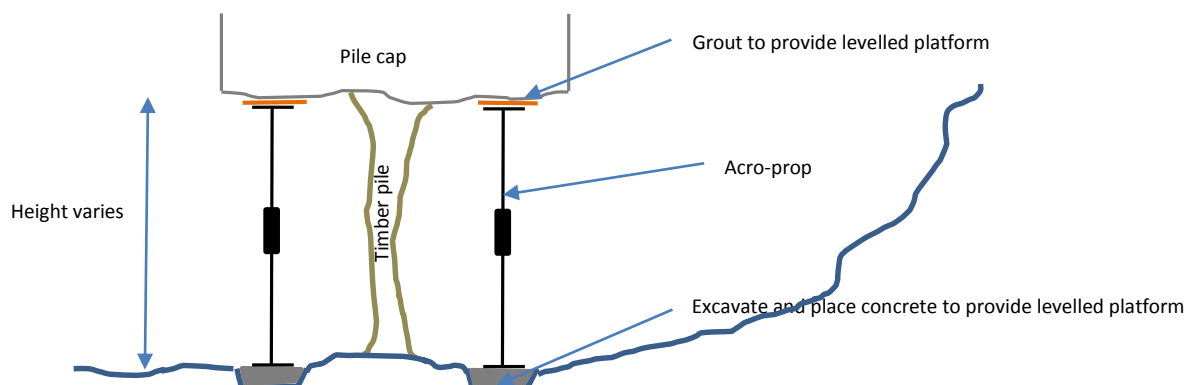
Tonkin & Taylor Ltd (T&T) has been engaged by Wellington City Council (WCC) to undertake a site inspection of the seawall along the western side of Shed 8 building in Shelly Bay.

Initial site inspections undertaken on 3 December and 5 December 2014 have revealed the following:

- Extensive undermining of pile caps and perimeter foundation beams over a large area along the building western edge (refer attached plan).
- The pile caps and beams appear to be in sound condition
- Many of the timber piles have either:
  - substantially degraded, pile diameter has reduced (necking effect) from approximately 300mm to 100-150mm and the ‘necked’ sections of the pile are significantly weakened (refer attached photo) or
  - were completely disconnected from the pile cap or missing.

## 2. Temporary emergency stability works

We propose to underpin the two critical pile caps with acro-props. Minimum three props to be installed under each pile cap. Refer detail below:



### 3. Programme

These emergency works need to be undertaken as soon as possible. We are proposing the following programme:

- Site visit with contractor and WCC – Monday 8 December (booked for 3pm)

*The purpose of the meeting is to establish the order of cost of the emergency stability works.*

*Programme below is provisional, depends on the order of cost of the emergency stability works.*

- Price estimate from contractor and H&S plan – Wednesday 10 December
- Workshop with WCC – Thursday 11 December
- Start of construction – Monday 15 December

#### **Attachments:**

Attachment A – Photos

Attachment B – Foundation plan

5-Dec-14

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## Attachment A – Photos



*Photo 1. Western side of Shed 8. Photo taken from wharf. Area with critical foundations marked in red.*



*Photo 2. Access to critical foundation No. 1 from water*





*Photo 3. Damaged timber piles – critical foundation No. 1*



*Photo 4. Access to critical foundation No. 1.*





*Photo 5. Damaged timber piles – critical foundation No. 2.*



*Photo 6. Access to critical foundation No. 2.*



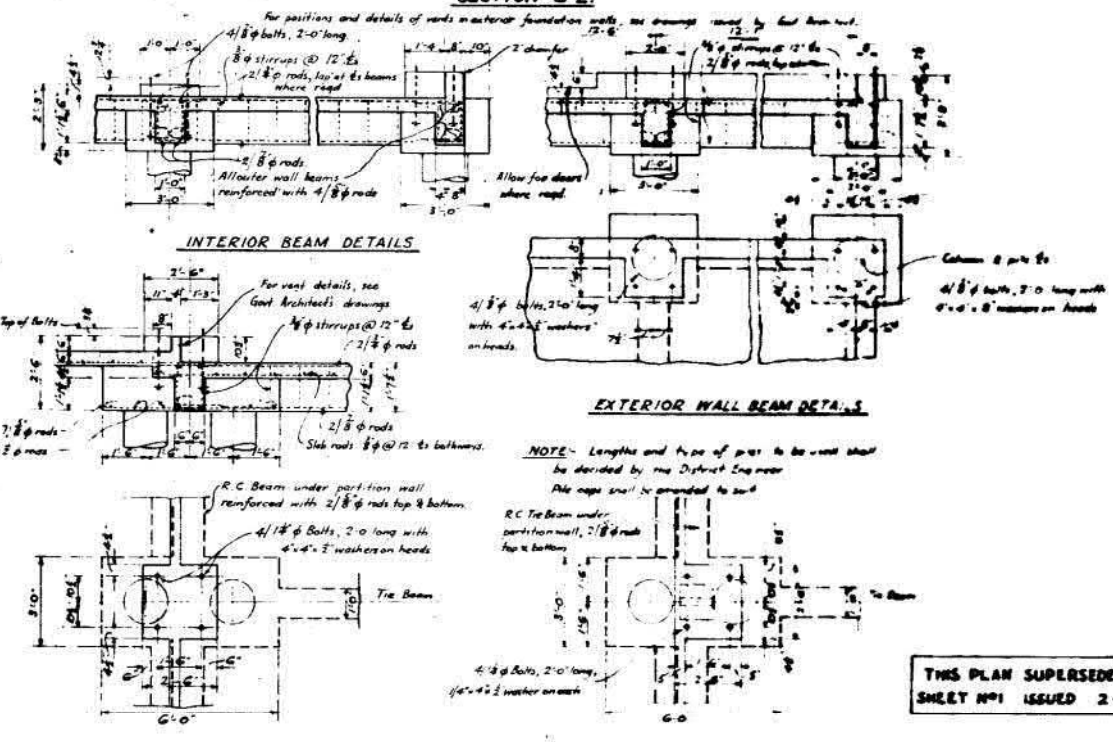
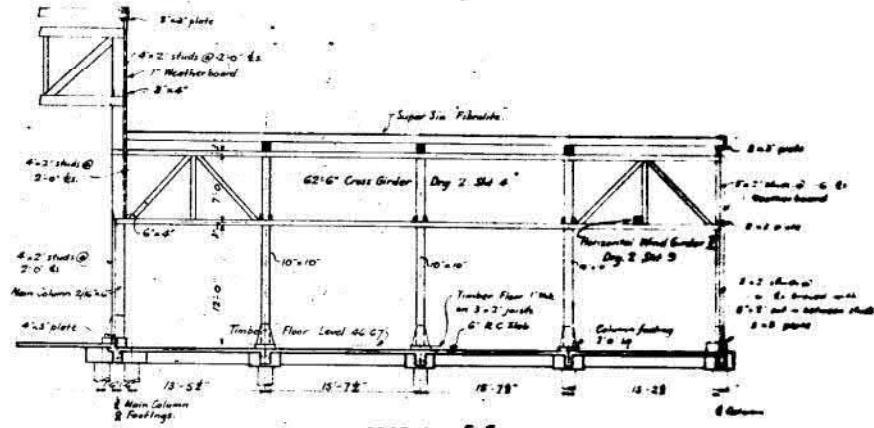
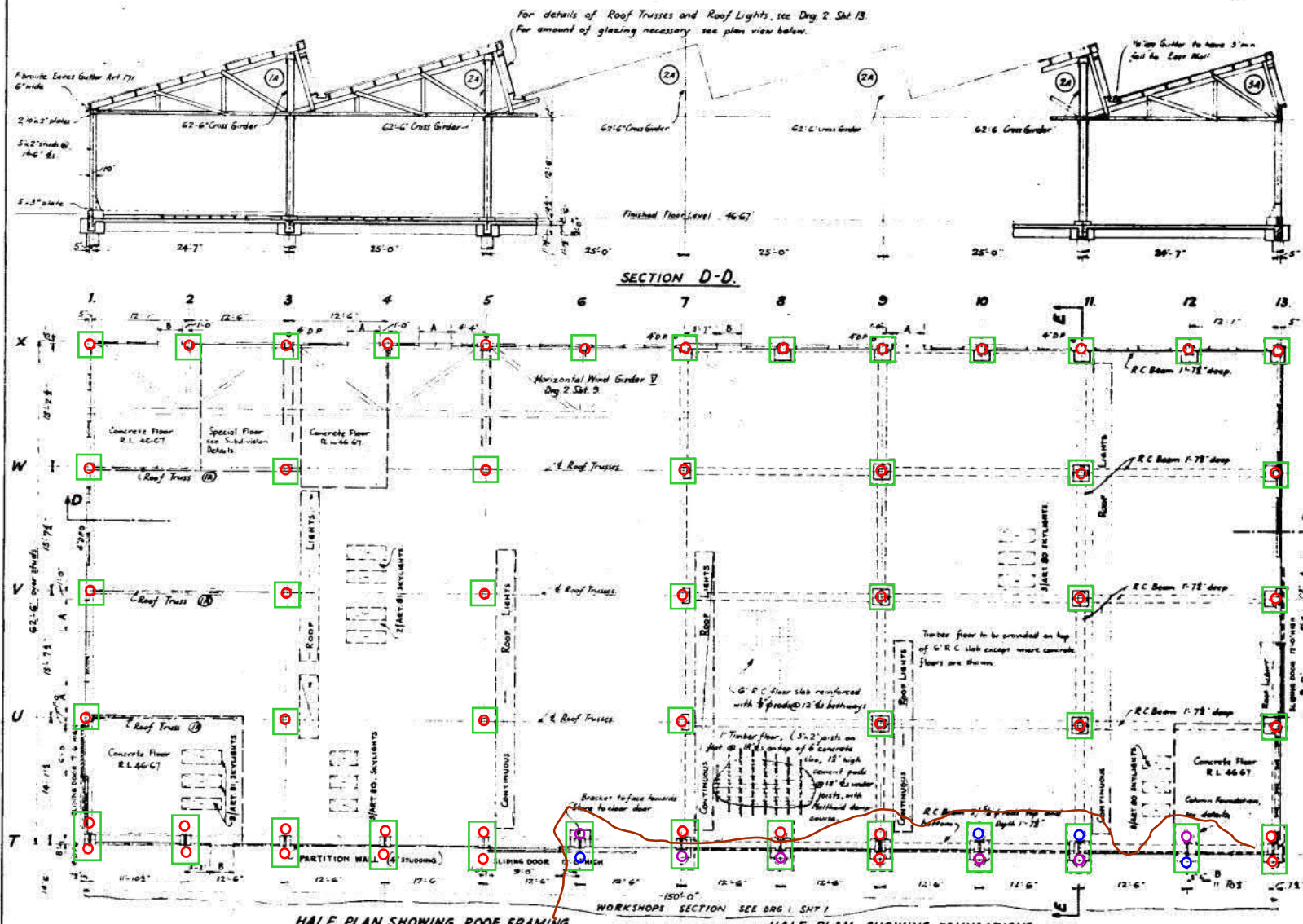
*Photo 7. General overview for access to critical foundations from water.*





**Attachment B: Foundation Plan**





THIS PLAN SUPERSEDES DRG. NO. 1 SHEET NO. 1 ISSUED 2-8-48.

NOTES - Door openings marked 'A' are to be 4'-2 1/2" to clear frames for 4'-0" doors  
3'-2 1/2" 3'-0"

For door details, windows, subdivision, fittings, positions and details of vents in foundation walls, see drawings issued by Govt Architect's Office.

Method dampcourse to be provided between timber and concrete

COLUMN FOUNDATIONS, PARTITION WALL BETWEEN STORES & WORKSHOPS.  
(DOES NOT APPLY TO COLUMN NO. T-6.)

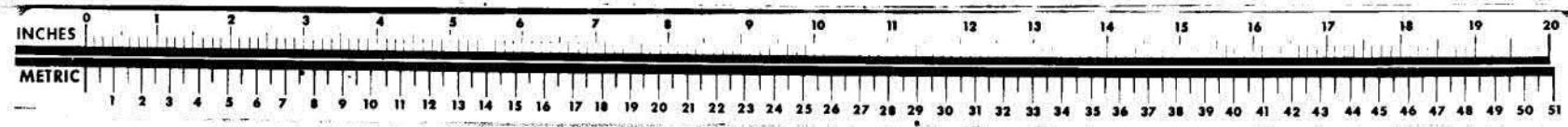
COLUMN FOUNDATION - T-6  
Sheet 3 of 5

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DATE	AMENDMENT	SIGNATURE	NAME	DATE
			M. Law	
			H. L. Long	
			P. H. Long	
			Armed Construction Dept.	

SHELLY BAY NAVAL DEPOT - WORKSHOPS & STORES.  
GENERAL LAYOUT - STORES SECTION.

PLATE NO. 11A  
P.W.D. 117020  
SHEET NO. 3 OF 5 SHEETS  
DRAWING NO. 7



**Attachment C: Photos**



*Photos 1 and 2. Critical foundation 1 – stages of work*



*Photo 3. Top of prop*



*Photo 4. Critical foundation 2.*





Wellington City Council  
101 Wakefield St,  
Wellington

Attention: Carrie Guthrie

Dear Carrie

### **Shelly Bay, Shed 8 Remedial Works Options**

This document sets out several conceptual options for repair works to the Shelly Bay foundations and the Shed 8 building adjacent the seawall.

Please find attached the following:

- Conceptual options, Table 1, Rev 0
- Preliminary design sketches
- Project risk register, Table 2, Rev 1
- Risk register specific to one conceptual option (option B), Table 3, Rev 1

No costing information has been provided for the proposed options. This is due to the significant uncertainties in cost to upgrade to the current wharf to allow remedial works to occur.

To allow us to streamline the conceptual design process (and save WCC costs), please confirm which option is preferred by WCC (A, B, C or D, refer to table 1), and please clarify the following:

- 1 Is there potential for the remedial works to tie in with the removal or re-development of the existing wharf? (If requested we could jointly approach GWRC with you to confirm this)
- 2 If a Producer Statement (PS1) is requested by WCC, do you need this to cover the performance of the building only or the land as well?

We recommend the next steps in the project are as follows:

- 1 WCC confirm requested information on preferred conceptual design and project constraints.
- 2 T&T provide update for estimate and programme for development of conceptual/detailed design
- 3 T&T arrange for further subsurface tests of material behind seawall to confirm the liquefaction susceptibility (and therefore if underpinning is required for option D, refer to table 1)
- 4 T&T to liaise with contractors regarding works to upgrade the wharf to facilitate construction of works (if option C or D is selected)
- 5 T&T to meet with WCC prior to commencing detailed design



Yours Sincerely,



Andrew Kennedy  
Civil Engineer

27-May-15

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Option ID	Description	Figure No.	Current wharf structure can remain	PS1 is provided for building foundations	PS1 is provided for a structure to support land	Future wharf plans not affected	Additional comments
A	Do nothing until future land development is known. Remedial works to upgrade the existing seawall and existing Shed 8 supporting the land once structure is removed. <ul style="list-style-type: none"> <li>Leave building and seawall in its current state</li> <li>Continue monitoring as part of risk mitigation strategy</li> </ul>	N/A	✓	x	x	✓	<ul style="list-style-type: none"> <li>Temporary propping works were constructed in December 2014 (refer to T&amp;T memo “Shelly Bay Shed 8 Emergency Repair Works” dated 5 Dec 2014)</li> <li>Ongoing deterioration of existing timber piles and undermining under existing building foundations could be expected</li> <li>Refer to T&amp;T “Shed 8 Building, Shelly Bay, Wellington Geotechnical Completion Report” dated 30 Jan 2015 for a summary of residual risk and building considerations</li> <li>A simpler and more comprehensive solution on how to best support the land on-site will be possible after removal of building</li> </ul>
B	Remedial works to reduce risk to the existing building structure by filling voids with mass concrete and upgrading timber lagging rails to minimise risk of further undermining.	1	✓	x	x	✓	<ul style="list-style-type: none"> <li>PS1 cannot be possible. However, risks of damage to building and land are significantly reduced</li> <li>Investigations to be undertaken to assess the extent of voids</li> <li>Refer to remedial works risk register table 3 (25 May 2015, Rev. 0)</li> </ul>
C	<b>Staged works</b> Stage 1: Remedial works (with minimum 50 year design life) to support the building (see sub-option C1). Stage 2: Remedial works (with minimum 50 year design life) to protect the land and seawall (see sub-options C2 and C3)	Refer sub-options below					<ul style="list-style-type: none"> <li>Liaison with GWRC will be required re plans to the existing wharf structure</li> <li>This option will allow WCC to provide full support to the existing building and defer some costs and allow a cheaper repair to be constructed in conjunction with replacement of existing wharf.</li> </ul>
D	Remedial works (with minimum 50 year design life) to support the building and the land. Refer to sub-options D1 to D3	Refer sub-options below					<ul style="list-style-type: none"> <li>Sub-surface investigations will be required to confirm if there is potential for liquefaction induced settlement of existing foundations (and therefore if piles are required in addition to sub-options D1 to D3)</li> </ul>
C1 (Stage 1)	Underpinning with piles <ul style="list-style-type: none"> <li>Timber piles or screw piles to be constructed at the location of the existing pile caps</li> <li>Timber/concrete stub piles to be installed inside the building and connections to main piles</li> <li>Concrete beam poured</li> </ul>	2	✓	✓	x	✓	<ul style="list-style-type: none"> <li>This solution will enable us to provide PS1 for foundation support to the building only (not the land)</li> <li>Works will be required inside the building and will cause disruptions, however no major damage to the building structure is expected providing remedial works to the seawall are undertaken following an earthquake</li> <li>Upgrade of wharf structure is likely to be required to gain access for construction of piles. Further liaison with construction will be required to access costs and methodology</li> </ul>
C2 (Stage 2)	Armoured seawall – rock <ul style="list-style-type: none"> <li>Armour rock to be placed on seaward side of seawall</li> </ul>	3	x	✓	✓	x	<ul style="list-style-type: none"> <li>This option appears to be comparatively cheaper than the other proposed options and protects the land while allowing current building structure to remain</li> <li>The extent of the armour rock will impact on future repairs to the existing wharf</li> </ul>
C3 (Stage 2)	Armoured seawall – concrete <ul style="list-style-type: none"> <li>Similar to Option C1, however concrete mass wall is constructed instead of rock armour</li> </ul>	4	x	✓	✓	x	<ul style="list-style-type: none"> <li>This allows a smaller footprint than a rock armoured seawall</li> <li>Resource consent and special control measures during construction are likely to be required</li> </ul>
D1	Secant pile wall <ul style="list-style-type: none"> <li>Continuous secant pile wall to be constructed in between existing seawall (land side) and the building</li> </ul>	5	✓	✓	✓	✓	<ul style="list-style-type: none"> <li>A long term solution that allows future developments on the wharf whilst remaining inside the current footprint of existing building foundations</li> <li>Structural connection of secant piles to foundations may be required if there is a risk of liquefaction induced settlement</li> </ul>
D2	Sheet pile retaining wall <ul style="list-style-type: none"> <li>Continuous sheet piles to be driven in between existing seawall (land side) and the building</li> </ul>	6	✓	✓	✓	✓	<ul style="list-style-type: none"> <li>A long term solution that allows future developments on the wharf whilst remaining inside the current footprint of existing building foundations</li> <li>Piles may refuse to penetrate into rock depending on weathering profile</li> </ul>
D3	Piles to support existing seawall <ul style="list-style-type: none"> <li>Ø600 piles to be constructed at 1-2m centres alongside existing seawall (seaward side)</li> </ul>	7	✓	✓	✓	✓	<ul style="list-style-type: none"> <li>This solution improves the lateral capacity of the existing seawall as opposed to creating an entirely new continuous wall</li> </ul>

## Note

1. Risk of seawall instability in a seismic event (or possibly severe storm)

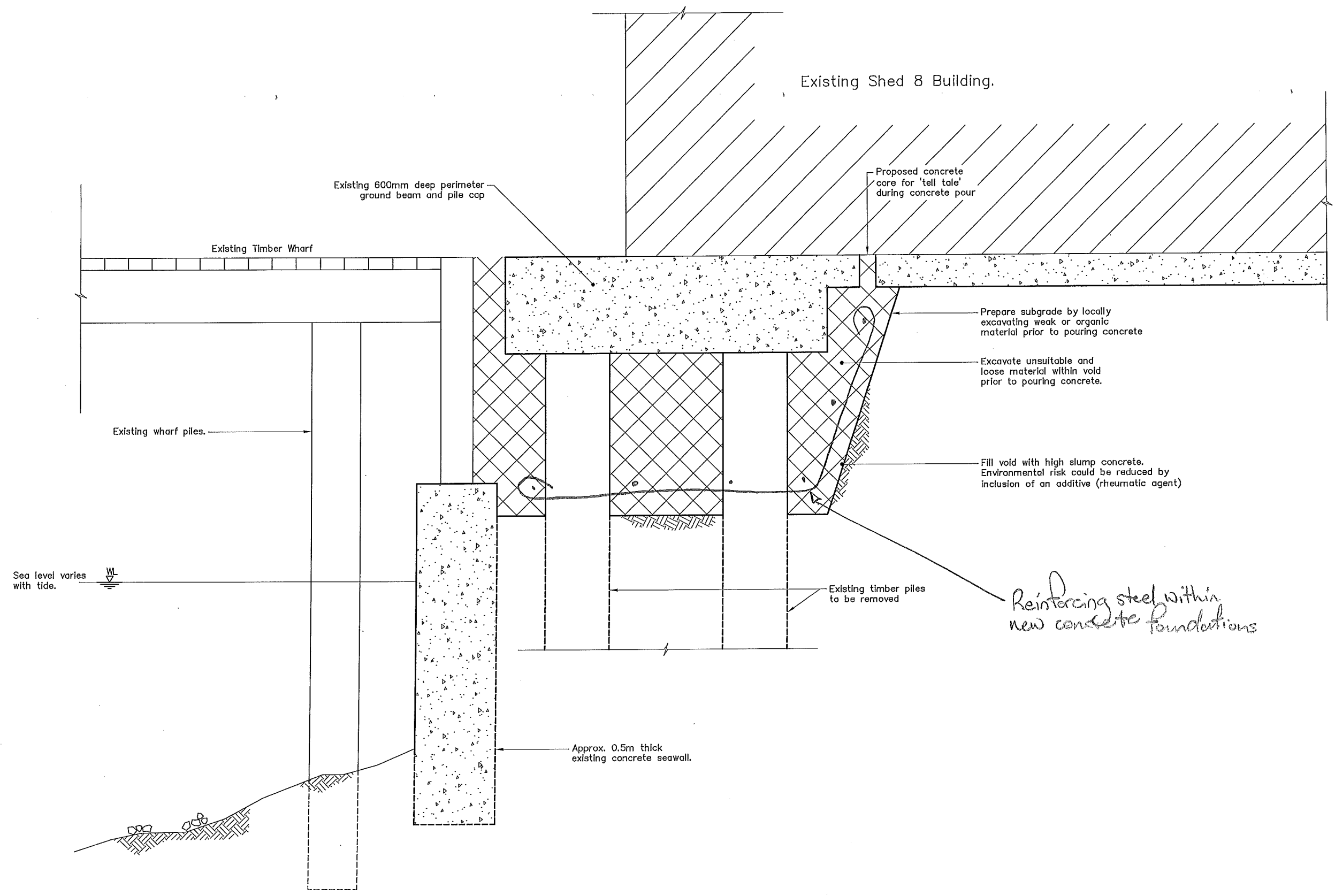
Table 2. General Project Risks

## Indicative Risk Appraisal

ID	Risk Item	LIKELIHOOD	CONSEQUENCE	RISK LEVEL	PROPOSED MITIGATION	RESIDUAL RISK (Preliminary Assessment. To be revised as design is confirmed)
1.1	Underground Services damaged during construction or existing damage identified during remedial works requiring repair.	POSSIBLE	MEDIUM TO HIGH	LOW TO MODERATE	<ul style="list-style-type: none"> <li>- Obtain As-built drawings and plans and compare with site observations and provide to tenderers.</li> <li>- Include a contingency for repair of unspecified services</li> </ul>	MODERATE TO LOW Potential for unknown/unidentified services to not be picked up during investigations
1.2	Asbestos present on site within works area. Asbestos tiles from the roof have come loose and fallen off in the past. Asbestos could be identified during preparation for construction.	POSSIBLE	MAJOR	MODERATE	Contractors Health & Safety Plan to cover this issue. WCC to remove fallen asbestos tiles from site.	LOW
1.3	Injury or death during construction: <ul style="list-style-type: none"> <li>• Working at a height</li> <li>• Working in a confined space</li> <li>• Access to work site over a damaged wharf</li> <li>• Working in marine environment</li> </ul>	POSSIBLE	DISASTROUS	HIGH	Site specific Health & Safety Plan to be provided to cover mitigation of risks. Temporary access scaffolding to be mandatory in contract. Temporary propping of foundations to be mandatory before anyone enters voids. Confined spaces training to be provided for all staff working in voids.	LOW
1.4	Project financial programme issues associated with difficulties with site access.	LIKELY	MAJOR	MODERATE	Early Contractor Involvement with design	LOW
1.5	Increased risk to structures from storm damage during construction.	VERY LIKELY	DISASTROUS	VERY HIGH	Contractor to monitor the weather forecast and put protection in place if a storm is predicted. Work to be carried out in sections to minimise area exposed during a storm.	LOW
1.6	Heritage controls leading to project time delay and costs.	POSSIBLE	MEDIUM	MODERATE	Investigation of potential heritage controls to be made in the early stages of design. We understand WCC will liaise as necessary to confirm.	LOW
1.7	Site used as water taxi stop in future. Potential for propeller scour.	LIKELY	MINOR  Level of scour insignificant for size of likely vessel	LOW	Effects to be considered by WCC in future when more information is available. Patch repair to concrete seawall may be required if there is possibility of bigger vessel used not considered in design.	UNCERTAIN (Likely to be low)
1.8	Access constraints from building tenants for works within building cause project costs/delays.	LIKELY	MEDIUM	MODERATE	<ul style="list-style-type: none"> <li>- Early communication with tenants by WCC to set expectation of what disruptions will occur and what condition of building will be left in after construction.</li> <li>- Requirement for clear methodology for Contractor for any works in or around building.</li> </ul>	LOW
1.9	Spill of fuel and construction contaminants to ocean	POSSIBLE	MAJOR	MODERATE	Contractor to provide mitigation plan in Construction Management Plan (Bunding, fueling off-site)	LOW
1.10	Disruption to local ecology: <ul style="list-style-type: none"> <li>• Penguin nesting area close to construction site.</li> <li>• Construction site is a seal habitat.</li> </ul>	VERY LIKELY	MEDIUM	HIGH	Consult with ecology experts on measures required to minimise negative impact on local wildlife.	LOW TO MODERATE
1.11	Climate change - increased frequency of storms events may mean more rapid deterioration of existing seawall and upper timber facing. Leading to more urgent requirement for further stage of works.	LIKELY	MEDIUM TO LOW	MODERATE TO LOW	Investigate likely scope of works and cost to complete full repair of foundations during construction of first stage (High priority) of design and construction. Consider these effects in detailed design.	LOW TO MODERATE Could be reduced further by including seismic assessment of existing seawall stability.
1.12	Condition of Shed 8 superstructure remains as per existing condition after foundation repair works complete	Refer CBP report. WCC may wish to consider repair works to superstructure				Refer to CBP report

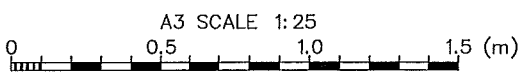
ID	ISSUE	LIKELIHOOD	CONSEQUENCE	RISK	PROPOSED MITIGATION	RESIDUAL RISK <sup>1</sup>
2.1	Unknown quantity of concrete means an unknown cost to project. Placing this risk on the contractor may lead to a high cost to WCC.	LIKELY	MEDIUM	MODERATE	A measure and value contract with a high contingency that accounts for an upper bound of concrete volume required. This will give a more competitive pricing of contract.	LOW
2.2	Lateral instability of existing concrete seawall leading to failure of the Shed 8 structure.	UNLIKELY 100 year seismic event	DISASTROUS	MODERATE	Reinforcing steel to be included to make foundations more robust in the event of minor lateral movement	MODERATE Remedial option to either make foundations independent of seawall or improve seawall may not within WCC budget. Moderate risk remains due to relying on old concrete structure with unknown condition/performance. This risk can be reduce further through coring investigation of the condition of the concrete seawall and assessment of seismic stability
2.3	Voids present but not visible behind timber lagging (indicating loss of foundation support, ongoing undermining and increased risk of damage to existing piles.	LIKELY	MEDIUM	MODERATE	Investigations during remedial works (whilst scaffolding erected) should include drilling closely spaced holes and probing/CCTV to identify voids behind existing lagging.	LOW There is potential that some voids are missed however these will be localised voids only. So residual risk assessed as Low to Moderate
2.4	Existing timber piles that have not been inspected fail within 5 years due to further deterioration in time or increased loading conditions	POSSIBLE TO LIKELY	MEDIUM Likely to be localised therefore cracking of slab and minor settlements could be expected	LOW TO MODERATE	Review risk level after investigation works proposed under item 2.3.	LOW TO MODERATE This risk can be reduced further by uncovering all timber piles and inspecting then repairing or replacing any damaged piles.
2.5	Further exposure to wave erosion due to: <ul style="list-style-type: none"> <li>gaps in timber railing</li> <li>failure of lateral support from wharf to timber rails fails</li> </ul>	LIKELY TO POSSIBLE	MEDIUM	MODERATE TO LOW	Replace faulty timber railings during first stage of works. Inspection of upper connection of timber lagging to wharf and the condition of this edge of the wharf.	LOW Risk remains due to ongoing decay/degradation of timber railing and wharf.
2.6	Localised settlement of perimeter foundation due to: <ul style="list-style-type: none"> <li>Poor quality subgrade for new concrete foundation</li> <li>Concrete does not fill all voids in areas being targeted.</li> <li>Organic debris or other material present behind timber lagging</li> </ul>	LIKELY	MEDIUM	MODERATE	Further excavation to prepare subgrade Concrete returns 'tell tales' to be drilled in the floor of Shed 8 to confirm that concrete has filled void. Geotechnical engineer to observe excavation and subgrade to identify organics or other unsuitable material that need to be excavated.	LOW There is still a low risk that unsuitable material is not identified.
2.7	Undermining of existing concrete seawall (because it is not founded on rock along full length) leading to loss of support to new mass concrete foundations infill and or existing timber piles that are left in place	POSSIBLE Potential for undermining to have been missed.	MAJOR	HIGH	Further, more rigours inspection and probing investigations required to confirm the full length of seawall is founded on rock (and no undermining present)	LOW
2.8	Concrete spill into marine environment during pour	POSSIBLE TO LIKELY	MEDIUM	LOW TO MODERATE	Early liaison with Contractor and GWRC. Comprehensive inspection of formwork by an engineer prior to concrete pour. Addition of an anti-washout agent in the mix.	VERY LOW
2.9	Building Consent Required	POSSIBLE	MEDIUM	LOW	T&T to discuss with WCC	VERY LOW

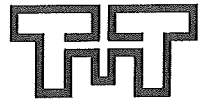
1. All actions mentioned in the residual risk column are not covered in T&T letter of engagement for remedial design works. If residual risk levels not are not considered appropriate by WCC, we will discuss likely further costs with you as necessary.



Sea level varies with tide.

*Reinforcing steel within new concrete foundations*

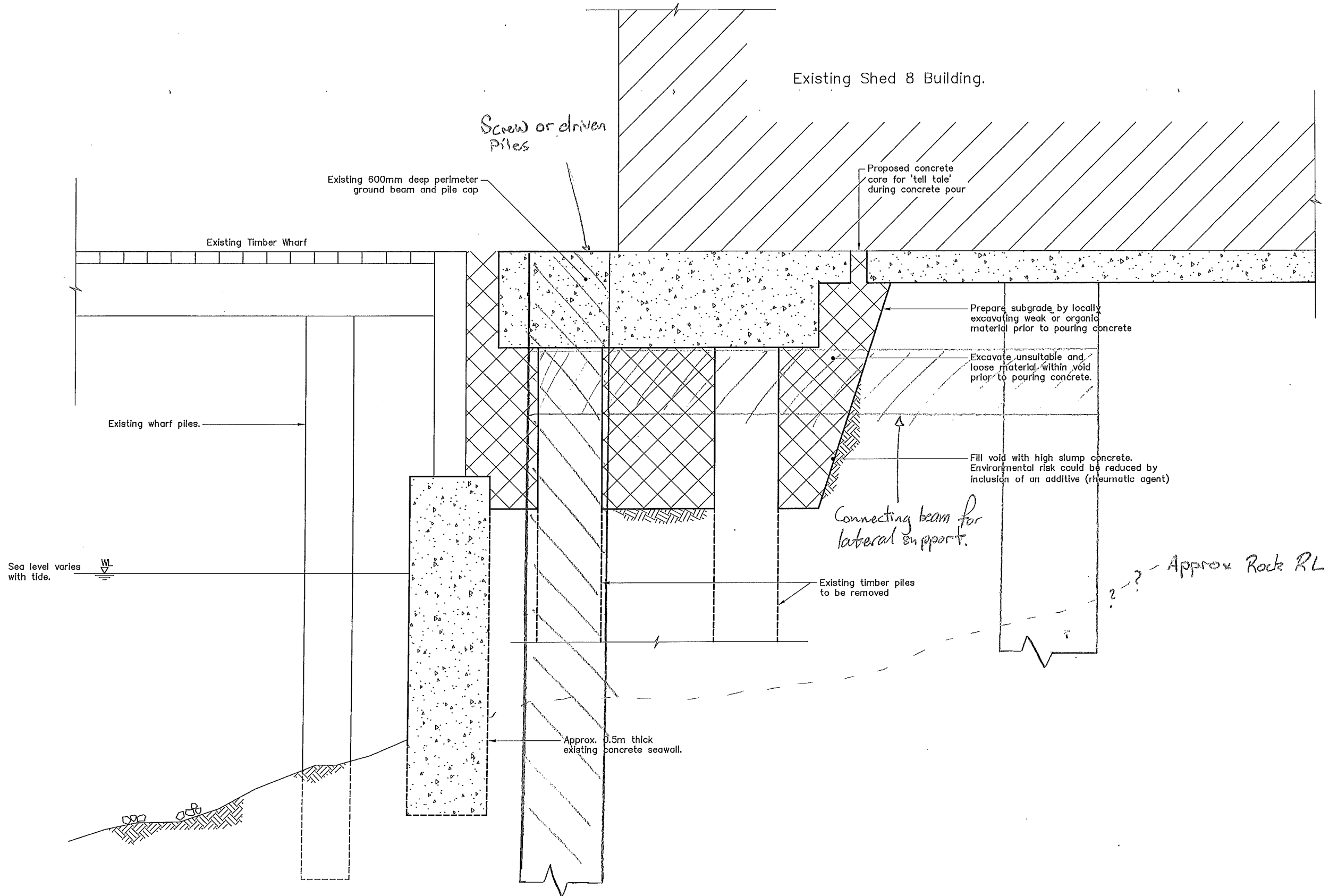


 <b>Tonkin &amp; Taylor</b> Environmental and Engineering Consultants Level 4, 2 Hunter St, Wellington www.tonkin.co.nz	DRAWN: DSW May 15 DRAFTING CHECKED: <input type="checkbox"/> APPROVED: <input type="checkbox"/> CADFILE: 85856.0040-F01.dwg SCALES (AT A3 SIZE): 1:25 PROJECT No.: 85856.0040	WELLINGTON CITY COUNCIL SHELLY BAY SHED 8 FOUNDATION REPAIRS Concept Repairs Ground Beams	FIG. No. Figure 1 – Underpinning with Concrete Mass REV. 0
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P:\85856\85856.0040\WorkingMaterial\CAD\FIGS\85856.0040-F01.dwg, F01, 19/05/2015 3:38:44 p.m., nat, A3, 1:1



P:\85856\85856.0040\WorkingMaterial\CAD\FIGS\85856.0040-F01.dwg, F02, 19/05/2015 3:38:44 p.m., nat, A3, 1:1



A3 SCALE 1:25  
 0 0.5 1.0 1.5 (m)

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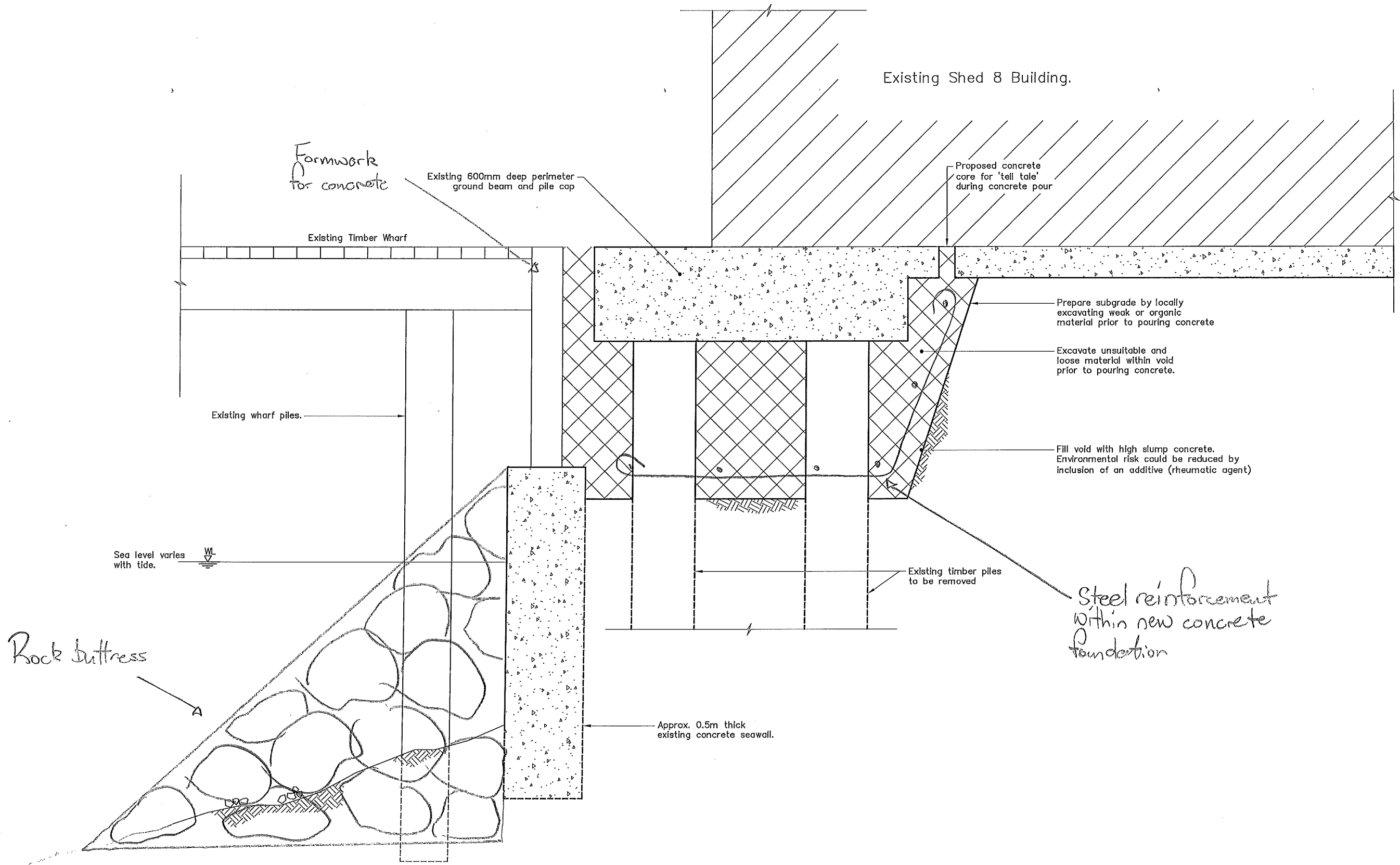
DRAWN	DSW	May 15
DRAFTING CHECKED		
APPROVED		
CADFILE : 85856.0040-F01.dwg		
SCALES (AT A3 SIZE) 1:25		
PROJECT No.	85856.0040	

WELLINGTON CITY COUNCIL  
 SHELLY BAY SHED 8  
 FOUNDATION REPAIRS  
 Concept Repairs Ground Beams

FIG. No. Figure 2 – Underpinning with piles

REV. 0

P:\85856\85856.0040\WorkingMaterial\CAD\FIGS\85856.0040-F01.dwg, F03, 19/05/2015 3:38:44 p.m., nat, A3, 1:1



Rock buttress

Formwork for concrete

Existing 600mm deep perimeter ground beam and pile cap

Existing Shed 8 Building.

Proposed concrete core for 'tell tale' during concrete pour

Existing Timber Wharf

Prepare subgrade by locally excavating weak or organic material prior to pouring concrete

Excavate unsuitable and loose material within void prior to pouring concrete.

Fill void with high slump concrete. Environmental risk could be reduced by inclusion of an additive (rheumatic agent)

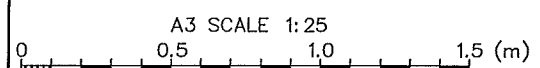
Existing wharf piles.

Sea level varies with tide.

Existing timber piles to be removed

Steel reinforcement within new concrete foundation

Approx. 0.5m thick existing concrete seawall.



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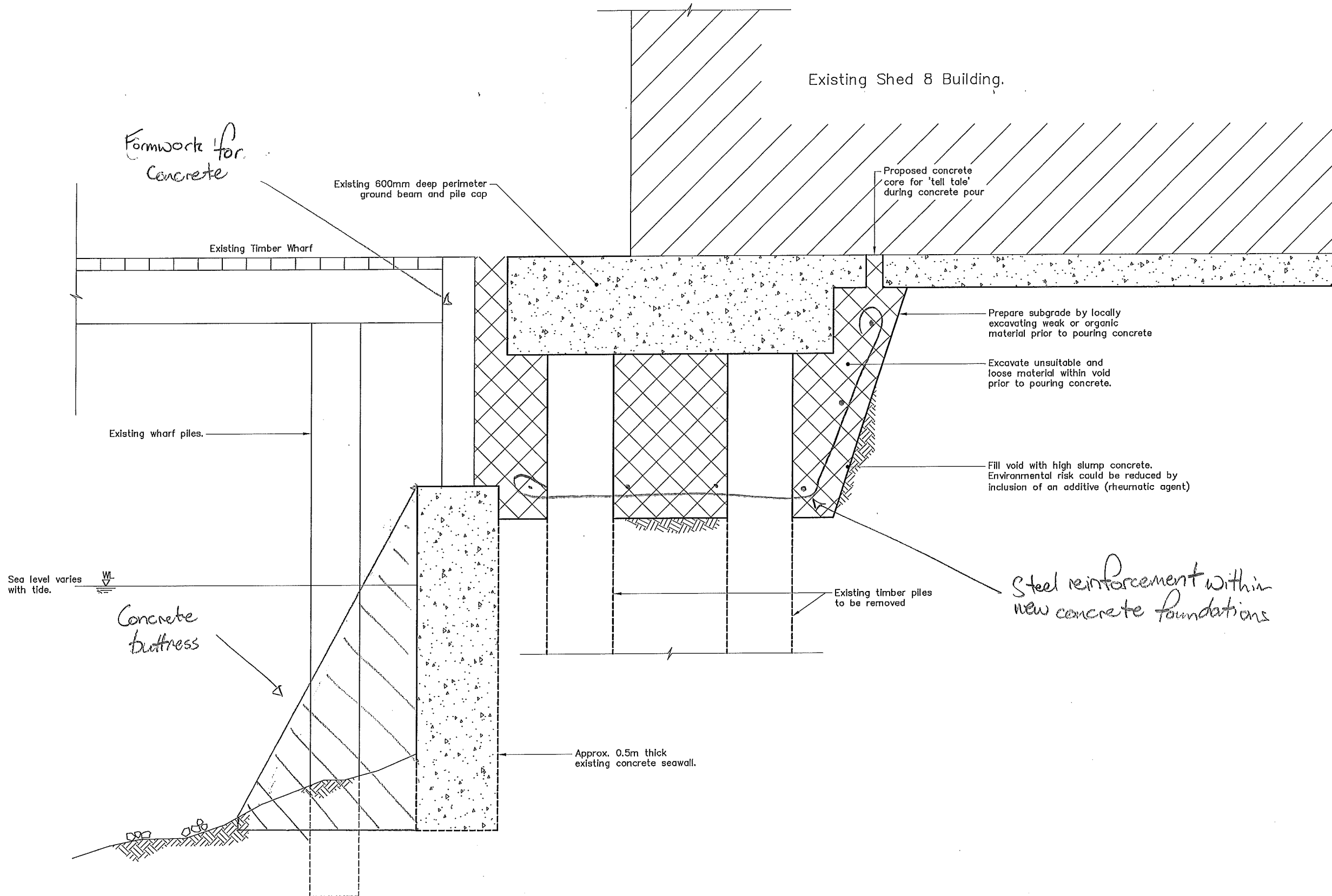
DRAWN	DSW	May. 15
DRAFTING CHECKED		
APPROVED		
CADFILE : 85856.0040-F01.dwg		
SCALES (AT A3 SIZE)		
1: 25		
PROJECT No.	85856.0040	

WELLINGTON CITY COUNCIL  
 SHELLY BAY SHED 8  
 FOUNDATION REPAIRS  
 Concept Repairs Ground Beams

FIG. No. Figure 3 – Rock Armoured Seawall

REV. 0

P:\85856\85856.0040\WorkingMaterial\CAD\FIGS\85856.0040-F01.dwg, F04, 19/05/2015 3:38:44 p.m., nat, A3, 1:1



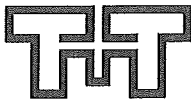
*Formwork for concrete*

*Concrete buttress*

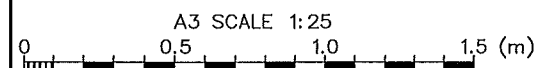
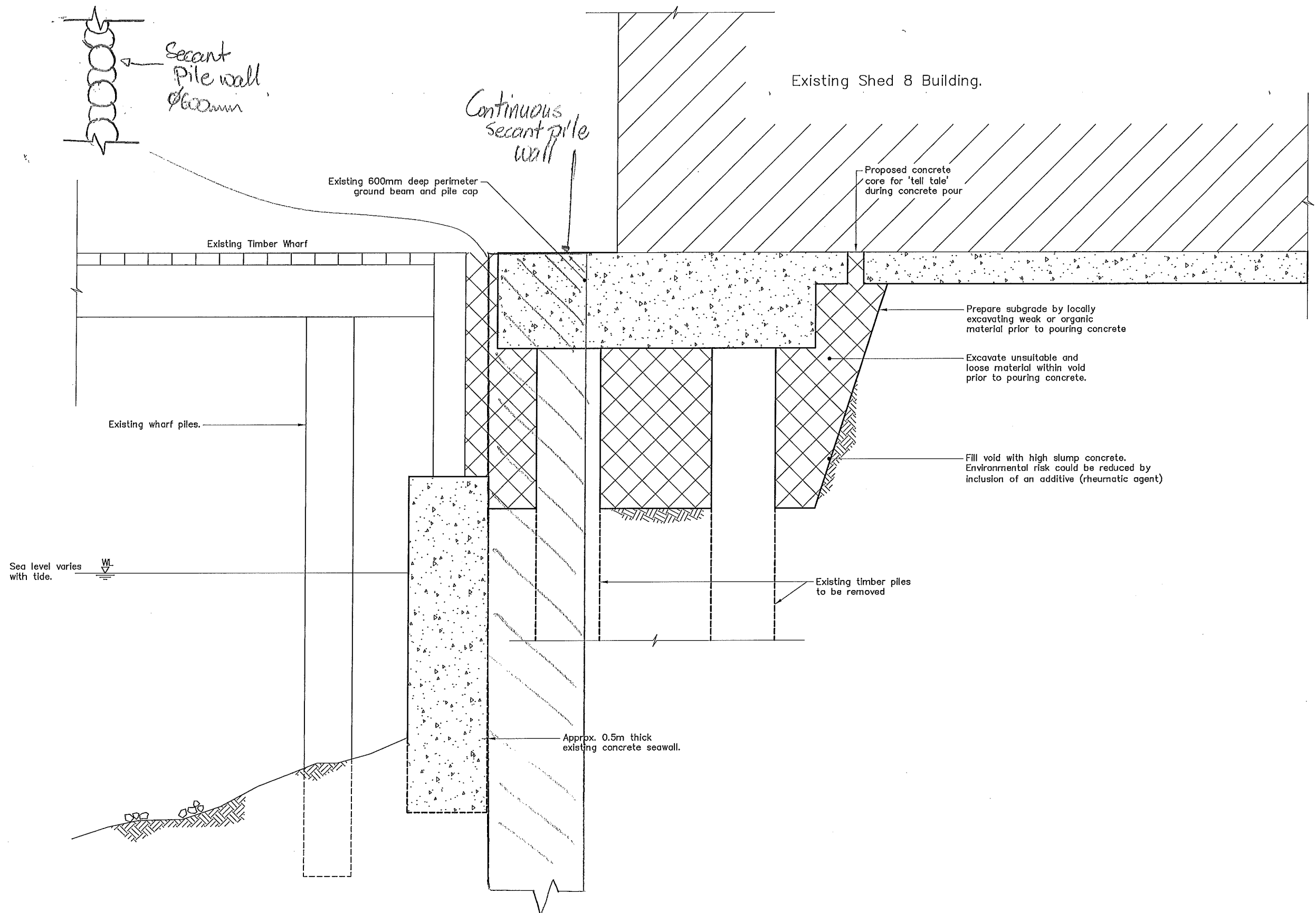
*Steel reinforcement within new concrete foundations*

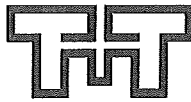
Sea level varies with tide.

A3 SCALE 1:25  
0 0,5 1,0 1,5 (m)

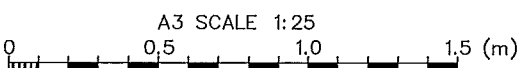
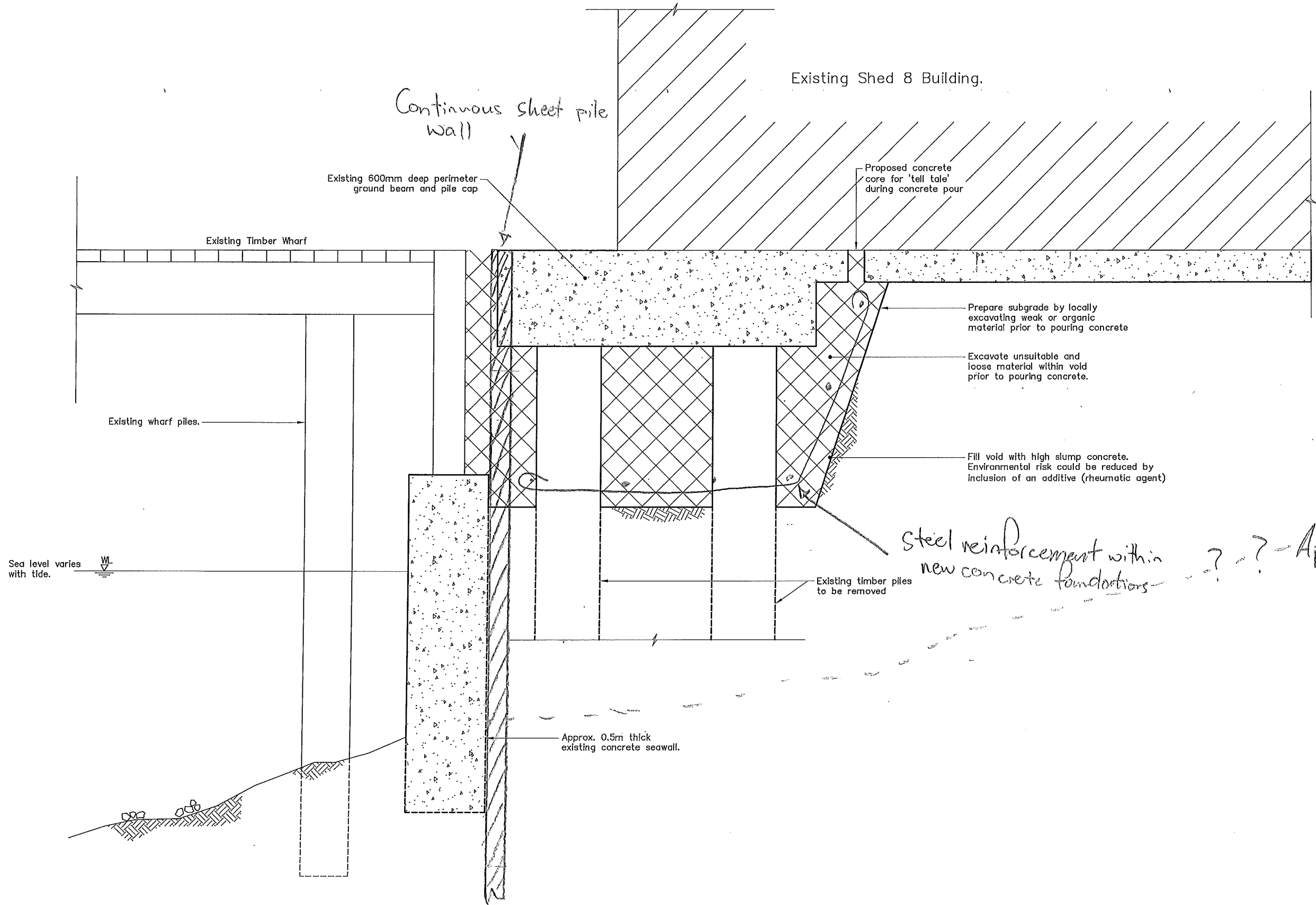
 <b>Tonkin &amp; Taylor</b> Environmental and Engineering Consultants Level 4, 2 Hunter St, Wellington www.tonkin.co.nz	DRAWN	DSW	May 15	WELLINGTON CITY COUNCIL SHELLY BAY SHED 8 FOUNDATION REPAIRS Concept Repairs Ground Beams	FIG. No. Figure 4 – Concrete Armour Seawall REV. 0
	DRAFTING CHECKED				
	APPROVED				
	CADFILE :	\\85856.0040-F01.dwg			
	SCALES (AT A3 SIZE)	1:25			
PROJECT No.	85856.0040				


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	CADFILE: 85856.0040-F01.dwg SCALES (AT A3 SIZE): 1:25		
	PROJECT No. 85856.0040		

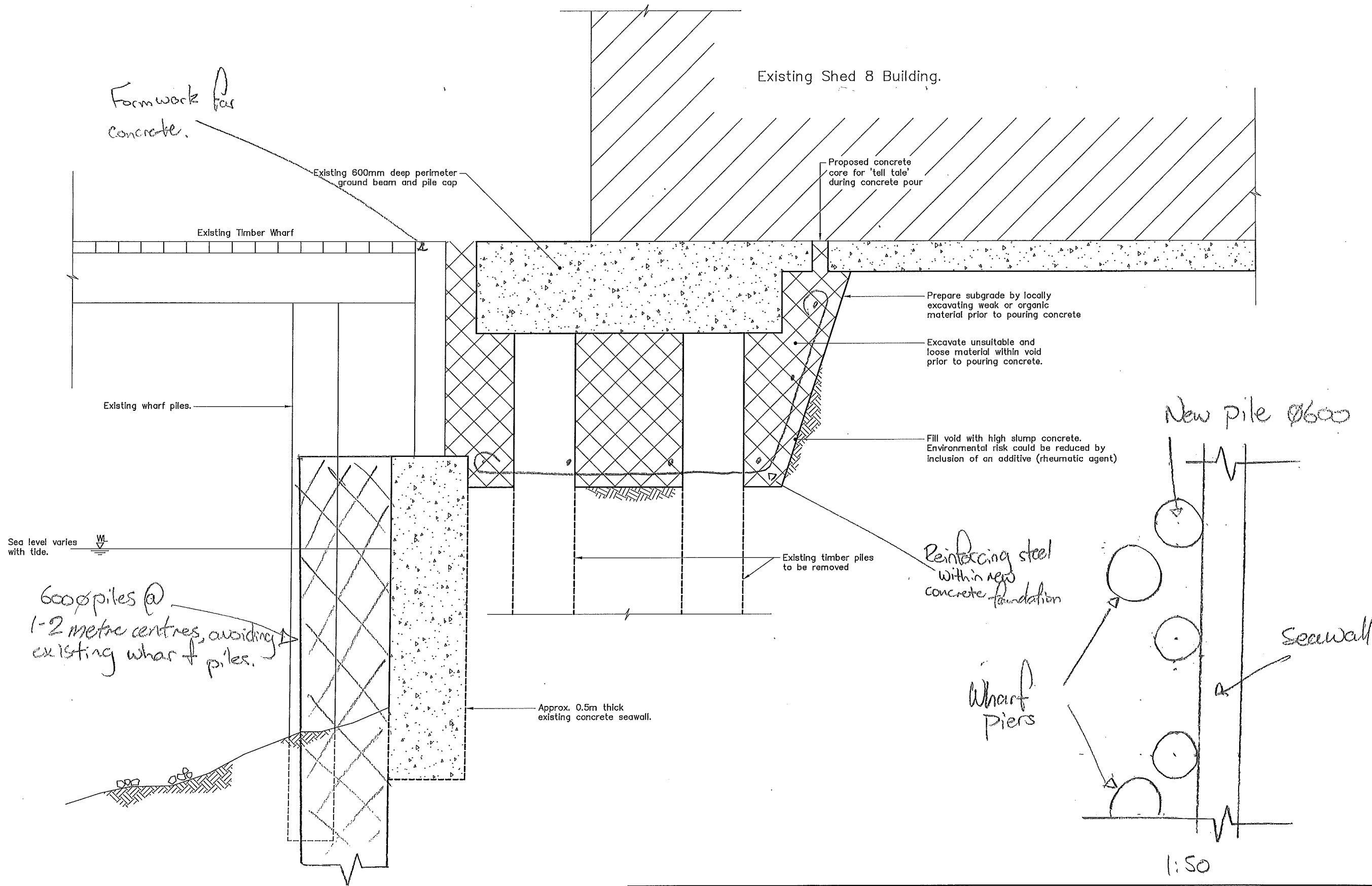
P:\85856\85856.0040\WorkingMaterial\CAD\FIGS\85856.0040-F01.dwg, F07, 19/05/2015 3:38:45 p.m., nat, A3, 1:1



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	CADFILE : 85856.0040-F01.dwg SCALES (AT A3 SIZE) 1:25		
	PROJECT No. 85856.0040		

Formwork for concrete.

Existing Shed 8 Building.



P:\85856\85856.0040\WorkingMaterial\CAD\FIGS\85856.0040-F01.dwg, F09, 19/05/2015 3:38:45 p.m., nat, A3, 1:1

A3 SCALE 1:25  
0 0.5 1.0 1.5 (m)

<p><b>Tonkin &amp; Taylor</b> Environmental and Engineering Consultants Level 4, 2 Hunter St, Wellington www.tonkin.co.nz</p>	<table border="1"> <tr> <td>DRAWN</td> <td>DSW</td> <td>May. 15</td> </tr> <tr> <td>DRAFTING CHECKED</td> <td></td> <td></td> </tr> <tr> <td>APPROVED</td> <td></td> <td></td> </tr> </table>	DRAWN	DSW	May. 15	DRAFTING CHECKED			APPROVED			<p>WELLINGTON CITY COUNCIL SHELLY BAY SHED 8 FOUNDATION REPAIRS Concept Repairs Ground Beams</p>	
	DRAWN	DSW	May. 15									
	DRAFTING CHECKED											
	APPROVED											
<p>CADFILE : 85856.0040-F01.dwg SCALES (AT A3 SIZE) 1:25</p>	<p>PROJECT No. 85856.0040</p>	<p>FIG. No. Figure 7 - Support of Current Seawall</p>	<p>REV. 0</p>									





**LEGEND**

**Public Investigations (NZGD)**

**Investigation Type**

 Machine Borehole

A3 SCALE: 1:1,000

0 10 20 30 40 50 (m)

1. World Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Created On:	12/02/2018
Created By:	EStocks
Approved By:	
TT Proj Ref:	85856.004
TT Map Ref:	TTMAPREF1433463001.902



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 105 Carlton Gore Road, Newmarket, Auckland  
[www.tonkintaylor.co.nz](http://www.tonkintaylor.co.nz)

WCC  
 Shelly Bay - Shed 8  
 Geotechnical Investigations

FIGURE No.  
 1





BOREHOLE LOG

BOREHOLE NO: 1

SHEET 1 OF 1

PROJECT:	LOCATION: BUILDING 3, SHELLY BAY WAREHOUSE	JOB NO: 23767-001
CO-ORDINATES: 2662513E 5988707N	DRILL TYPE: DOWN HOLE HAMMER (AIR)	HOLE STARTED: 1PM 25/7/07
RL: +2.0m (approx)	DRILL METHOD: CONCENTRIC	HOLE FINISHED: 5PM 25/7/07
DATUM:	DRILL FLUID: AIR	DRILLED BY: GRIFFITHS DRILLING LOGGED BY: AM CHECKED BY: TK

DRILLING AND TESTS			ENGINEERING DESCRIPTION				GEOLOGICAL						
FLUID LOSS	WATER	CORE RECOVERY	SAMPLES, TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	SHEAR STRENGTH OR RELATIVE DENSITY	ESTIMATED SHEAR STRENGTH, kPa	ORIGIN TYPE, MINERAL COMPOSITION, DETECTS, STRUCTURE	UNIT
								A/c seal					
		51%	10// 6/4 N=15 3/2		1		GM	silty GRAVEL (m), angular dark brown-orange with some clay non-plastic	M			FILL - CW/HW greywacke gravel changing with depth to silty fill.	
			2// 1/1 N=3 0/1				ML	SILT orange-brown with some clay and minor gravel (c) angular black-dark brown, med-low plasticity	M-W			bedrock?	
		67%	6// 21/30 for 70mm N=50+		2		GM	CW-HW greywacke rock recovered as silty GRAVEL (m), angular orange brown (sw) with some sand	D			CW greywacke rock	
		33%	50 for 150mm N=50+				GM	CW-HW greywacke rock recovered as GRAVEL (f-m) angular dark brown orange, with some silt and minor sand.	W				
		42%	2// 50 for 70mm N=50+		3		GM	... change to ... GRAVEL (f-m) angular dark grey brown with some sand and silt	D			? ? HW greywacke rock	
		24%	50 for 110mm N=50+				GM						
			50 for 50mm N=50+		4		GM						
			50 for 70mm N=50+				GM						
								EOB 4.45m, TARGET DEPTH REACHED					





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**BOREHOLE LOG**

BOREHOLE NO: 2  
SHEET 1 OF 2

PROJECT: *Shelly Bay* LOCATION: *BUILDING B, SHELLY BAY WHARF* JOB NO: *83769.001*  
 CO-ORDINATES: *2662513E* DRILL TYPE: *DOWN HOLE HAMMER* HOLE STARTED: *9am 25/7/07*  
*3988707N* DRILL METHOD: *CONCENTRIX* HOLE FINISHED: *12pm 25/7/07*  
 RL: *+7.0m @ 199200* DATUM: DRILL FLUID: *AIR* DRILLED BY: *GRIFFITHS DRILLING*  
 LOGGED BY: *AM* CHECKED BY: *TR*

DRILLING AND TESTS				ENGINEERING DESCRIPTION				GEOLOGICAL						
FLUID LOSS	WATER	CORE RECOVERY	METHOD/CASING	SAMPLES, TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	SHEAR STRENGTH OR RELATIVE DENSITY	ESTIMATED SHEAR STRENGTH, kPa	ORIGIN TYPE, MINERAL COMPOSITION, DETECTS, STRUCTURE	UNIT
									<i>A/C Seal</i>					
			<i>28% CASING</i>	<i>12//</i> <i>6// (N=50)</i> <i>15/18</i>		<i>1</i>		<i>GM</i>	<i>sandy silty GRAVEL (m), yellow brown, sub angular</i>	<i>Dry</i>			<i>HW-MW Greywacke gravel fill.</i>	
			<i>20%</i>	<i>50 for 120mm (N=50+)</i> <i>50 for 85mm (N=50+)</i>		<i>2</i>		<i>GM</i>	<i>CW greywacke rock recovered as sandy silty GRAVEL (m) (mw) mix of yellow-brown and dark brown-black gravel. Dark gravel breaks down to silty SAND.</i>	<i>Dry</i>			<i>bedrock?</i> <i>CW greywacke rock</i>	
			<i>27%</i>	<i>50 for 125mm (N=50+)</i> <i>50 for 70mm (N=50+)</i>		<i>3</i>							<i>CW-HW greywacke rock</i>	
			<i>OPEN</i>	<i>50 for 80mm (N=50+)</i> <i>50 for 70mm (N=50+)</i> <i>50 for 50mm (N=50+)</i>		<i>4</i>								









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BOREHOLE LOG

BOREHOLE NO: 3  
SHEET 1 OF 1

PROJECT: *Shelly Bay* LOCATION: *BUILDING 8, SHELLY BAY WHARF* JOB NO: *23769-001*  
 CO-ORDINATES: *2662513E* DRILL TYPE: *window sampler* HOLE STARTED: *9am 26/06/07*  
*5988707N* DRILL METHOD: *Driven* HOLE FINISHED: *11am 26/06/07*  
 RL: *+2.0m* DRILL FLUID: *NONE* DRILLED BY: *BROWN BROTHERS*  
 DATUM: LOGGED BY *AIK* CHECKED BY: *TK*

DRILLING AND TESTS				ENGINEERING DESCRIPTION				GEOLOGICAL						
FLUID LOSS	WATER	CORE RECOVERY	METHOD/CASING	SAMPLES, TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	SHEAR STRENGTH OR RELATIVE DENSITY	ESTIMATED SHEAR STRENGTH, kPa	ORIGIN TYPE, MINERAL COMPOSITION, DETECTS, STRUCTURE	UNIT
				<i>NONE</i>				<i>GM</i>	<i>GRAVEL (f-c) sub angular yellow-brown mottled white, with some silt and minor sand. gravel is mix of HW gravel - breaks down to gravel (f) with some silt and SW-MW gravel.</i>	<i>D</i>			<i>Fill</i> <i>HW-cw greywacke gravel and sand</i>	
						<i>1</i>		<i>GM</i>	<i>sandy GRAVEL (f-c), gravel is a mix of coarse sub angular HW gravel - breaks to med gravel with sand and SW-MW dark grey sub angular gravel.</i>	<i>M</i>				
						<i>2</i>		<i>GM</i>	<i>GRAVEL (c) angular SW brown orange with some sand and minor silt</i>	<i>M</i>				
						<i>3</i>		<i>GM</i>	<i>Silty GRAVEL (f) brown-orange angular with some clay dark grey blue (non plastic)</i>	<i>M-W</i>			<i>bedrock?</i>	
								<i>GM</i>	<i>Sandy GRAVEL (f) brown-orange angular with some silt yellow orange brown</i>	<i>D</i>			<i>CW-HW greywacke rock (?)</i>	
									<i>EOB 3.2m No further penetration possible.</i>					

# BOREHOLE LOG

**BOREHOLE No:** BH4  
 Hole Location: Refer to site plan  
 SHEET 1 OF 1

PROJECT: WCC-SHELLYBAYSHED8 LOCATION: SHED 8, SHELLY BAY JOB No: 85856.004

CO-ORDINATES 5988693 mN DRILL TYPE: HPP-150 HOLE STARTED: 14/7/15  
 (NZMG) 2662516 mE  
 R.L. 2.00 m DRILL METHOD: Wash HOLE FINISHED: 14/7/15  
 DATUM WELLHT1953 DRILL FLUID: Water DRILLED BY: Webster Drilling  
 LOGGED BY: NAMM CHECKED: MJRB

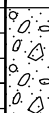


GEOLOGICAL		ENGINEERING DESCRIPTION																			
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.	FLUID LOSS	WATER	CORE RECOVERY (%)	METHOD	CASING	TESTS	SAMPLES	N.R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE / WEATHERING CONDITION	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)			COMPRESSIVE STRENGTH (MPa)			DEFECT SPACING (mm)	SOIL DESCRIPTION Soil type, minor components, plasticity or particle size, colour.
														10	25	50	5	10	20		
VOID											NOT USED	-	-								Drilling from wharf level. 1.0m deep void below wharf level.
UNKNOWN			0	W																	Material on sea wall: Medium GRAVEL. Loose, wet. Gravel, subangular, slightly weathered, strong. Contains concrete blocks and possible asbestos.
FILL			53	SPT		0//1/4/5/45 for 5mm N > 50					M	L									No core recovery (wash boring)
																					Medium GRAVEL, grey. Loose, moist. Gravel, subangular, slightly weathered, strong.
																					Medium GRAVEL with some sand and trace silt, brown. Loose, moist. Gravel, subangular, slightly weathered, strong. Sand, fine to coarse. End of borehole at 2.38m (terminated at top of seawall due to refusal).

T-T DATATEMPLATE-SPT.GDT.mib

# BOREHOLE LOG

**BOREHOLE No:** BH5  
 Hole Location: Refer to site plan  
 SHEET 1 OF 1

PROJECT: WCC-SHELLYBAYSHED8	LOCATION: SHED 8, SHELLY BAY	JOB No: 85856.004
CO-ORDINATES (NZMG) 5988676 mN 2662520 mE	DRILL TYPE: HPP-150	HOLE STARTED: 15/7/15
R.L. 2.00 m	DRILL METHOD: Wash + HQ3	HOLE FINISHED: 16/7/15
DATUM WELLHT1953	-3 DRILL FLUID: Water	DRILLED BY: Webster Drilling
		LOGGED BY: NAMM CHECKED: MJRB

GEOLOGICAL		ENGINEERING DESCRIPTION															
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.	FLUID LOSS WATER CORE RECOVERY (%) METHOD CASING	TESTS	SAMPLES	N.R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE / WEATHERING CONDITION	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)			COMPRESSIVE STRENGTH (MPa)			DEFECT SPACING (mm)	SOIL DESCRIPTION Soil type, minor components, plasticity or particle size, colour.  ROCK DESCRIPTION Substance: Rock type, particle size, colour, minor components. Defects: Type, inclination, thickness, roughness, filling.
										10	25	100	200	50	100		
VOID					1.7		NOT USED	-	-							Drilling from wharf level. 1.7m deep void below wharf level.	
FILL				3/2/2/2/1 N = 7	2.0		M	L								Sandy, fine to coarse GRAVEL, brown. Loose, moist. Gravel, subangular, moderately weathered, strong. Sand, fine to coarse.	
					2.0		-	-								No recovery (wash boring)	
CONCRETE					2.5 - 3.0		-	-								2.5 to 3.0m- Concrete (base of sea wall).	
GREYWACKE SANDSTONE					3.0		HW	W								Highly weathered, dark yellowish brown SANDSTONE; weak, moderately to very steeply inclined, smooth and undulating, closely spaced defects. Manganese staining. From 3.0 to 3.3m depth: recovered as coarse gravel and cobbles (drilling induced)	
					3.3 - 3.66		-	-								3.3 to 3.66m- Core loss	
					3.3 - 3.66		HW	W								SANDSTONE, as above	
					5.8											End of bore hole at 5.80m (target depth)	

T-T DATATEMPLATE-SPT.GDT mjb

# BOREHOLE LOG

**BOREHOLE No: BH6**  
 Hole Location: Refer to site plan  
 SHEET 1 OF 1

PROJECT: WCC-SHELLYBAYSHED8 LOCATION: SHED 8, SHELLY BAY JOB No: 85856.004

CO-ORDINATES 5988696 mN DRILL TYPE: HPP-150 HOLE STARTED: 30/7/15  
 (NZMG) 2662519 mE DRILL METHOD: Wash + HQ3 HOLE FINISHED: 31/7/15  
 R.L. 2.00 m DRILL FLUID: Water DRILLED BY: Webster Drilling  
 DATUM WELLHT1953 LOGGED BY: NAMM CHECKED: MJRB

GEOLOGICAL		ENGINEERING DESCRIPTION												
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.	FLUID LOSS WATER CORE RECOVERY (%) METHOD CASING	TESTS	SAMPLES N <sub>R.L.</sub> (m) DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE CONDITION WEATHERING STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)			COMPRESSIVE STRENGTH (MPa)			DEFECT SPACING (mm)	SOIL DESCRIPTION Soil type, minor components, plasticity or particle size, colour.  ROCK DESCRIPTION Substance: Rock type, particle size, colour, minor components. Defects: Type, inclination, thickness, roughness, filling.
							10	25	50	50	100	200		
CONCRETE					NOT USED	-	-							Concrete (floor slab)
VOID														Drilling from wharf level (0.45m deep void below floor slab).
FILL			N=0 Sunk under weight of hammer			M	VL							No recovery. Logged from exposure: Medium GRAVEL with some sand, brown. Very loose, moist. Gravel, subangular, slightly weathered, strong. 0.5
			N=0 Sunk under weight of hammer			-	-							No recovery (wash boring) 1.0 No recovery.
			1/0/0/1/2 N=3			M	VL							No recovery (wash boring) 1.5 Sandy, medium to coarse GRAVEL, brown. Very loose, moist. Gravel, subangular, slightly weathered, strong. Contains some brick.
			5//1/2/1/2 N=6			M	L							No recovery (wash boring) 2.0 Sandy, fine to coarse GRAVEL with some silt and minor clay, orangish brown. Loose, moist. Gravel, subangular, slightly weathered, strong.
			46//4 for 4mm N > 50			M	VD							No recovery (wash boring) 2.5 Silty, fine to coarse SAND with some gravel, light brownish orange. Very dense, moist.
GREYWACKE SANDSTONE						HW	WW-W							Highly weathered, dark yellowish brown, SANDSTONE; weak-very weak, moderately to very steeply inclined, smooth and undulating, closely spaced defects. Manganese staining. 3.0
														End of borehole at 4.5m (target depth) 4.5

T-T DATATEMPLATE-SPT.GDT.mrtb





Customer Ref: 85856.004/1  
Job No: 680644.000  
18 August 2015

Tonkin & Taylor  
PO Box 5271  
Wellesley Street  
Wellington

Attention: Nick McLean

Dear Nick

**Shed 8, Shelly Bay**  
**Laboratory Test Report**

Samples from the above mentioned site have been tested as received and according to your instructions. Test results are included in this report.

Samples not destroyed during testing will be retained for one month from the date of this report before being discarded.

Please reproduce the report in full when transmitting to others or including in internal reports.

If we can be of any further assistance, feel free to get in touch. Contact details are provided at the bottom of this page.

GEOTECHNICS LTD

Report prepared by:

.....  
Rongomai Hoskin  
Laboratory Support Coordinator

Authorised for Geotechnics by:

Paul Burton  
cn=Paul Burton, c=NZ,  
o=Geotechnics,  
email=pburton@geotechnics.co.nz  
I have reviewed this document  
2015.08.18 11:07:27 +12:00

.....  
Paul Burton  
Project Director

Report checked by:

.....  
Alan Benton  
Wellington Manager

This report consists of 2 pages.

18-Aug-15  
t:\wellington\geo projects\680644\workingmaterial\20150818.shed8.rep1.docx



2 Hunter Street,  
Wellington 6011  
New Zealand

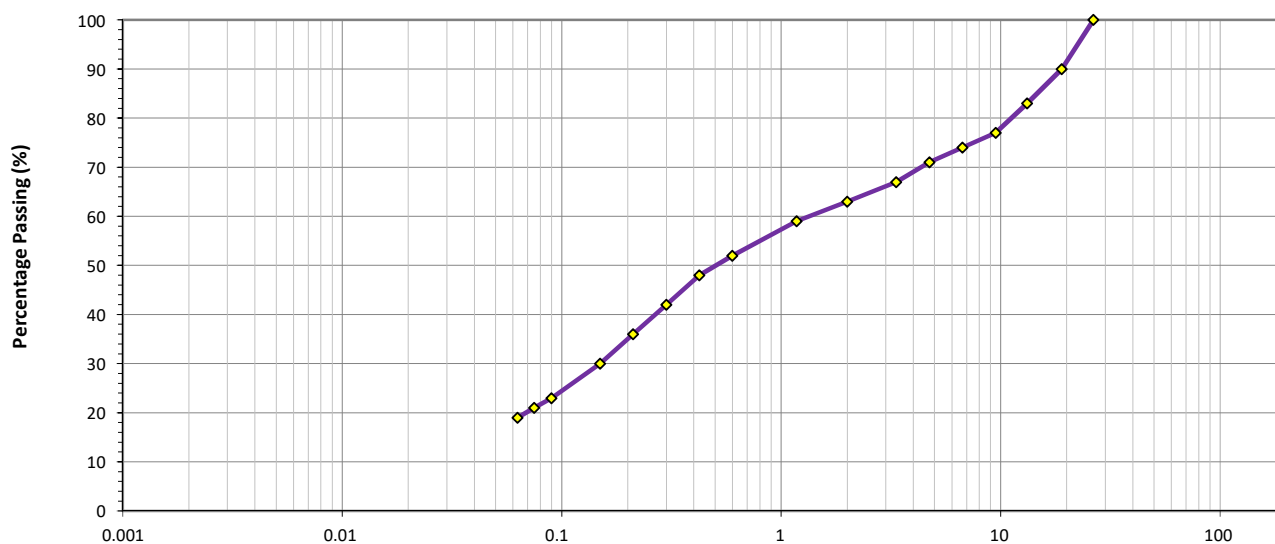
p. +64 4 381 8584

**Geotechnics Project ID** 680644  
**Customer Project ID** 85856.004  
**Customer Project Name** Shelly Bay

### DETERMINATION OF THE PARTICLE SIZE DISTRIBUTION - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS			
<b>LOCATION</b>	<b>ID</b>	BH6	
	<b>Description</b>	Shed 8 remedial works	
	<b>Data</b>	N/A	
<b>SAMPLE</b>	<b>Geotechnics ID</b>	GEOT201508102	<b>Date Received</b> 6/08/2015
	<b>Reference</b>	PSD1	<b>Depth</b> 2.00m
	<b>Description</b>	Gravelly fine to coarse SAND with some silt, grey. Moist, gravel is rounded to sub-angular, well graded.	
<b>SPECIMEN</b>	<b>Reference</b>	N/A	<b>Depth</b> N/A
	<b>Description</b>	N/A	

### TEST RESULTS



Clay	Silt		Sand			Gravel				
	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	v. coarse

Particle Size (mm)

Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	100	4.75	71	0.300	42
100	-	19.0	90	3.35	67	0.212	36
75.0	-	16.0	-	2.00	63	0.150	30
63.0	-	13.2	83	1.18	59	0.090	23
53.0	-	9.50	77	0.600	52	0.075	21
37.5	-	6.70	74	0.425	48	0.063	19

### TEST REMARKS

- The material used for testing was natural, whole soil.
- The percentage passing the <0.063mm was obtained by difference.

**Approved By** RTH **Date** 17/08/2015



# Memo

<b>To:</b>	<b>Cathie Guthrie</b>	<b>Job No:</b>	<b>85856.004</b>
<b>From:</b>	<b>Andrew Kennedy</b>	<b>Date:</b>	<b>22 August 2017</b>
<b>Subject:</b>	<b>Shelly Bay Shed 8 August 2017 Update</b>		

## 1 Introduction

T+T undertook an initial inspection beneath the wharf adjacent to Shed 8 in December 2014. The inspection revealed extensive undermining of pile caps and perimeter foundation beams over a large area along the building's western edge. The pile caps and beams appeared to be in sound condition however many of the timber piles were either substantially degraded or completely disconnected from the pile cap.

Emergency remedial works was commissioned by WCC in December 2015 to reinstate support to pile caps. Remedial works included installing temporary steel props to provide some support to pile caps and installing plywood boards to replace damage timber rails to protect the foundations from further erosion from the sea.

A monitoring regime was then implemented and is ongoing at the time of writing this memo.

As an indication of when WCC should be seeking to complete permanent repair works T+T provided initial guidance for works to be in place within 1 year of installing the temporary propping, i.e by December 2016.

Because of uncertainty in the future development of the area WCC has held off on implementing robust permanent remedial works, and now seeks to further defer any permanent works.

## 2 Summary of Observations from Monitoring

To date, 23 inspections have been undertaken since our inspection in December 2015. The key observations are:

- There has been progressively more damage to the plywood facing installed in December 2015 and this is now disconnected from the timber bottom plate attached to the seawall at some locations.
- Further damage to the existing timber vertical railings has occurred during the period of our inspections.
- On 19/08/2016 further damage to the timber railings identified that the undermined area extended further north. Three more piles were identified as being damaged and providing little or no support to the pile caps (refer T+T Figure 1. Foundation Plan dated 25/08/2016).
- No evidence of any further undermining of the foundations.
- No evidence of any further damage to the concrete seawall.
- No evidence of an increase in load being transferred to the piles.
- No evidence of any cracking or other damage to the foundations.

- Other than some minor surface corrosion there is no evidence of any damage to the temporary props that have been installed.

We understand that Hampton Jones Ltd were commissioned by WCC to undertake a building survey in December 2016 and there was no evidence of any recent internal damage that may suggest the western edge of building has settled.

### **3 Conclusions**

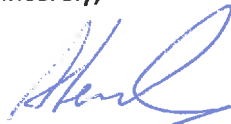
Our conclusion is that the risk to the building is currently the same (or with negligible change) as our assessment in December 2015, therefore we consider it is acceptable to defer the permanent works and use the building in its currently occupied state provided that:

- The current monitoring regime (refer VO2, dated 21 March 2016 for details) is maintained,
- Remedial works outlined in section 4 below are implemented,
- An internal survey of the building is undertaken by a professional Civil / Structural Engineer and that this Civil / Structural Engineer undertakes a Peer Review of the conclusion of this report for WCC,
- WCC has a procedure for evacuating the building in the event of a moderate earthquake event or greater,
- A review of this document and its conclusions is undertaken on or before end August 2018 to review the risk associated with occupying the building.

### **4 Recommendation for physical works to be implemented**

- The existing section of plywood boarding is providing protection to the ground supporting the foundations and should be repaired to secure it in place.
- The area of plywood boarding should be extended to the north to cover the gaps in the pre-existing vertical timber lagging.
- Temporary propping should be constructed under the damaged foundations identified in Void D as per T+T letter report dated 30 January 2015.

Yours sincerely,



Andrew Kennedy

Project Director

23-Aug-17

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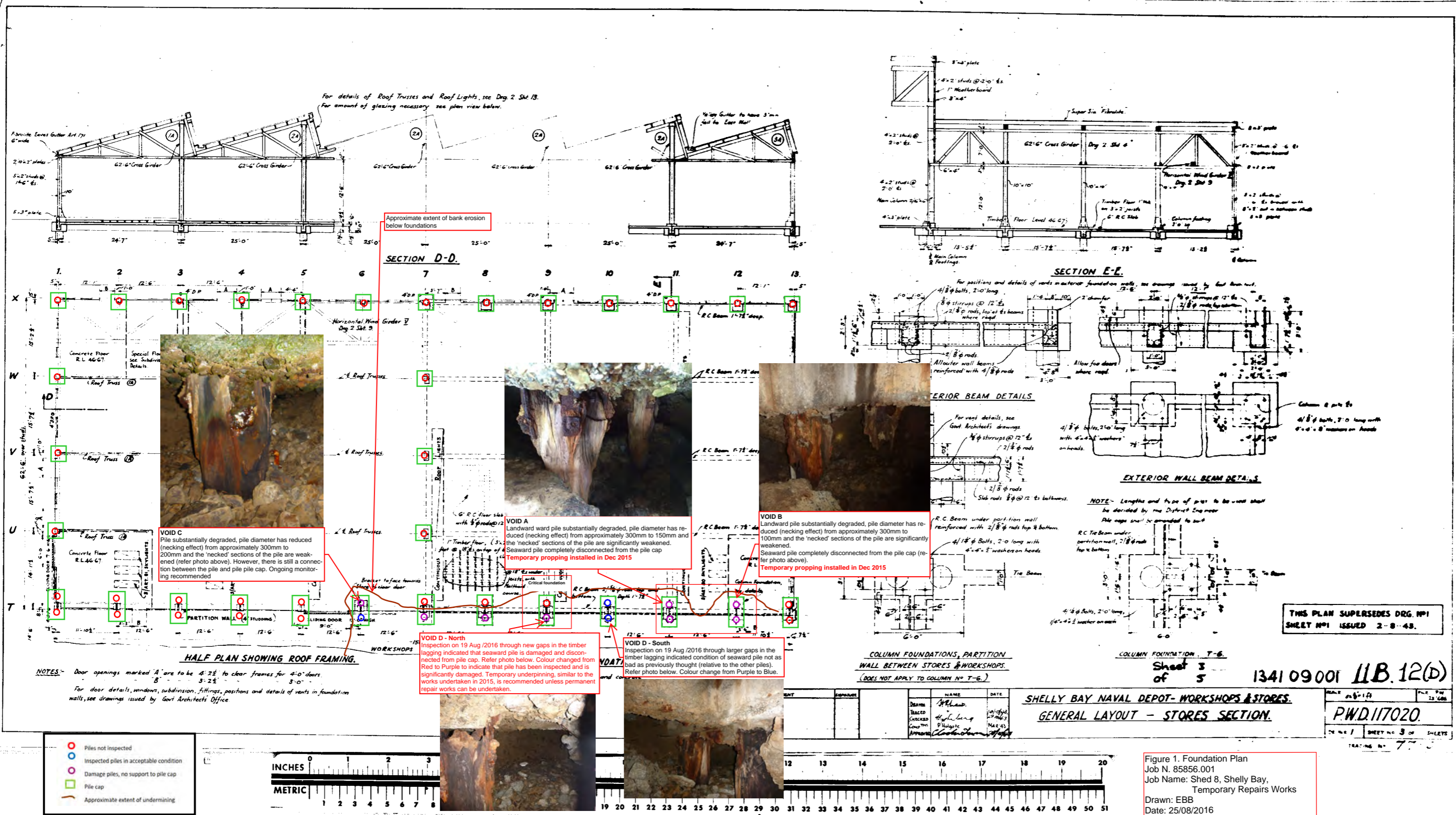


Figure 1: Foundation Plan  
 Job N. 85856.001  
 Job Name: Shed 8, Shelly Bay,  
 Temporary Repairs Works  
 Drawn: EBB  
 Date: 25/08/2016