TRADE CONTRACTORS SUBMITTAL RECORD (TSR)

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Document title: Method Statement for Sonic Logging – Chum System

Method Statement	**X**	**Quality & Environmental Plan**	
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Calculation		**Inspection or Test Record**	
Other			

Lead Consultant Comments:	**Consultant Comments:**
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Expanded Limited

Contract Number: A2611

Canary Wharf Crossrail Station

Method Statement for:

SONIC LOGGING (PMC)

Ref No. 61101-2200-MS080

Revision	Prepared by	Date	Approved		Date
00	PMC	03/07/09	**Expanded Limited**	A Passmore	03/07/09

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PMC Precision Monitoring & Control ltd.

The Independent Pile Testing Specialists

Precision Monitoring & Control

METHOD STATEMENT

FOR

SONIC LOGGING – CHUM SYSTEM

PROJECT:- **ISLE OF DOGS STATION**
CROSSRAIL PROJECT
CANARY WHARF

PREPARED FOR CLIENTS:- **EXPANDED PILING**

Date:- **JULY, 2009**

Rev (01)

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1. INTRODUCTION

This statement is intended to describe the method and equipment employed in performing crosshole sonic logging of foundation structures such as piles and barrettes. This type of test, along with all aspects of indirect, non destructive testing should be viewed in conjunction with all available pile construction details when assessing pile acceptability.

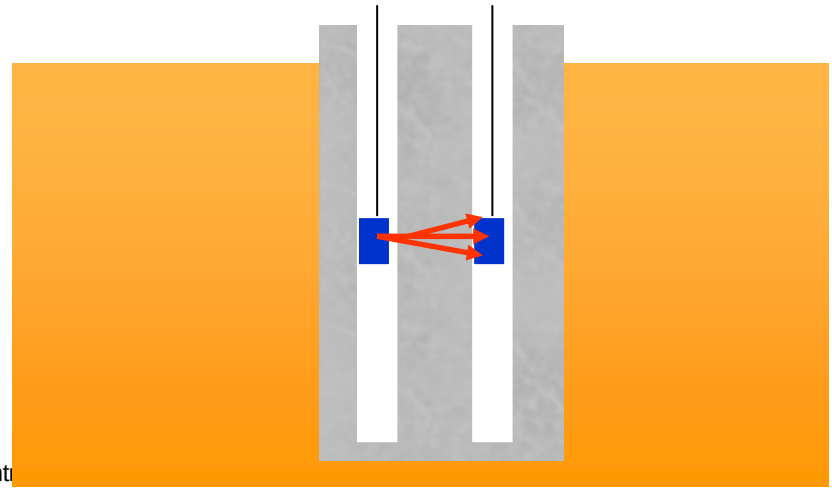
2. DESCRIPTION OF TECHNIQUE

Information on pile identity, length and diameter, construction type, installation and strata details are supplied by the client prior to the testing programme.

The technique is usually carried out within preformed access tubes set into cast in-situ piles. It is normal to have a minimum of three access tubes in piles and four tubes for piles of 1m diameter and upwards. The transit time between each pair of access tubes is checked in turn. Thus 3 tubes will yield 3 sets of traces and 4 tubes will yield 6 traces.

The test is carried out by first ensuring that the tubes are free from blockages throughout their entire length, and that they are filled with fresh water to provide an acoustic coupling between the probes and the walls of the access tubes. The probes are then lowered in adjacent tubes to the base of the pile. The probes are light and suspended by their connecting electrical cables, which transmit the test signals to the surface data acquisition unit. The probes are lifted smoothly and simultaneously up the pile to provide a display of the transit time against depth for the transmitter and receiver probes. Once the top of the pile is reached the data is checked for significant defects and stored digitally in the data acquisition unit. The next pair of access tubes is then analysed in the same manner.

Upon returning to the office the signal traces are downloaded to personal computer and printed in a formal report.



3. CHUM THEORY

The CHUM utilises the greatly enhanced power of the current generation of ruggedised site computers and is therefore capable of storing all raw signals for subsequent further analysis in the office.

The CHUM presents the stored data not as a series of black and white pixels but as two separate lines detailing the first arrival time (FAT) and the relative energy of the received signals.

- First Arrival Time (FAT)

The FAT is an indication of the time taken for the transmitted pulse to travel through the pile medium and be received by the receiver.

- Relative Energy

The relative energy line is calculated by integrating the pulse envelope for each and every pulse. The value calculated is proportional to the received energy in joules. Since the energy of the signals the transmitter transmits is approximately constant, it is also expected to be approximately constant at the receiver.

Relative energy values, on the other hand, are related to changes in concrete quality only and are therefore a very good indication. For this reason no units are assigned to this curve and are therefore kept as a relative measurement. Absolute energy values on the other hand are affected by the transmitted energy, the signal frequency and the distance the signal travels. Those parameters are related to the test procedure and equipment and not to the concrete quality and therefore give no indication about the concrete quality.

When an anomaly in the tested medium blocks the signal, it absorbs some (or all) of the transmitted signal, and a lower energy (if any) is read at the receiver. Some defects can significantly reduce the received energy but not change the first arrival time (FAT) since a direct path between the transmitter and the receiver still exists. If energy drops sharply and significantly, there is a good possibility to find an anomaly.

It should be noted that within the CHUM profiles both FAT and relative energy are essential and complementary components. It is incorrect to rely only on FAT.

Significant anomalies are highlighted by a sharp increase in FAT and decrease in relative energy.

4. EQUIPMENT

5. SETTING UP

- Ensure client has secured reasonable access to pile head locations and that ALL access tubes are free from damage and debris and that all access tubes are filled with fresh water.

- Switch on the instrument, and wait for the windows main screen to appear
- Double click with the pen on the CHUM icon. The CHUM main screen will appear
- Click File and then, if applicable NEW PROJECT buttons, then insert location name or project number. You can enter the name by pressing the little A button, and the soft keyboard will appear. You can then enter the projects name by tapping the suitable keys with the pen.
- Press the OK button
- Enter suitable text on the title and subtitle lines (optional)
- Press the big  button to activate the pile screen**.**

6. TESTING

The test wizard consists of several stages :

- Pile details
- Leveling the probes
- Start pulling
- Logging
- Analysis

To move between the test phases, click the NEXT and BACK buttons

The pile name is displayed on the window caption.

6.1 PILE DETAILS AND GEOMETRY

In this screen, enter information about whole pile;

Pile name

Sub-site

Diameter

Access tube arrangement

Sub-sites are a useful way of breaking up a big project into smaller units, e.g. different buildings. By default, all piles belong in the “default” sub-site. To create a new sub-site, press the NEW button and the new sub-site screen will appear:

Both SAVE buttons exits the wizard and saves all changes.

SAVE FULL : Each pulse is saved, files are big, FAT can be picked on each pulse.

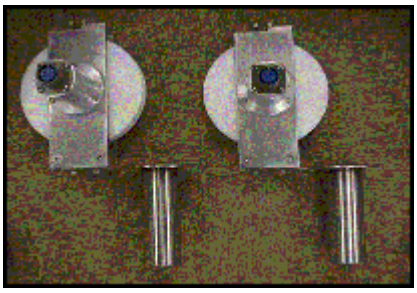
SAVE COMPACT : Only arrival time and energy are recorded in the files.

REPORT button prints a report from this pile only.

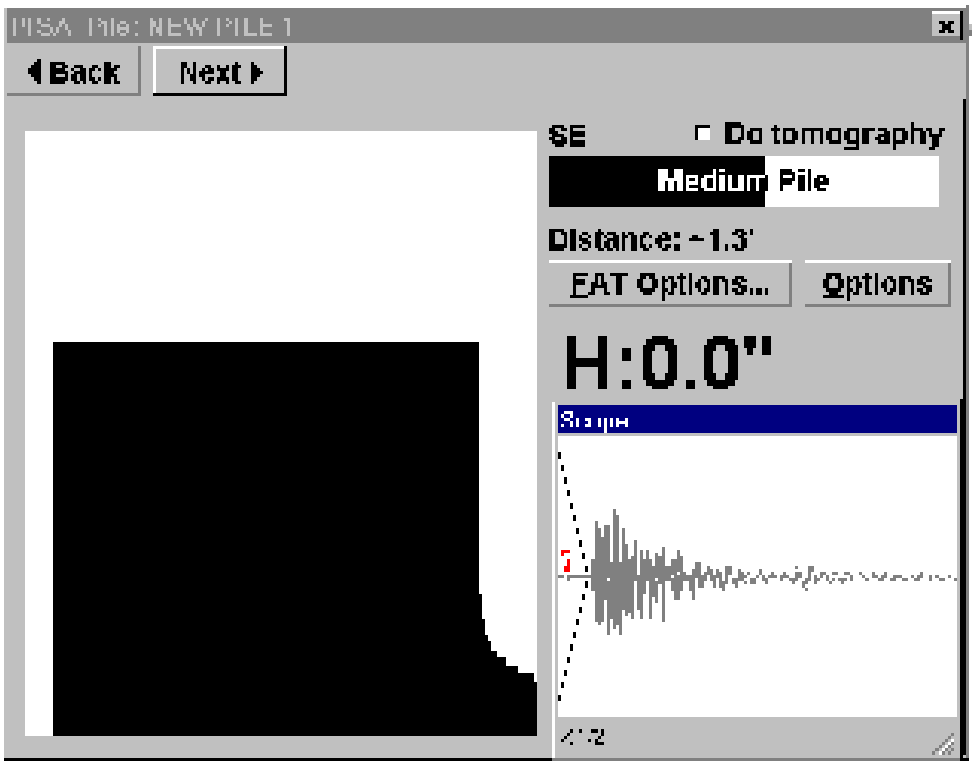
The little tab sheets on the bottom left-hand corner enable you to specify the pipe arrangement you are going to test.

Tested cross-sections are painted with a thick red line – this way you can always see what sections are still untested.

Place the pulleys on top of two of the access tubes, lower both transmitter and receiver ALL THE WAY TO THE BOTTOM.



Click on the section to be tested and press [NEXT] and the levelling screen will appear.



Whilst in the levelling screen, you may move any of the probes up or down in order to bring them to the same level. This is accomplished by observing the following indicators:

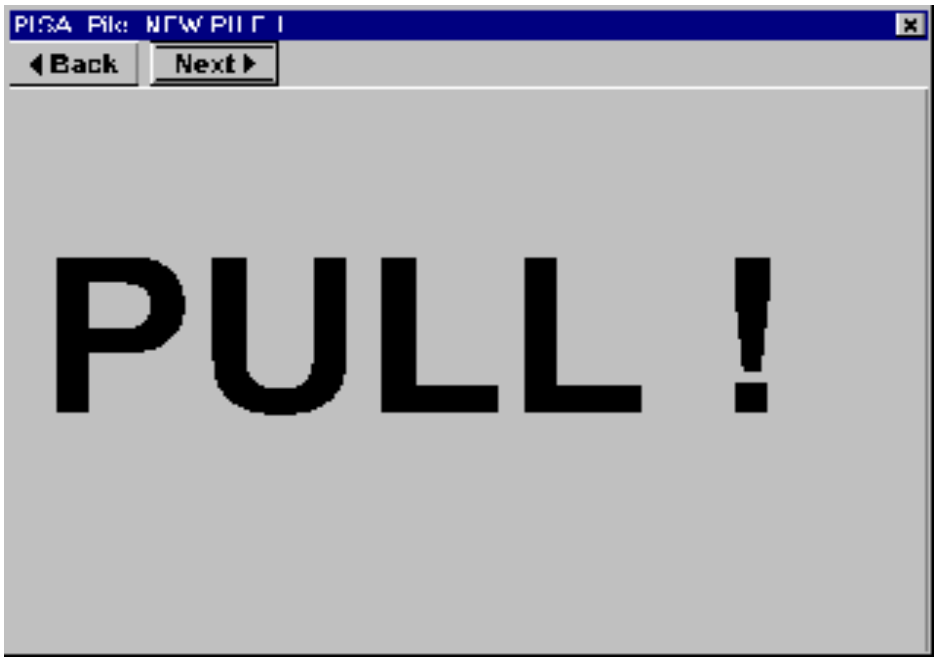
The black strip being closest to the left hand side of the screen and also the widest.

The signal on the scope window is the strongest (low gain)

Distance on the meter is minimal (This should be roughly equal to the measured distance between the tubes)

You may have to carry out this procedure a few feet off the bottom if the pile base is anomalous.

Having satisfied the levelling criteria, click [NEXT] and the pulling prompt will appear.



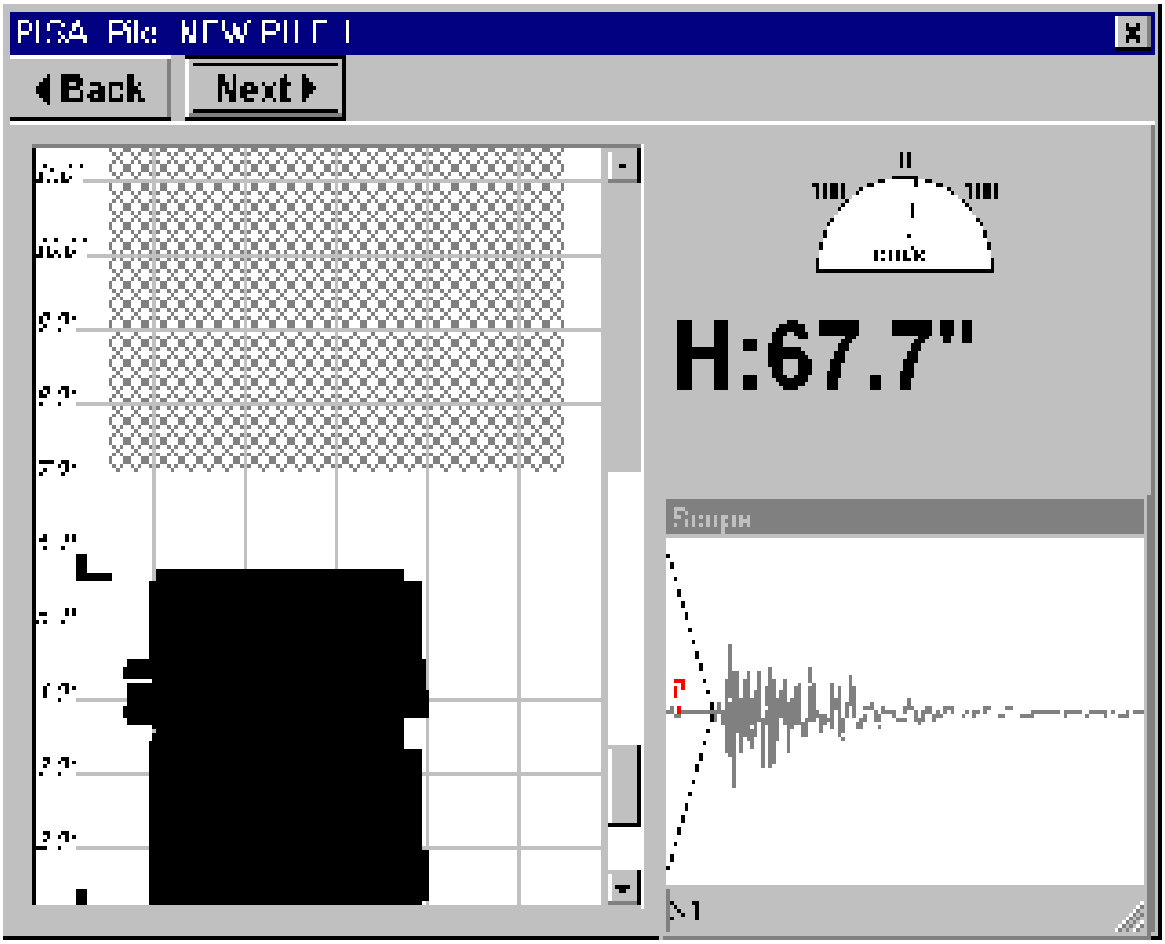
CHUM will move to the logging phase when you start pulling. At this stage start pulling both cables together, hand after hand, as smoothly as possible until both probes reach the top.

The rate of pulling should be

no more than 2m per second.

6.2 LOGGING

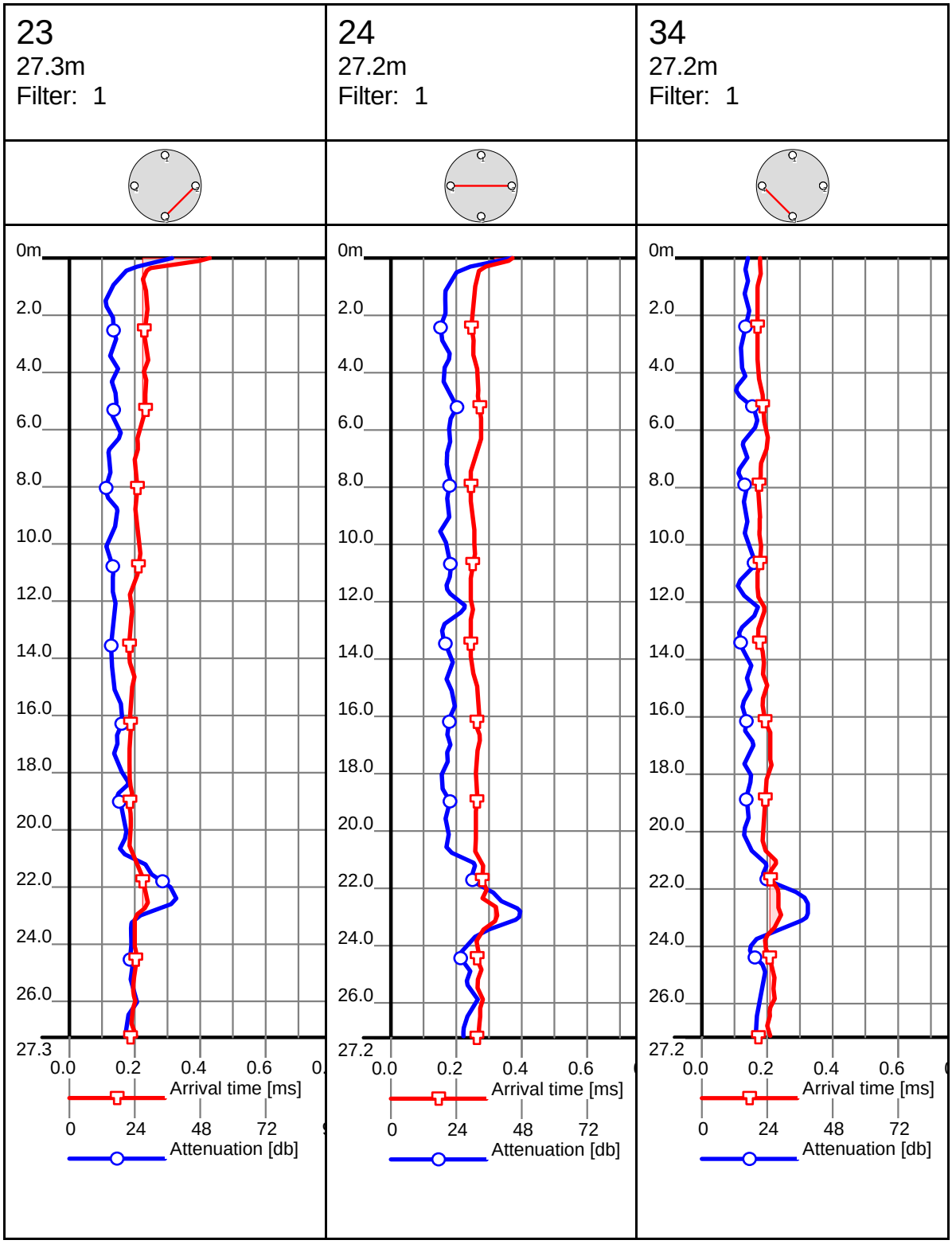
The data collection screen is similar to the levelling screen, except for the vertical depth axis along the signal strip on the left hand side of the screen, as well as no distance (between the transducers) presented in the meter area. The plot will scroll upward as the cables are pulled up. In suspect areas of concrete, the probes can be raised and lowered to try and increase the number of data points taken. The plot of the signal strength will scroll along up and down as the cables are pulled up and down. Suspect zones will be noticeable when the strip is thinner and/or when the left edge of the strip is further away from the depth axis (increase in FAT).



When logging is complete click [NEXT] and then repeat all steps from profile selection.

7. PRESENTATION

The results of the profile are normally presented as follows indicating FAT (First Arrival Time) and relative energy, using a filter level of 1:

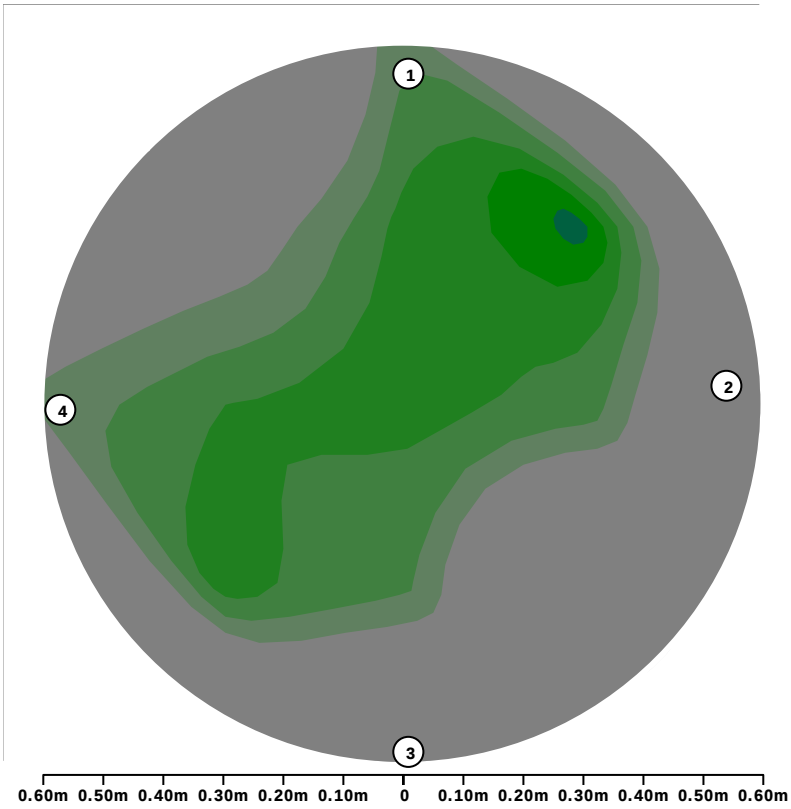


⇐Typical traces indicating anomaly within pile shaft between 22 and 24 metres depth

8. ANALYSIS

Once the test traces have been checked by a suitably qualified person, further investigation may be required if anomalous results are highlighted. Firstly, if possible the profiles in question should be relogged some time after the initial set of runs. If the same profiles are recorded then all pile construction records should be checked to ascertain any pertinent points that could provide the reasons why the traces were recorded. To aid the investigation process, further analysis software may be introduced to produce the data in 2D or 3D format. Should nothing be shown within the records then the Engineer will have to decide whether the affected traces are significant to the performance of the pile in service.

-23.2metres



CHUM SONIC LOGGING SYSTEM

CTP1TOM

C <3428 m/s