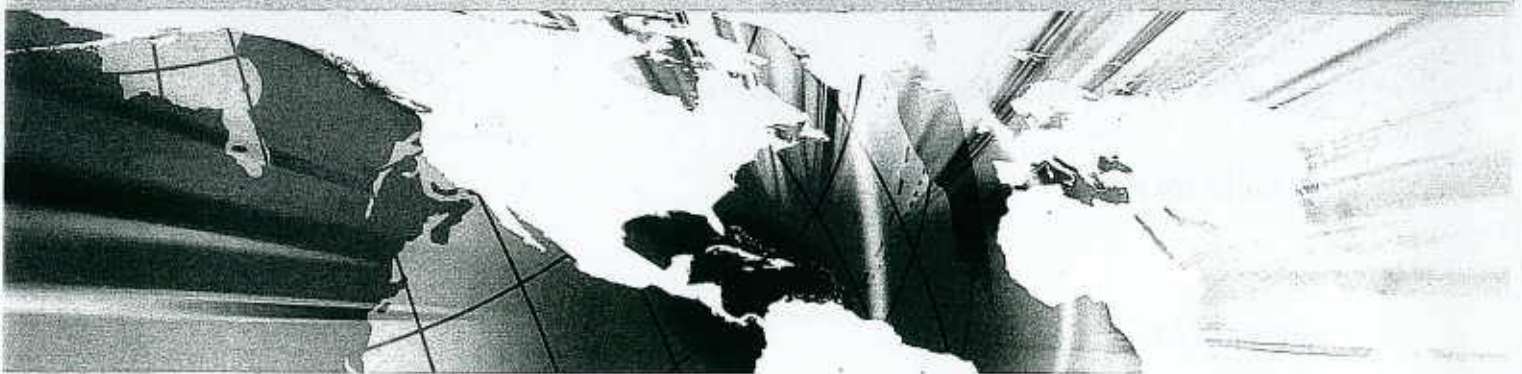


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**INTERSERVE**

**Underground Caverns at Rhydymwyn, Mold**

**Report on Inspection, Remedial Works and Monitoring**

**21 March 2013**

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Wardell Armstrong  
Sir Henry Doulton House, Forge Lane, Etruria, Stoke-on-Trent, ST1 5BD, United Kingdom  
Telephone: +44 (0)845 111 7777 www.wardell-armstrong.com



**DATE ISSUED:** 21 March 2013  
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**REPORT NUMBER:** J08

**INTERSERVE**

**Underground Caverns at Rhydymwyn, Mold**

**Report on Stability Inspection and Remedial Works**

**21 March 2013**

**PREPARED BY:**

[Redacted] Applied Geologist

[Redacted] Associate Director

**APPROVED BY:**

[Redacted] Technical Director

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## DRAWINGS

Drawing No.	Title	Scale
NL00910/01	Plan of Caverns for Reference	NTS

## APPENDICES

Appendix 1	Tell Tale Monitor Results (2001 to 2013)
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## 1 INTRODUCTION

- 1.1 This report has been prepared in accordance with order number DF44570 provided by ██████████ Interserve on 13 February 2013 in accordance with Wardell Armstrong's proposal letters dated 23 November 2012 and 24 January 2013.
- 1.2 This report comprises the results of the inspection and remedial works carried out during February and March 2013.
- 1.3 Wardell Armstrong (WA) carried out the inspection between 28 February 2013 and 8 March 2013, assisted by T L Excavations Ltd. Appropriate health and safety measures were implemented and the work consisted of the following:
- Examination of the tell tale monitoring stations;
  - Visual inspection of the Caverns, ventilation shafts and ventilation cross cut tunnels;
  - Sounding inspection of discrete areas identified during the visual inspection and during previous work from a mobile access platform;
  - Inspection of the concrete lined ingress and egress tunnels;
  - Clearing the floor of fallen debris.
- 1.4 The purpose of the inspection was to determine whether the Caverns are in a suitably stable condition to allow for the safe entry of the Caverns by members of the Inspectorate for Chemical Weapons. The north-south orientated Caverns are defined as A-D on the attached Drawing No. NL00910/01. The east-west orientated tunnels are referred to as cross-cut tunnels.
- 1.5 The inspection coincided with a phase of monitoring/remediation which comprised the following:
- Investigation and remedial works to Cavern A Drainage System;
  - Installation of metal mesh to prevent spalling of concrete into the cavern entrance portal;
  - Removal of limescale build up on metal floor grilles;
  - Radon monitoring;
  - Replacement of Cavern roof water catchment and drainage;
  - Installation of second water catchment hopper;
  - Provide and install replacement door on northern access tunnel;

- Paint main entrance doors and internal barrier;
- Installation of steel access decking to the main entrance.

1.6 The remediation works described above had previously been recommended in Wardell Armstrong's report J07 with additional work items agreed at a meeting which took place on 20 December 2012.

## 2 STABILITY INSPECTION OF CAVERNS

### *Tell Tale Monitoring Stations*

- 2.1 A total of twelve tell tale monitoring stations have been installed within the Caverns to monitor movement of fractures. The approximate locations of the Tell Tales are indicated on Drawing No NL00910/02.
- 2.2 In April 2001 eight tell tale monitoring stations were installed on the concrete and brick buttressing at D1 (TT1 to TT3 and TT5 to TT9) to monitor stability. A tell tale was also installed above the entrance to the southern ventilation shaft tunnel at the southern end of Cavern D opposite the concrete buttress (TT4) where a fracture was evident and one installed at position D2 (TT10) where another fracture in the natural rock pillar had been observed.
- 2.3 Two additional tell tales were installed in 2007 to monitor a fracture on the Cavern wall above the entrance to the southern shaft (TT11) and a fracture identified on the concrete floor parallel to the south western trench of Cavern C (TT12).
- 2.4 The monitoring stations were installed with the crosshairs in their central position. The results of the recent inspection of the stations are provided in Table 1 below and graphically at Appendix 1.
- 2.5 Tell tales TT1, TT5 and TT6 were destroyed during remedial works carried out in 2011.

Table 1 Summary of Tell Tale Monitoring Results		
Monitoring Station	Results	
	26/6/12 to 8/3/2013	Total (Since 2001)
TT1	<i>Destroyed as part of 2011 works</i>	-
TT2	0.5mm horizontal	2mm horizontal and 1mm vertical
TT3	0.25mm horizontal and 0.5mm vertical	0.75mm horizontal and 1.75mm vertical
TT4	0.5mm horizontal and 0.5mm vertical	0.75mm horizontal and 0.75mm vertical
TT5	<i>Destroyed as part of 2011 works</i>	-
TT6 (Refix)	<i>Destroyed as part of 2011 works</i>	-
TT7	0.5mm vertical	2mm horizontal and 0.5mm vertical
TT8	0.25mm vertical	1.5mm horizontal and 1.5mm vertical
TT9	0.25mm horizontal and 0.75mm vertical	0.75mm horizontal and 2mm vertical
TT10	0.25mm horizontal and 0.75mm vertical	0.75mm horizontal and 0.75mm vertical
		<b>Total (Since 2007)</b>
TT11	0.75mm horizontal	0.75mm horizontal and 0.25mm vertical
TT12	0.5mm vertical	0.25mm horizontal and 0.25mm vertical

- 2.6 The tell tale monitoring results show that minimal movement has occurred between the monitoring carried out on 26 June 2012 and the most recent monitoring carried out on 8 March 2013. TT9 and TT10 had the greatest movement of 0.25mm horizontally and 0.75mm vertically.

### **Visual Inspection**

#### *Cavern Roofs and Walls*

- 2.7 The inspection showed that there had been no significant fall of rock in the Caverns and access tunnels since the last inspection carried out on 26 June 2012.
- 2.8 Inspection of the white washed pillar wall above the concrete and brick buttressing at D1 revealed that the weaker shale continues to spall but in minor quantities.
- 2.9 Inspection of the remaining concrete and brick buttressing of the pillar at D1 did not identify any evidence of instability during the interim period since the main buttress was demolished in 2011.
- 2.10 The concrete buttressing at D4 in Cavern D adjacent to the entrance of the cross cut tunnel to the northern ventilation shaft, as indicated on Drawing No. NL00910/02, continues to crumble and fresh spalled material was evident. This has been identified over many years and is not considered to require any remedial works.
- 2.11 A general visual inspection of the Cavern walls was carried out. Although spalling rock from the walls does not pose as much a risk as rock falling from the roof, the condition of the walls provides an indication of the overall stability of the Caverns.
- 2.12 The walls in Cavern C and D at several locations, have been identified as a risk of potential significant rock spall which may require remedial measures, such as bolting, to prevent damage occurring to the main Cavern floors and, potentially, leading to further instability to the cavern roof. A detailed inspection of all the Cavern walls would be necessary to assess specific risks in order to determine whether remediation measures are required.

#### *Cavern Floor*

- 2.13 The Cavern floor was visually inspected as in previous years and was assessed as being in good condition. The fractures in the floor of Cavern D are considered to be

stable. The fracture at TT12 in Cavern C shows very limited movement (0.25mm horizontal and 0.25mm vertical). This does not constitute a stability issue at present; however, inspection of this area should continue.

2.14 The floor of the Caverns is suspended over the true floor at a height of between 1 metre and 1.5 metres. The intervening space is flooded and filled with debris including steel. Caverns C and D contain concrete trenches running parallel to the Cavern walls. During April 2001, barriers were erected around the trenches in Caverns C and D and exit signs installed within the Caverns. The barriers and exit signs remain in good condition.

2.15 In Caverns C and D, fracturing of the suspended floor (in that part of the floor between the two trenches) running parallel to and adjacent to the trenches was noted. This suggests that at some time, the suspended floor had been settling into the trenches. However, a mortar mix had been spread across these fractures on 9 March 1997 and since this date; no further movement has been observed on the fractures.

2.16 A visual inspection of all the grilles was carried out as part of the works to clear the limescale covering some of the grilles. Two grilles were observed to be severely corroded to the point where they have begun to disintegrate.

#### *Shafts and cross-cut tunnels*

2.17 An assessment of the shafts was undertaken which included an inspection of the shaft caps, shaft bases and the cross-cut tunnels linking the shafts to Cavern D. The shaft caps comprise approximately 4 metre square concrete slabs containing grilles to allow ventilation.

2.18 The caps are in good condition with only minimal signs of weathering. When inspected from below, the shafts can be seen to be in good condition, showing no signs of instability or collapse since the previous inspection. Access to the base of the northern shaft is via a steep rock slope which was not climbed during the inspection. The base of this shaft was inspected remotely from the base of the rock slope. No defects were identified in the shaft column.



- 2.19 The cross cut tunnels to the shafts are driven through a poorer quality rock than the rock which is found in the main Caverns. These tunnels are in a thinly bedded shaley limestone which is, in part, flaking from the roof. The roof bolts and plastic mesh installed in the roof of these areas in 2011 has assisted in stabilising the rock. No evidence of significant spalled rock was seen within the mesh.

*Cavern Access and Egress*

- 2.20 Access to the Caverns is via a main central concrete lined access tunnel. Secondary access and egress is provided via a northern concrete lined tunnel. The southern access tunnel is blocked at the entrance and can only be accessed from within the Caverns.
- 2.21 These tunnels were visually inspected and the concrete was identified to be in good condition, showing little signs of deterioration with the exception of limited water ingress at distinct locations. However, a large portion of the metal arches lining the tunnel appear to be severely corroded.
- 2.22 In places the concrete lining the southern access tunnel was fractured and water was running onto the floor. The inspection of the fractured and water ingress points did not identify any evidence of significant instability at these locations. It is recommended that this tunnel and the areas of fracturing continue to be examined for evidence that the concrete is deteriorating.
- 2.23 Directly within the cavern entrance portal previous inspections had determined that the concrete had deteriorated in part where the concrete roof is bisected by the former Cavern ventilation system, posing a risk to visitors to the Caverns. Remediation works were carried out to mitigate this hazard and are discussed later in this report. This area is indicated on Drawing No. NL00910/02.
- 2.24 The floor outside at the main central access/egress portal is clear of debris and provided a safe means of access. However, it was agreed that a steel walkway would be installed to allow visitors to walk to the main entrance door from the main roadway to negate disturbance to ecologically sensitive areas and to avoid walking through water in times of heavy rainfall. The steel walkway was installed during the 2013 remedial works and is described later in this report.

### **Sounding Inspection**

- 2.25 A sounding inspection was undertaken from a mobile access platform using a pinch bar to inspect the roof of all the Caverns to identify "hollow" areas. The "hollow" nature of the rock is identified by the sound emitted when struck with a steel bar. This indicates that this section of the roof is loose from the overlying rock and increases the potential for sudden roof collapse.
- 2.26 Three specific areas where significant roof material was barred down occurred at the following approximate locations within the Caverns (indicated on Drawing No. NLO0910/02):
- convergence point A5;
  - the corner of the pillar immediately west of convergence point B2;
  - 15m north of convergence point B3.
- 2.27 The material was barred from the edge of roof slabs previously identified as being a hazard of falling due to sounding hollow previously. The material at each location comprised less than a volume of approximately 1.0m by 1.0m. There was also occasional "hollow" spots identified in Caverns C and A.
- 2.28 During the roof inspection of Cavern D outside the entrance to the tunnel leading to the southern ventilation shaft, the sounding inspection encountered significant "hollow" roof indicated on Drawing No. NLO0910/02. This area continues to pose a significant hazard and it may be necessary to cordon off the area to visitors or erect supports.
- 2.29 During the 2012 inspection, an approximate area of 12m x 4m, was identified to be "hollow", located approximately 15m to the north of the main entrance tunnel adjacent to convergence point B3 shown on Drawing No. NLO0910/02. TL Excavations marked up the floor beneath this area to provide warning of loose rock above. A significant spall was identified associated with this area during the 2013 inspection and this particular area poses a safety risk.

- 2.30 During the 2011 inspection, the central section of Cavern A was cordoned off due to a significant risk from roof spall. During the 2013 inspection, it was noted that there was no significant volumes of spalled material on the floor. However, this area remains a significant risk and is to remain cordoned off.
- 2.31 The areas of "hollow" rock identified in previous reports were no different to previous years; however, continued monitoring of these areas will need to take place.
- 2.32 At the end of the works, the Cavern floor was swept clear of debris to aid easy identification of areas where further spalling of rock from the roof has taken place.

### ***Gas Monitoring***

#### *Atmospheric gas level*

- 2.33 Gas monitoring equipment was continually used to check for gas levels during the inspection. No evidence of any noxious gases was found and the ventilation system was fully operational.

#### *Radon Monitoring*

- 2.34 The Health Protection Agency report HPA-RPD-033 "Indicative Atlas of Radon in England and Wales" (2007) reports the Caverns to be in an area at high risk of Radon gas. In addition, works carried out at a separate nearby underground site have detected elevated levels of Radon. Therefore, it was agreed at the meeting carried out on 20 December 2012 that the Caverns would be monitored for a three week period during the 2013 Cavern inspection and remediation works and additional passive monitoring thereafter for a further 3 month monitoring period. The works were carried out in accordance with WA's proposal letter and through consultation with the Health Protection Agency (HPA).
- 2.35 Preliminary monitoring was carried out utilising Alpha Guard monitors and passive monitors at several locations within the Caverns over a period of approximately 3 weeks. The monitoring established that there were no significant levels of Radon encountered within the Caverns over the three weeks during the inspection and remedial work. The monitors have been passed to the HPA who will provide a separate report regarding the Radon.

2.36 The initial Alpha Guard monitoring results did not identify elevated levels of Radon. However, previous passive monitoring, carried out in 2005, identified that Radon could be present at elevated levels during different times of the year. To fully investigate this, it was agreed to carry out a full 12 months of passive monitoring to assess any variation in Radon levels caused by seasonal change. The results of this monitoring will be available in 2014.

#### ***Water***

2.37 The drainage holes drilled to the River Alyn culvert flowing beneath the access tunnel were inspected. The holes were free of debris and in good condition allowing continued drainage to the river.

2.38 The drainage system installed in the roof of Cavern B (north) has previously been reported to be ineffective as the point of water ingress has moved over the years. Remedial works were carried out during the 2013 inspection; details of which are provided later in this report.

2.39 The outlet pipe from the drainage system was overflowing in Cavern A. Further investigation along the length of the pipe showed that the pipe's diameter reduced from c.150mm metal pipe to a c.50mm plastic pipe near the secondary exit of the Caverns. Remedial works to prevent this overflow were proposed in 2012 and carried out in 2013, the details of which are provided later in this report.

### **3 REMEDIAL WORKS**

- 3.1 As per recommendations made in report NL00910/J07, dated November 2012, and WA's letters of proposal dated 23 November 2012 and 24 January 2013, remedial works have been carried out during February and March 2013. A summary of these works is provided below:

#### **Inspection and Remedial Works to Cavern A Drainage System**

- 3.2 The Cavern A drainage system has been remediated to prevent water overflowing on to the Cavern floor. A system has been put in to place to allow the overflow water to drain into the culvert leading to the River Alyn.

#### **Installation of Metal Mesh above Cavern Entrance Portal**

- 3.3 A wire mesh has been installed above the cavern entrance portal to reduce the risk of future spalling impacting on visitors to the Caverns the location of which is shown on Drawing No. NL00910/02.

- 3.4 The wire mesh has been installed in such a way as to arch under the space where concrete would fall into, immediately above the floor of the main entrance. The wire mesh will now catch any spalling concrete and the risk of spalling concrete to visitors has now been mitigated.

#### **Removal of Limescale Build Up on Metal Floor Grilles**

- 3.5 During the 2012 inspection, several of the metal floor grilles were noted as being covered with limescale, particularly in Cavern A. These were cleared during the 2013 inspection to make them more obvious to visitors.

#### **Replacement of Cavern Roof Water Catchment and Drainage**

- 3.6 During the 2012 inspections, it was determined that the water catchment system in the northern most section of Cavern B was no longer suitable due to the corrosion of the scaffolding and has, therefore, been replaced. The location of the area where catchment is required is indicated on Drawing No. NL00910/02.

- 3.7 A 1.5m x 1.5m galvanised hopper suspended from the roof was emplaced, suspended by chains attached to roof bolts at the four corners of the hopper. The bolts in the roof were drilled approximately 250mm deep. Pipe work has been connected to the pre-existing pipe work. The pipe work is also suspended from the

roof by a chain connected to a bolt driven 250mm into the roof. The new system is quieter and catches all the water falling from the Cavern roof.

#### **Installation of Second Water Catchment Hopper**

- 3.8 During periods of heavy rainfall, a second ingress of water occurs from the roof, adjacent to the main water ingress. A water catchment hopper was also installed beneath this ingress point to avoid water spilling freely onto the Cavern floor. This hopper is also suspended from the roof and drains to the other hopper's pipe work.

#### **Installation of Steel Access Decking to the Main Entrance**

- 3.9 The roadway leading to the Cavern entrance has been determined as being ecologically sensitive and susceptible to poor drainage during heavy rainfall which can lead to hazardous underfoot conditions, particularly when frozen. Therefore, a raised steel walkway has been emplaced to provide pedestrian access to the Caverns.

- 3.10 A specialist contractor was appointed by TL Excavations to fabricate and install the walkway and a Senior Structural Engineer from Wardell Armstrong inspected the installation. The walkway now provides a suitable access to the Cavern entrance without disturbing ecologically sensitive and overly wet slippery areas.

#### **Provide and Install Replacement Door on Northern Access Tunnel**

- 3.11 The door accessing the northern tunnel was deemed to be in an unfit state and has now been replaced. The location of the replaced door is shown on Drawing No. NL00910/02.

#### **Paint Main Entrance Doors and Internal Barrier**

- 3.12 The main entrance door and the internal barrier immediately within the Cavern entrance were painted to protect the metal work from further degradation.

## 4 CONCLUSIONS AND RECOMMENDATIONS

### *Conclusions*

- 4.1 The remedial works recommended in WA report NL00910/J07 have all been carried out. The remedial works discussed and agreed at a meeting which took place on 20 December 2012 have also been carried out.
- 4.2 Inspection of the tell tales revealed minimal movement (<1mm) of any of the fractures being monitored.
- 4.3 The Cavern inspection identified that minimal roof spalling has occurred since the previous inspection. The sounding inspection identified no new "hollow" areas requiring attention and only a limited amount of loose material was barred down from the roof. It is recommended that access is restricted to the "hollow" areas previously marked or cordoned off.
- 4.4 The drainage system at the northern end of Cavern B has been replaced and provides a more effective system to mitigate the water ingress from the roof at this location.
- 4.5 Remedial measures to prevent overspill from the drainage pipe work in Cavern A has been carried out in order to remove the water from the Cavern B drainage system more effectively.
- 4.6 The roof immediately within the main entrance has been covered with steel mesh to prevent spalling concrete falling directly onto the floor below.
- 4.7 Radon monitoring has been carried out within the Caverns and has identified no elevated levels of Radon over the course of the recent 2013 inspection and remedial works. A further 12 months of Radon monitoring is being carried out and a Radon report will be issued subsequently, in 2014.
- 4.8 The floor grilles have been inspected and cleared of limescale where necessary. The inspection identified two grilles requiring replacement. These should be replaced at the next opportunity. It is recommended that a detailed survey of all the floor grilles is carried out during the next inspection.

4.9 The main entrance door and the internal barrier near the main entrance have been painted to ensure they remain in good condition.

4.10 The northern access tunnel entrance door has been replaced.

***Recommendations***

4.11 The following recommendations are provided:

- A thorough visual/sounding inspection of the Cavern Walls should be carried out at the next opportunity to identify high risk areas of instability and to identify if any remediation measures are required to prevent wall collapse;
- The access safety requirements should be reviewed once the 12 months Radon monitoring has been completed;
- The southern end of Cavern D, at the access to the southern ventilation shaft, should be cordoned off due to a significant risk of roof spall;
- The "hollow" area previously identified in Cavern B, which was marked on the floor, should be cordoned off to avoid entry to this area;
- The ventilation shaft tunnels should be prevented from entry by a locked gate with the ability to allow airflow;
- The water catchment and drainage system installed in Cavern B should be inspected annually to ensure that the system remains effective;
- A thorough inspection of all metal floor grilles should be carried out and any severely corroded grilles replaced.

4.12 It is recommended that the visual and sounding inspection of the Caverns continues annually and a convergence survey undertaken every 5 years.



## DRAWINGS

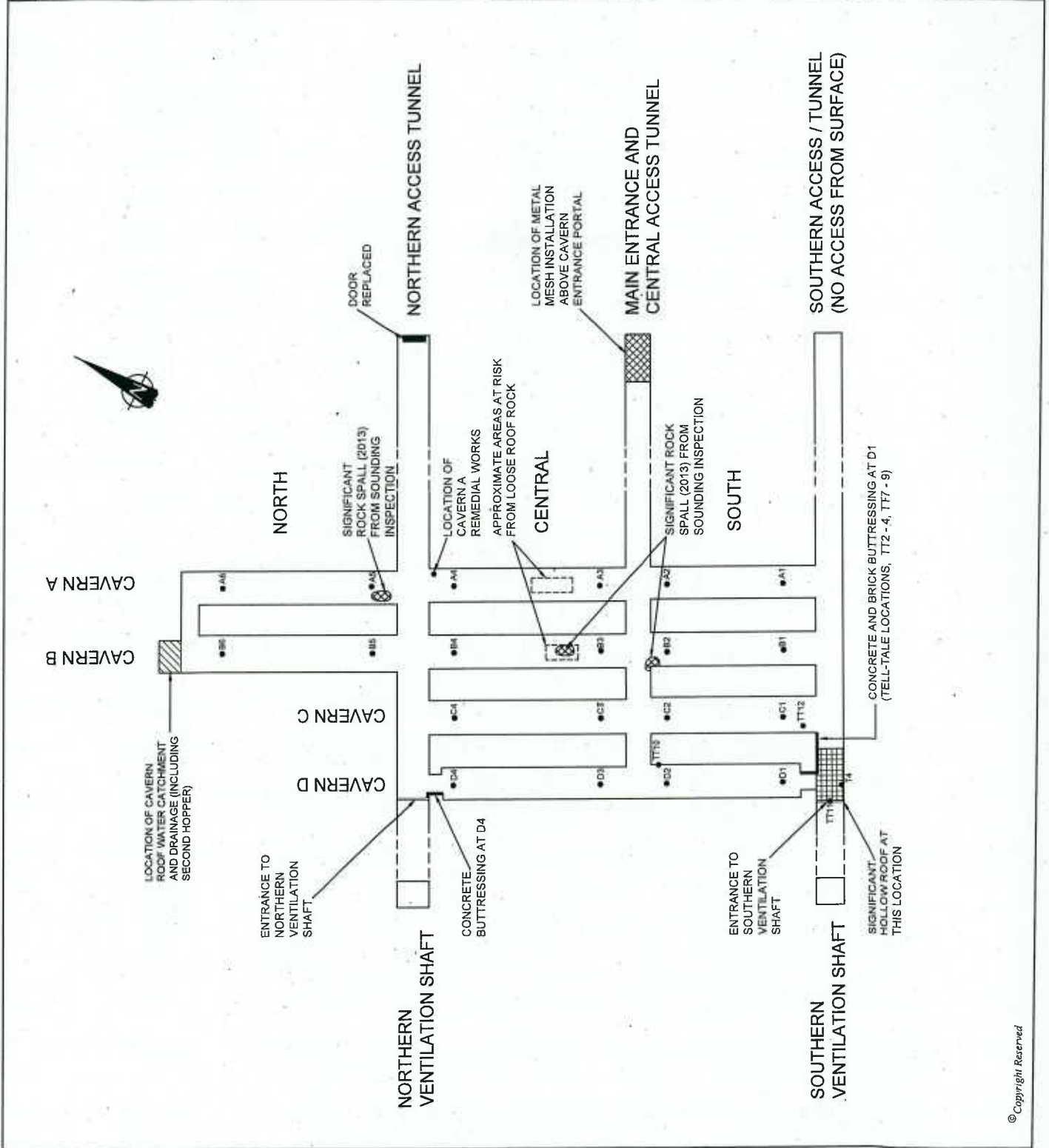
DO NOT SCALE FROM THIS DRAWING

**KEY**

- A6 CONVERGENCE BOLT LOCATIONS
- TT12 TELL TALE LOCATIONS (APPROXIMATE)

**NOTE**

THE FULL LENGTH OF THE ACCESS TUNNELS AND THE TUNNELS LEADING TO THE VENTILATION SHAFTS ARE NOT SHOWN.



REV	DATE	BY	CHKD	APP'D
A	First Issue			

INTERSERVE

PROJECT  
UNDERGROUND CAVERNS AT RHYDYFMYN, MOLD

DRAWING TITLE

PLAN OF CAVERNS FOR REFERENCE

DWG NO.	SCALE	DATE
NL00910/02	Not to scale	March 2013
DRAWN BY	CHECKED BY	APPROVED BY
SJB	GF	RB

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## APPENDICES

**Appendix 1**

**Tell Tale Monitor Results (2001 to 2013)**



# Crack Monitoring Record for the Standard and Corner Tell-Tale

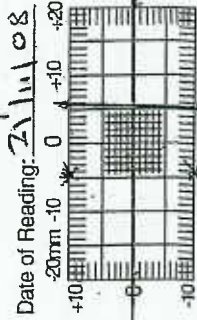
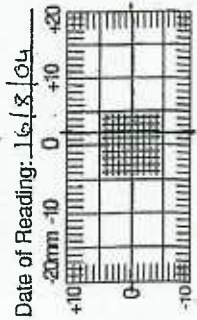
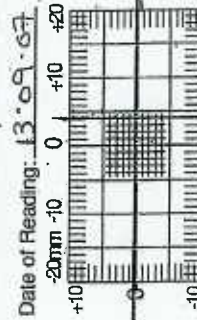
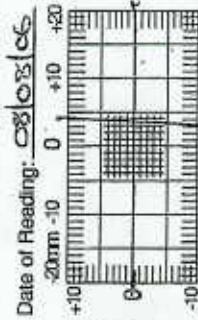
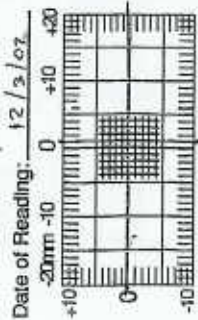
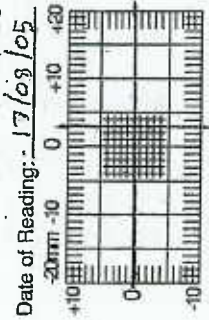
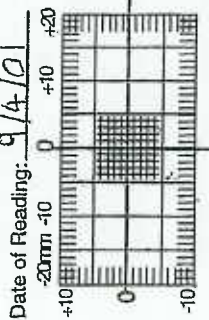
Project / Monitor Reference: TT1

Tell-Tale Location: \_\_\_\_\_

Floor & Displacement Tell-Tales also available. Please call. Need more precision? Ask about Crack-Offset

+ Represents crack opening

+ Represents crack opening



# Crack Monitoring Record for the Standard and Corner Tell-Tale

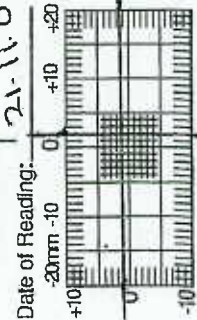
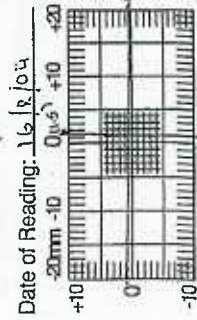
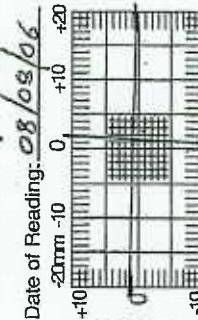
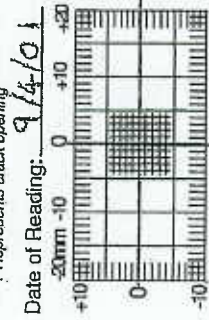
Project / Monitor Reference: TT2

Tell-Tale Location: \_\_\_\_\_

Floor & Displacement Tell-Tales also available. Please call. Need more precision? Ask about Crack-Offset

+ Represents crack opening

+ Represents crack opening

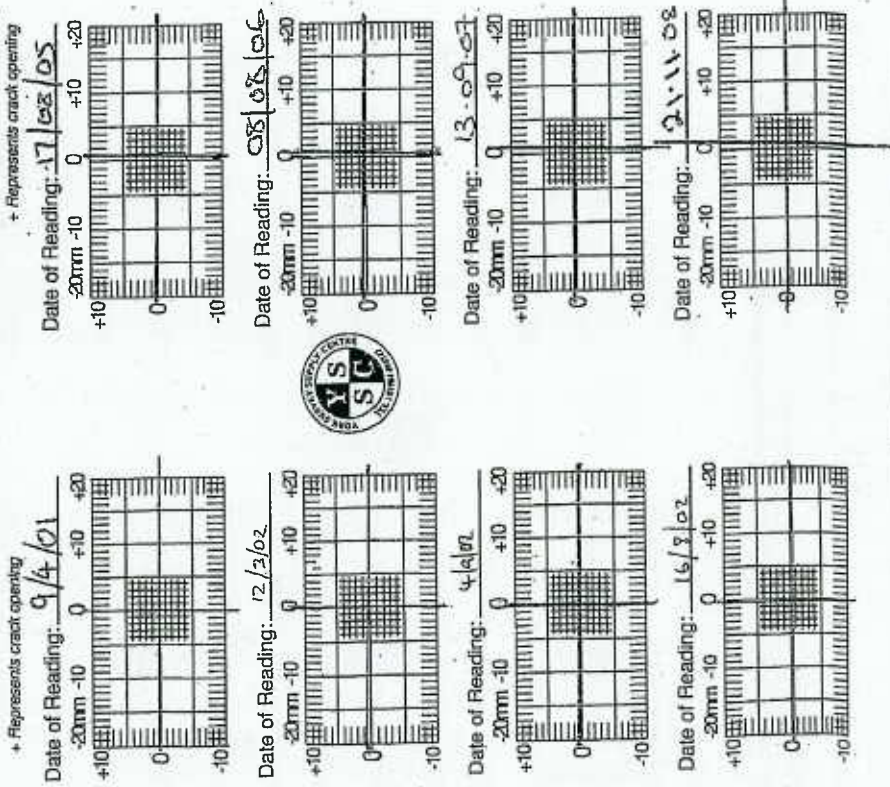




# Crack Monitoring Record for the Standard and Corner Tell-Tale

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 Tell-Tale Location: \_\_\_\_\_

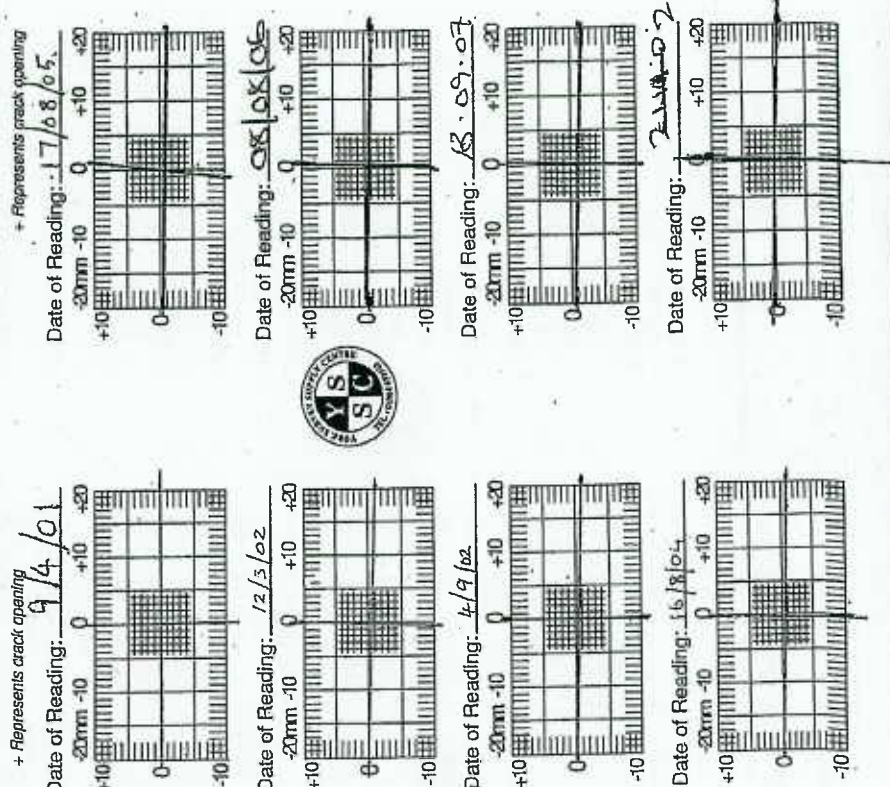
Floor & Displacement Tell-Tales also available. Please call. Need more precision? Ask about Crack-Meet



# Crack Monitoring Record for the Standard and Corner Tell-Tale

Project / Monitor Reference: TT4  
 Tell-Tale Location: \_\_\_\_\_

Floor & Displacement Tell-Tales also available. Please call. Need more precision? Ask about Crack-Meet



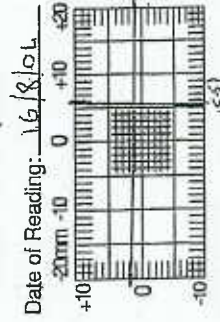
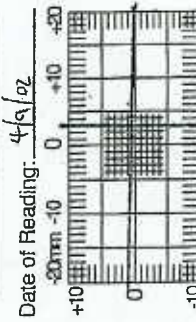
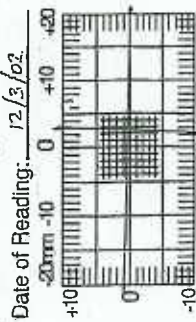
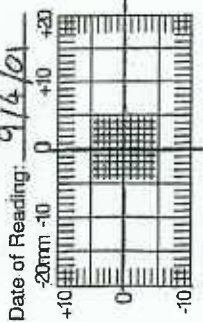
# Crack Monitoring Record for the Standard and Corner Tell-Tale

Project / Monitor Reference: TT 5

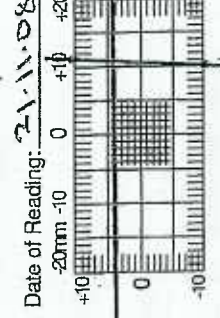
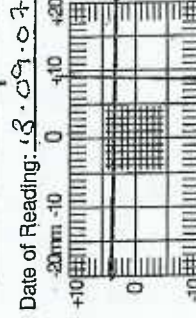
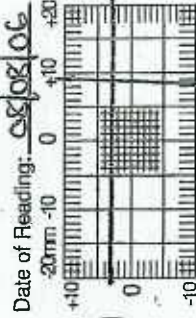
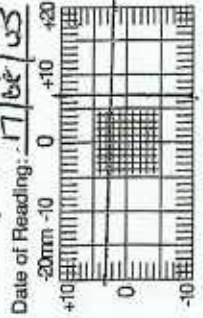
Floor & Displacement Tell-Tales also available. Please call. Need more precision? Ask about *Crack-Mount*

Tell-Tale Location: \_\_\_\_\_

+ Represents crack opening



+ Represents crack opening



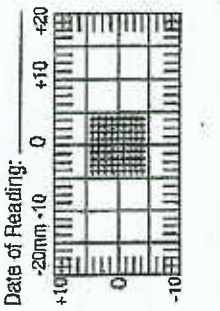
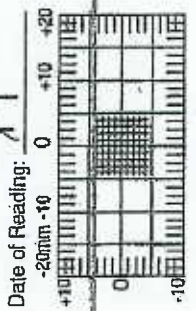
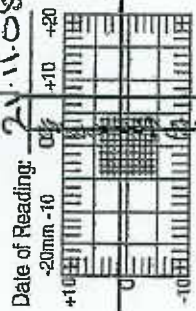
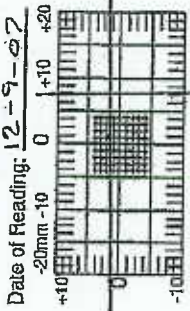
# Crack Monitoring Record for the Standard and Corner Tell-Tale

Project / Monitor Reference: \_\_\_\_\_

Tell-Tale Location: TT 6 re-fix

Floor & Displacement Tell-Tales also available. Please Call. Need more precision? Ask about *Crack-Mount*

+ Represents crack opening



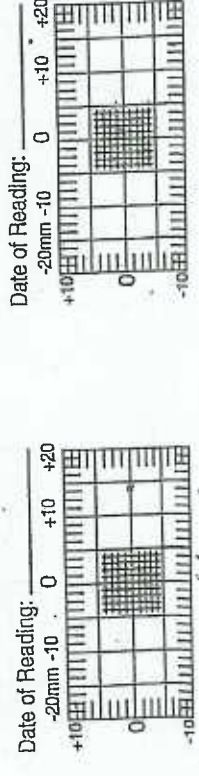
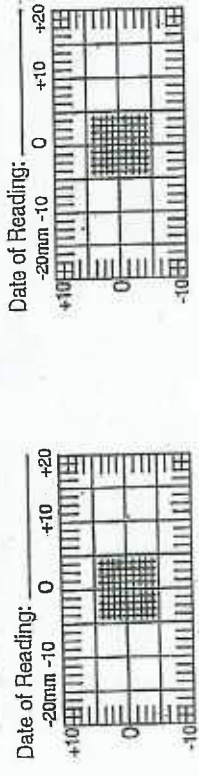


# Crack Monitoring Record for the Standard and Corner Tell-Tale

Project / Monitor Reference: TTS  
 Tell-Tale Location: 11/11

Floor & Displacement Tell-Tales also available. Please Call. Need more precision? Ask about Crack-Meas

+ Represents crack opening

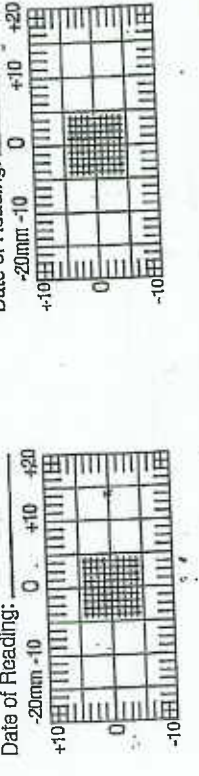
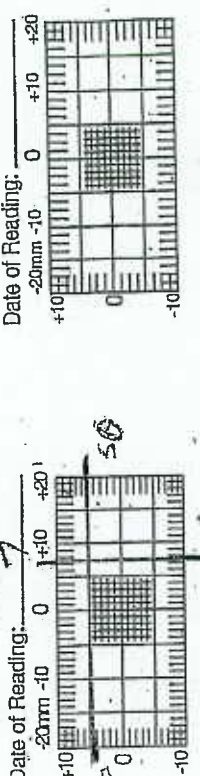


# Crack Monitoring Record for the Standard and Corner Tell-Tale

Project / Monitor Reference: TTS  
 Tell-Tale Location: 11/11

Floor & Displacement Tell-Tales also available. Please Call. Need more precision? Ask about Crack-Meas

+ Represents crack opening







# Crack Monitoring Record for the Standard and Corner Tell-Tale

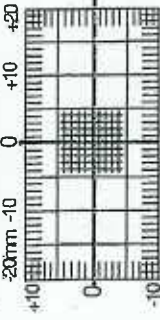
Project / Monitor Reference: T17

Tell-Tale Location: \_\_\_\_\_

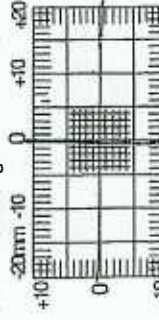
Floor & Displacement Tell-Tales also available. Please call. Need more precision? Ask about Crack-Offset

+ Represents crack opening

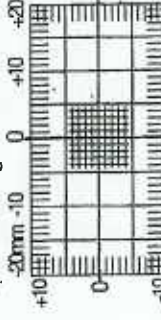
Date of Reading: 09/04/01



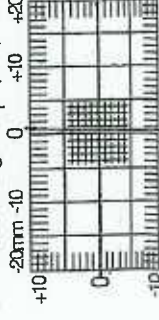
Date of Reading: 12/3/02



Date of Reading: 4/9/02

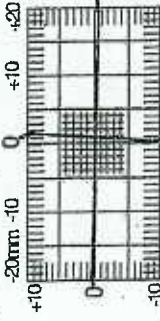


Date of Reading: 16/8/04

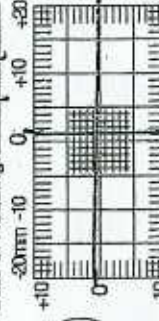


+ Represents crack opening

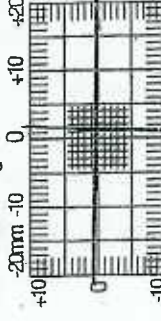
Date of Reading: 17/08/05



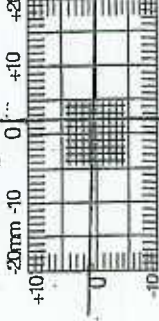
Date of Reading: 08/08/06



Date of Reading: 13/09/07



Date of Reading: 21/11/08



# Crack Monitoring Record for the Standard and Corner Tell-Tale

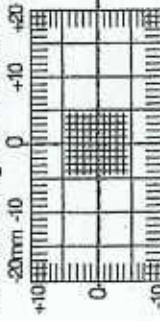
Project / Monitor Reference: T18

Tell-Tale Location: \_\_\_\_\_

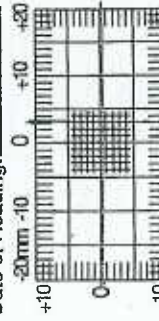
Floor & Displacement Tell-Tales also available. Please call. Need more precision? Ask about Crack-Offset

+ Represents crack opening

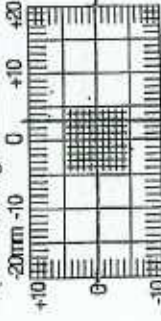
Date of Reading: 09/04/01



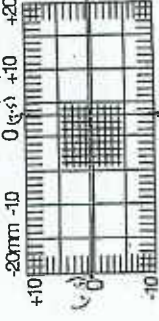
Date of Reading: 12/3/02



Date of Reading: 4/9/02



Date of Reading: 16/8/04



# Crack Monitoring Record for the Standard and Corner Tell-Tale

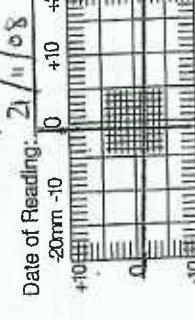
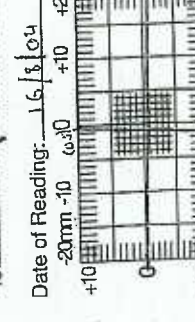
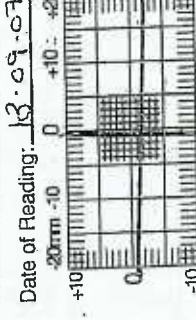
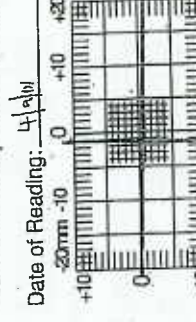
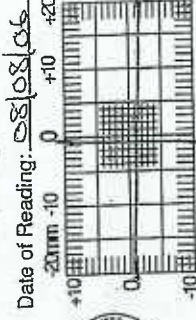
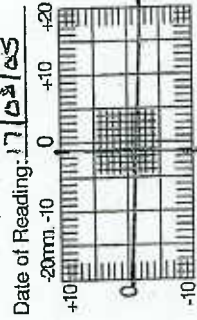
Project / Monitor Reference: VT9

Tell-Tale Location: \_\_\_\_\_

Flour & Displacement Tell-Tales also available. Please call. Need more precision? Ask about Crack-Offset

+ Represents crack opening

+ Represents crack opening



# Crack Monitoring Record for the Standard and Corner Tell-Tale

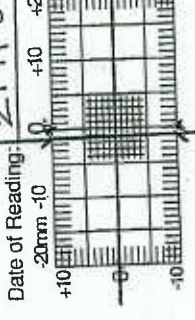
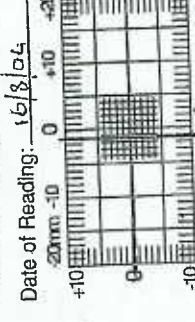
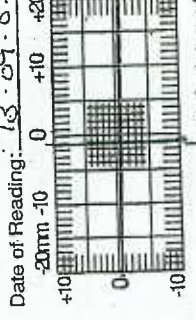
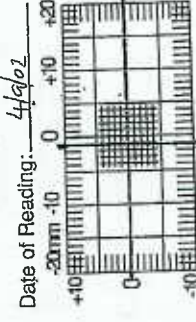
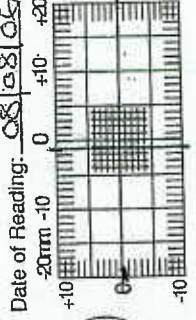
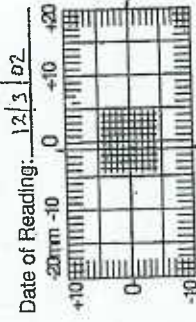
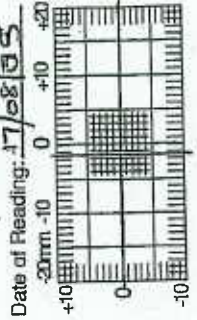
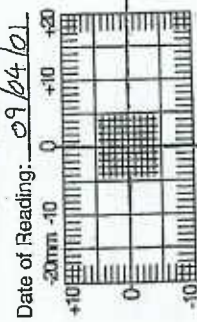
Project / Monitor Reference: TT10

Tell-Tale Location: \_\_\_\_\_

Flour & Displacement Tell-Tales also available. Please call. Need more precision? Ask about Crack-Offset

+ Represents crack opening

+ Represents crack opening

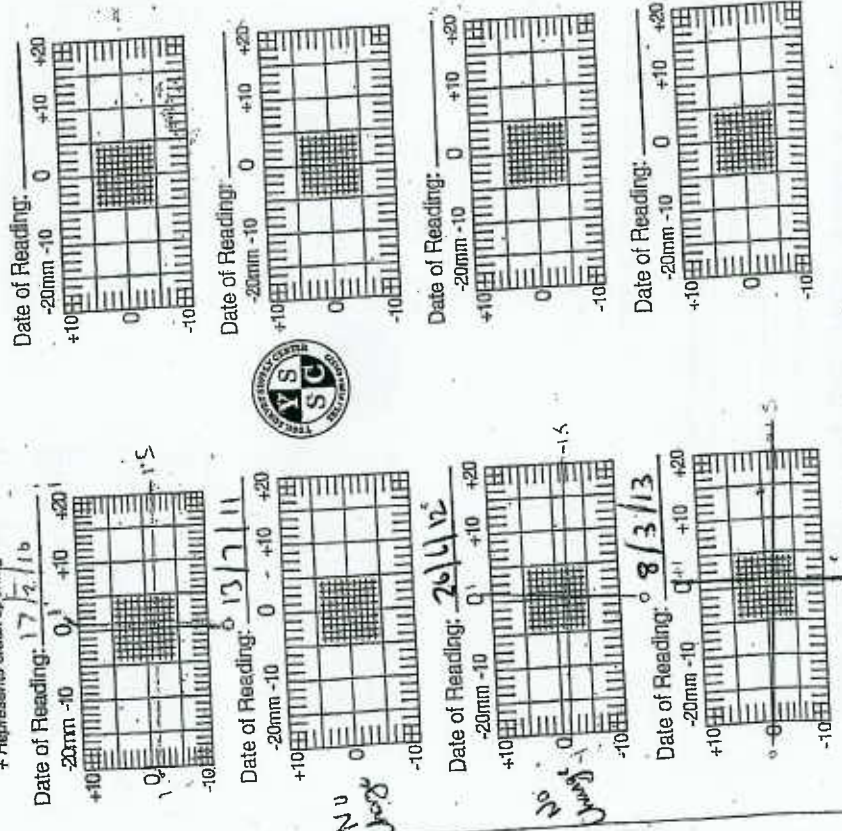


# Crack Monitoring Record for the Standard and Corner Tell-Tale

Project / Monitor Reference: Tr 4  
 Tell-Tale Location: \_\_\_\_\_

Floor & Displacement Tell-Tales also available. Please Call. Need more precision? Ask about Crack-Offsets

+ Represents crack opening

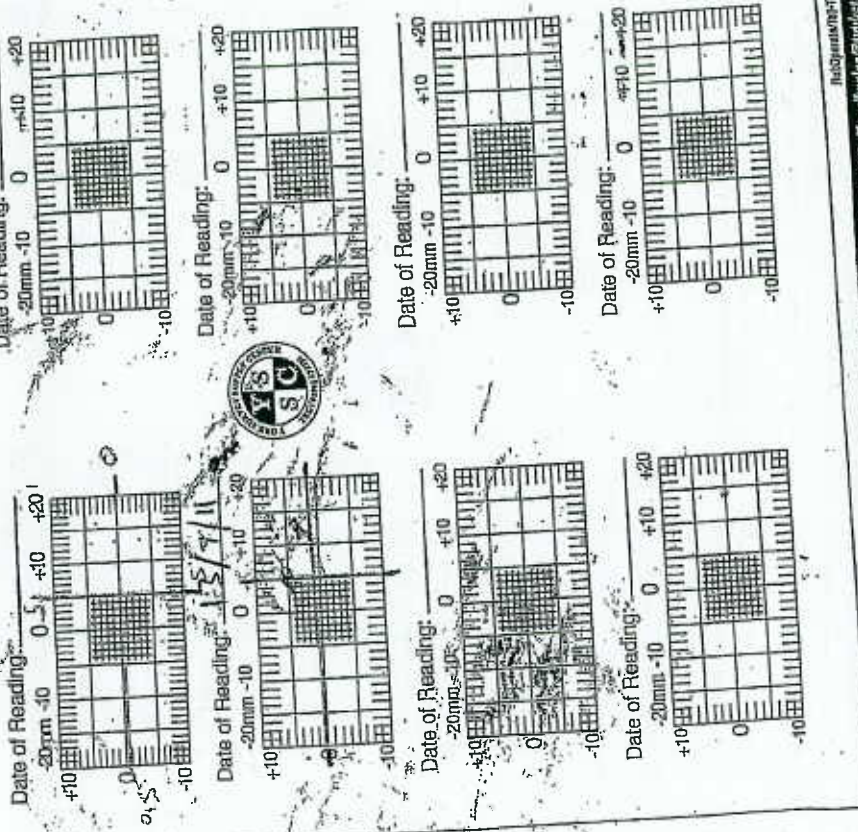


# Crack Monitoring Record for the Standard and Corner Tell-Tale

Project / Monitor Reference: \_\_\_\_\_  
 Tell-Tale Location: \_\_\_\_\_

Floor & Displacement Tell-Tales also available. Please Call. Need more precision? Ask about Crack-Offsets

+ Represents crack opening





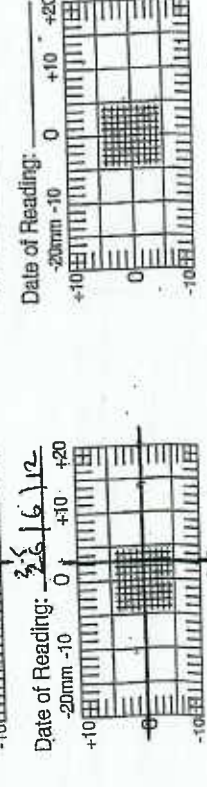
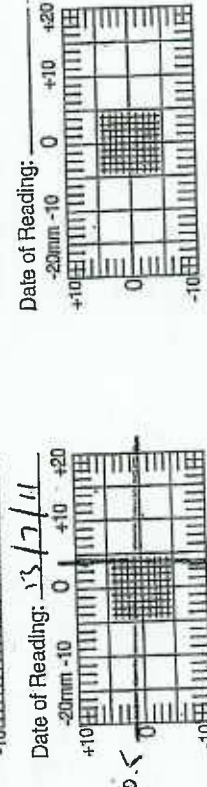
York Survey Supply Centre

# Crack Monitoring Record for the Standard and Corner Tell-Tale

Project / Monitor Reference: TT7  
 Tell-Tale Location: \_\_\_\_\_

Floor & Displacement Tell-Tales also available. Please Call. Need more precision? Ask about Crack-Classe

+ Represents crack opening



Prospect House, Deaigra Cayley Drive, Clifton Moor York YO30 4XE Tel: 01904 522722 • Fax: 01904 522722 • Email: sales@yorksurvey.co.uk



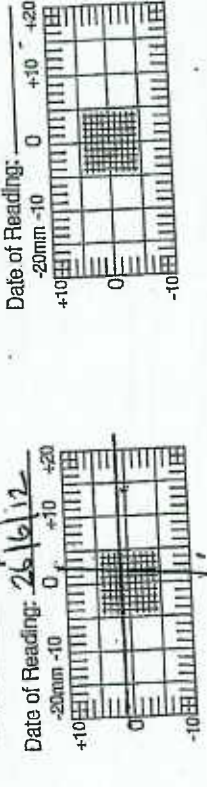
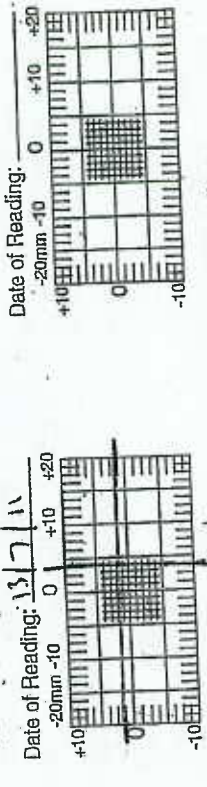
York Survey Supply Centre

# Crack Monitoring Record for the Standard and Corner Tell-Tale

Project / Monitor Reference: \_\_\_\_\_  
 Tell-Tale Location: TT8

Floor & Displacement Tell-Tales also available. Please Call. Need more precision? Ask about Crack-Classe

+ Represents crack opening



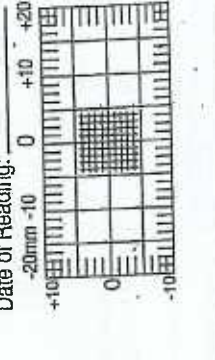
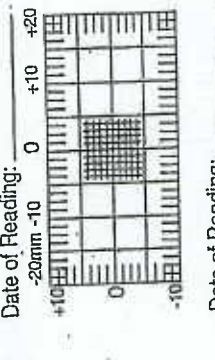
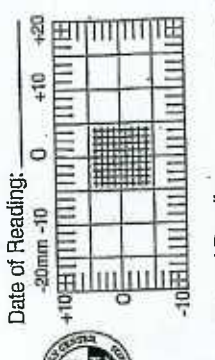
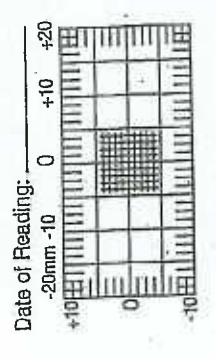
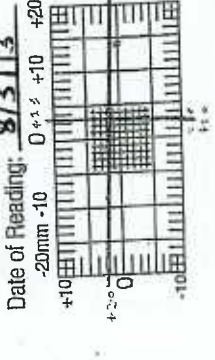
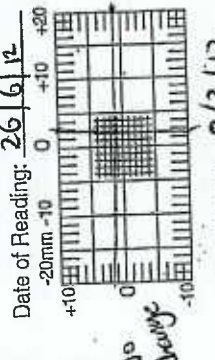
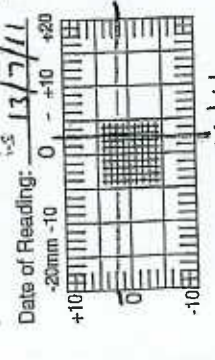
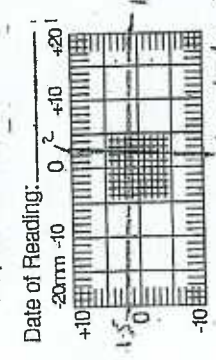
Prospect House, Deaigra Cayley Drive, Clifton Moor York YO30 4XE Tel: 01904 522722 • Fax: 01904 522722 • Email: sales@yorksurvey.co.uk

# Crack Monitoring Record for the Standard and Corner Tell-Tale

Project / Monitor Reference: \_\_\_\_\_  
 Tell-Tale Location: T12

Floor & Displacement Tell-Tales also available. Please Call. Need more precision? Ask about Crack-Meas

+ Represents crack opening

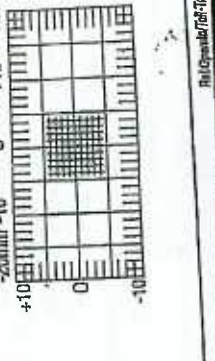
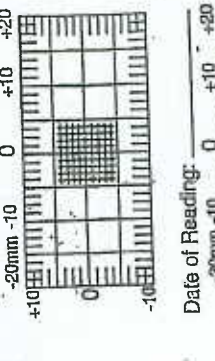
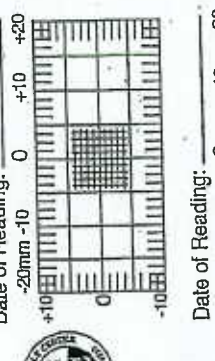
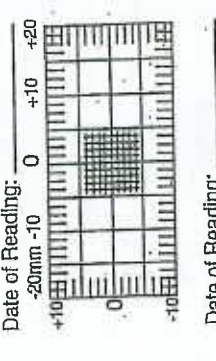
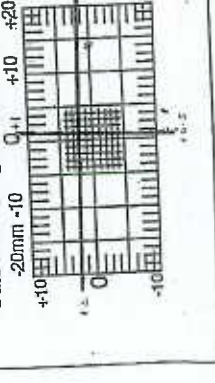
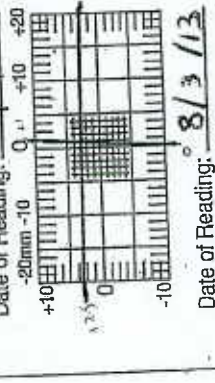
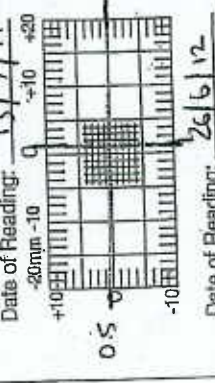
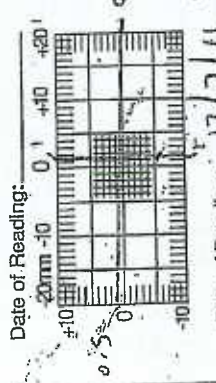


# Crack Monitoring Record for the Standard and Corner Tell-Tale

Project / Monitor Reference: \_\_\_\_\_  
 Tell-Tale Location: T13

Floor & Displacement Tell-Tales also available. Please Call. Need more precision? Ask about Crack-Meas

+ Represents crack opening



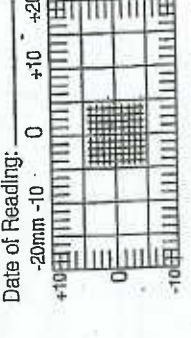
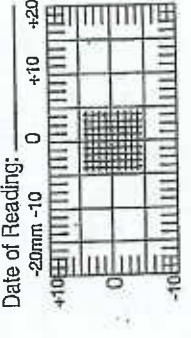
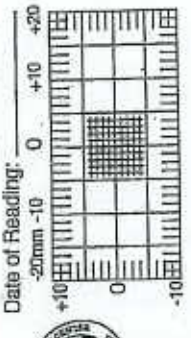
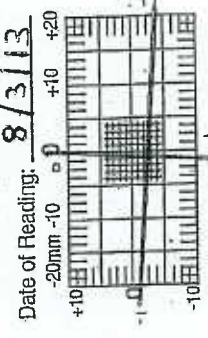
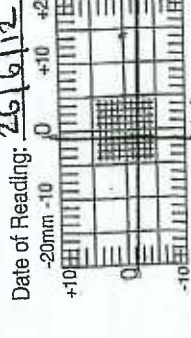
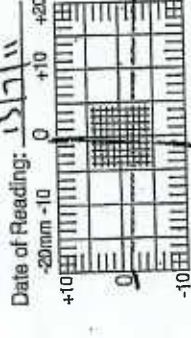
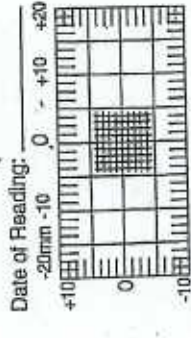
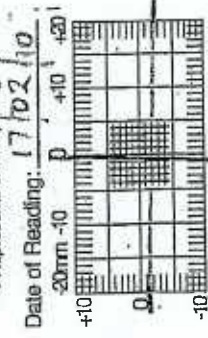


# Crack Monitoring Record for the Standard and Corner Tell-Tale

Project / Monitor Reference: \_\_\_\_\_  
 Tell-Tale Location: 119

Floor & Displacement Tell-Tales also available. Please Call.  
 Need more precision? Ask about *Crack-Clacks*

+ Represents crack opening

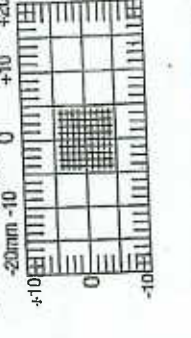
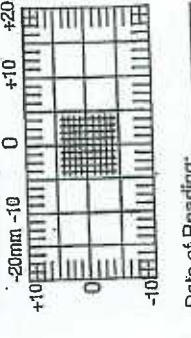
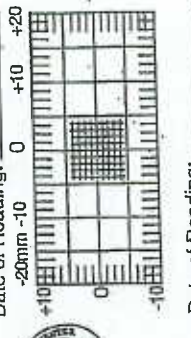
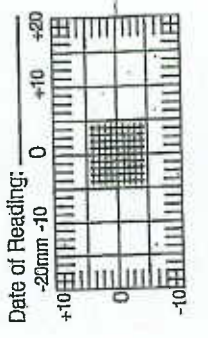
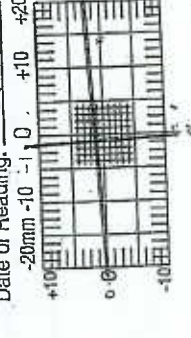
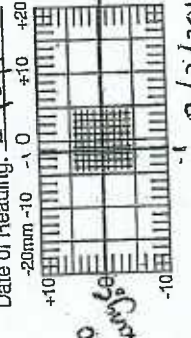
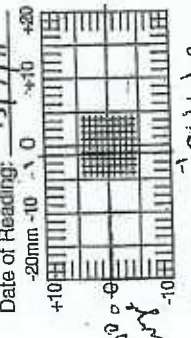
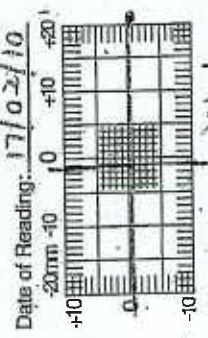


# Crack Monitoring Record for the Standard and Corner Tell-Tale

Project / Monitor Reference: \_\_\_\_\_  
 Tell-Tale Location: 1110

Floor & Displacement Tell-Tales also available. Please Call.  
 Need more precision? Ask about *Crack-Clacks*

+ Represents crack opening





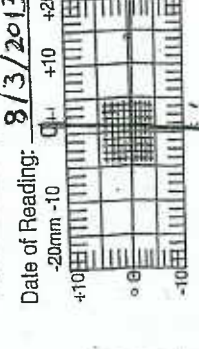
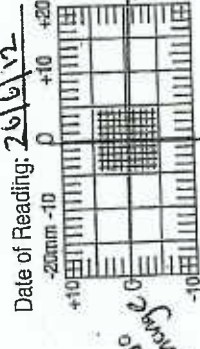
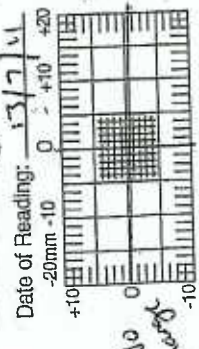
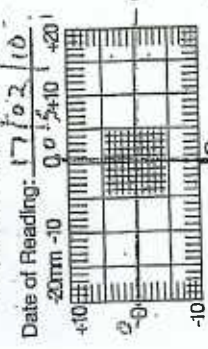
York Survey Supply Centre

# Crack Monitoring Record for the Standard and Corner Tell-Tale

Project / Monitor Reference: TT 11  
Tell-Tale Location: \_\_\_\_\_

Floor & Displacement Tell-Tales also available. Please Call. Need more precision? Ask about Crack Collars

+ Represents crack opening



Ref: 00000000000000000000

Project: Holmes, Georgia Dayley Drive, Cullin Moor York YO20 4NE Tel: 01504 622720 Fax: 0604055 E: mail@yorksurvey.co.uk



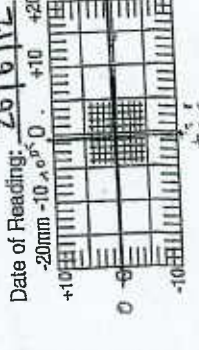
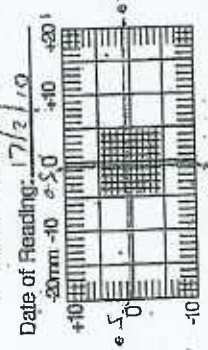
York Survey Supply Centre

# Crack Monitoring Record for the Standard and Corner Tell-Tale

Project / Monitor Reference: TT 12  
Tell-Tale Location: \_\_\_\_\_

Floor & Displacement Tell-Tales also available. Please Call. Need more precision? Ask about Crack Collars

+ Represents crack opening



Ref: 00000000000000000000

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wardell-armstrong.com

STOKE-ON-TRENT  
Sir Henry Doulton House  
Forge Lane  
Etruria  
Stoke-on-Trent  
ST1 5BD  
Tel: +44 (0)845 111 7777

CARDIFF  
22 Windsor Place  
Cardiff  
CF10 3BY  
Tel: +44 (0)29 2072 9191

EDINBURGH  
Suite 2/3, Great Michael House  
14 Links Place  
Edinburgh  
EH6 7EZ  
Tel: +44 (0)131 555 3311

GREATER MANCHESTER  
2 The Avenue  
Leigh  
Greater Manchester  
WN7 1ES  
Tel: +44 (0)1942 260101

LONDON  
Third Floor  
46 Chancery Lane  
London  
WC2A 1JE  
Tel: +44 (0)20 7242 3243

NEWCASTLE UPON TYNE  
City Quadrant  
11 Waterloo Square  
Newcastle upon Tyne  
NE1 4DP  
Tel: +44 (0)191 232 0943

PENRYN  
Tremough Innovation Centre  
Tremough Campus  
Penryn  
Cornwall  
TR10 9TA  
Tel: +44 (0)1872 560738

SHEFFIELD  
Unit 5  
Newton Business Centre  
Newton Chambers Road  
Thorncliffe Park  
Chapeltown  
Sheffield  
S35 2PH  
Tel: +44 (0)114 245 6244

TRURO  
Wheal Jane  
Baldhu  
Truro  
Cornwall  
TR3 6EH  
Tel: +44 (0)1872 560738

WEST BROMWICH  
Thynne Court  
Thynne Street  
West Bromwich  
West Midlands  
B70 6PH  
Tel: +44 (0)121 580 0909

International offices:

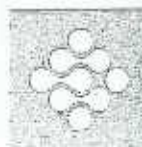
ALMATY  
29/6 Satpaev Avenue  
Rakhat Palace Hotel  
Office Tower, 7th Floor  
Almaty  
050040  
Kazakhstan  
Tel: +7-727-3341310

MOSCOW  
Suite 2, Block 10,  
Letnikovskaya St.  
Moscow, Russia  
115114  
Tel: +7(495) 980 07 67

Wardell Armstrong Archaeology:

CUMBRIA  
Cocklakes Yard  
Carlisle  
Cumbria  
CA4 0BQ  
Tel: +44 (0)1228 564820

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