



Public Health  
England

Radon Group  
CRCE,  
Chilton, Didcot  
Oxon OX11 0RQ

[REDACTED]  
radon@phe.gov.uk  
www.ukradon.org

[REDACTED]  
Wardell Armstrong LLP  
2 The Avenue  
Leigh  
WN7 1ES

RECEIVED

18 SEP 2013

WARDELL ARMSTRONG  
LEIGH OFFICE

Our Ref 9023/OCCRES\_UH

16 September 2013

Dear [REDACTED]

### Report of Radon Measurements

Please find enclosed the Report of Radon Measurements which gives the results of the radon gas measurements taken with passive monitors.

The Ionising Radiations Regulations 1999 are normally applied when the average radon gas concentration in any area, when measured with a passive exceeds  $400 \text{ Bq.m}^{-3}$  (becquerels per cubic metre of air). For underground mines and tunnels without continuous ventilation the summer reading is likely to represent the highest concentration of radon gas.

The results show that the radon levels are in excess of the Ionising Radiations Regulations 1999 threshold of  $400 \text{ Bq m}^{-3}$ . This means that the Regulations apply and that action is required to control the exposure of employees to radon gas.

You need to inform the local Health and Safety Inspector of these results. Further advice should also be available from the council on radon remedial work.

TL Excavations Ltd asked for a copy of these results when they returned their monitors; as we have no contract with them we have not complied with this request.

If you have any queries, please contact me on the number below.

Yours sincerely

[REDACTED]

P.P. [REDACTED]  
Radon Studies Group

Enclosures

Tel: [REDACTED]

e-mail: [REDACTED]



Public Health  
England

Radon Group  
CRCE,  
Chilton, Didcot  
Oxon OX11 0RQ

T + [REDACTED]  
F + [REDACTED]  
radon@phe.gov.uk  
www.ukradon.org

## Report of Radon Measurement

For:

[REDACTED]  
Wardell Armstrong LLP  
2 The Avenue  
Leigh  
WN7 1ES

Subject:

Measurement of radon-222 concentrations

Measurement Site:

Interserve  
17 Nant Alyn Road, Rhydymwyn  
Nr Mold, Flintshire  
CH7 5HQ

Date of report:

16 September 2013

The concentrations of radon-222 at the locations given on the attached sheets were measured with PHE radon gas passive monitors. The cumulative exposures recorded by the monitors were converted to concentrations averaged over the exposure time. Background corrections and calibration factors were obtained from control monitors kept at PHE.

The table shows the average radon gas concentration at each location in units of becquerels per cubic metre of air ( $\text{Bq m}^{-3}$ ). The random uncertainties in the measurement are estimated to be 15%.

[REDACTED]  
Radon Services Team Leader

## Report of Radon Measurements

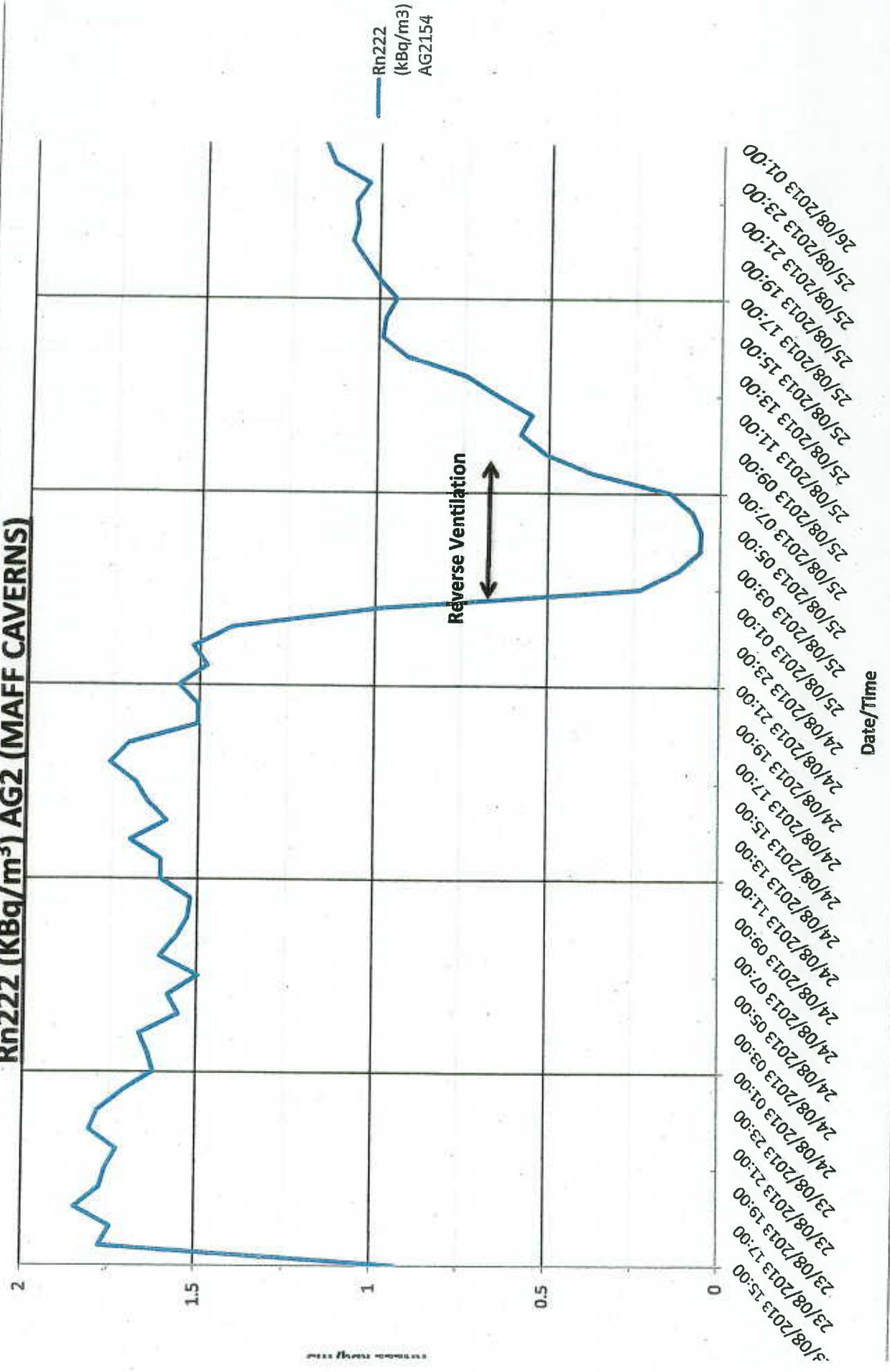
**Customer** Wardell Armstrong LLP

**Measurement site** Interserve  
17 Nant Alyn Road, Rhydymwyn  
Nr Mold, Flintshire  
CH7 5HQ

**PHE Ref** 1475066

Detno	Position	Date placed	Date removed	Radon gas concentration, Bq m <sup>-3</sup>	
				Measured	Winter corrected
08244018	Position 1	21/02/2013	23/08/2013	1800	2800
08244032	Position 2	21/02/2013	23/08/2013	800	1200
08244025	Position 3	21/02/2013	23/08/2013	720	1100
08244027	Position 4	21/02/2013	23/08/2013	310	480

# Rn222 (KBq/m<sup>3</sup>) AG2 (MAFF CAVERNS)



[REDACTED]

---

**From:** [REDACTED]  
**Sent:** 01 October 2013 13:56  
**To:** [REDACTED]  
**Cc:** [REDACTED]  
**Subject:** FW: MAFF Cavern Radon Monitoring Results  
**Attachments:** [REDACTED]\_20130918\_144439.pdf; leighground@wardell-armstrong.com\_20130227\_112828.pdf; scan0013.jpg

**Importance:** High

[REDACTED]

Please find below and attached.  
Scan 0013 shows radon levels 20 meters into the tunnel over the weekend 23<sup>rd</sup> Aug, an Alpha guard (real-time) monitor was placed there at the same time the passive monitors were replaced, and picked up again on the 27<sup>th</sup> when TL Excavations returned to work in a local mine.

[REDACTED]

Below should answer the remainder questions, and with the letter received from [REDACTED] (Wardell Armstrong) on the 19<sup>th</sup> Sept.  
Radon is still being monitored with passive's and the full report will not be known until next March-April. Radon is also being monitored in the gate house with interim report due in 3 months, final report April-May.  
Please advise if I have missed anything.

[REDACTED]

[REDACTED]

[REDACTED]

17 Nant Alyn Road  
Rhydymwyn  
Nr Mold  
Flintshire  
CH7 5HQ

[REDACTED]

[REDACTED]

---

**From:** [REDACTED]  
**Sent:** 19 September 2013 12:05  
**To:** [REDACTED]  
**Cc:** [REDACTED]  
**Subject:** MAFF Cavern Radon Monitoring Results  
**Importance:** High

Dear [REDACTED]

Further to [REDACTED] speaking to you a few minutes ago, the text that follows, summarises our current understanding of the radon situation at your site.

As you are aware on 21st February 2013 in conjunction with a Radiation Protection Advisor (RPA) from the Health Protection Agency, Wardell Armstrong undertook a day of "real time" monitoring of radon concentrations in the MAFF Caverns, using a Saphymo Alphaguard monitor. During the visit radon concentrations were measured at 8 locations within the caverns and these monitored locations are identified by the red crosses on the plan that forms the second attachment above.

The Alphaguard monitoring identified radon concentrations ranging between 4 Bqm<sup>-3</sup> and 33 Bqm<sup>-3</sup> and the average measured radon concentration was taken to be some 16 Bqm<sup>-3</sup>.

As these "winter time" readings were significantly below the 400 Bqm<sup>-3</sup> action value, stipulated by the Ionising Radiation Regulations 1999 (IRR99), it was considered in conjunction the RPA that no formal action was required. However, this decision would be subject to review, as we were aware that "summer time" values in underground workings have a tendency to be significantly higher. To establish if this was the case, 4 passive radon monitors were installed that day (21/02/2013) to register the ongoing radon concentrations being developed in the caverns. The locations where the passive monitors were installed are identified by the dark blue crosses on the plan that forms the second attachment above.

The 4 passive monitors were subsequently taken out of the caverns by [REDACTED] on 23<sup>rd</sup> August 2013 and a copy of the report giving their results forms the first attachment above. The recorded radon concentrations measured represent the average radon concentrations detected at each of the four locations during the 6 month period 21/02/2013 to 23/08/2013.

It can be seen that the passive monitors' results are significantly higher than the real time monitoring values obtained in February, as the four measured radon concentrations during the period ranged from 310 Bqm<sup>-3</sup> to 1800 Bqm<sup>-3</sup> and had an average value of some 909 Bqm<sup>-3</sup>, a value that exceeds the 400 Bqm<sup>-3</sup> action value, that is discussed above. Consequentially in line with the requirements of the IRR99 there is now a requirement for Interserve, as the owners of the caverns, to undertake measures that include the following:

- Assess the risk posed by the radon to individuals entering the caverns;
- The appointment of a Radiation Protection Advisor (RPA);
- The appointment of a Radiation Protection Supervisor (RPS);
- Designation of Supervised /Controlled Areas dependent on potential radon dose;
- Undertake appropriate radon monitoring;
- Preparation of Local Rules to minimise exposure to radon;
- Designation of Classified Persons (if appropriate).

Trusting that the above is clear. Please be in touch if you require clarification of any points.

Regards

[REDACTED]  
[REDACTED]  
[REDACTED]  
**Wardell Armstrong LLP**

2 The Avenue  
Leigh  
Greater Manchester  
WN7 1ES

[REDACTED]  
[REDACTED]  
[www.wardell-armstrong.com](http://www.wardell-armstrong.com)  
[REDACTED]

It was good to speak with you earlier, glad you are well.


You will see from [REDACTED] email that the Radon results from the recent monitoring are elevated and shall need to be considered for future works / entry. [REDACTED] email provides some details on the potential way forward and we would be happy to help you address it.

As discussed the monitoring shall continue to obtain results for a full yearly cycle. Nevertheless it would be prudent to take account of these results and, until a set of Local Rules are in place, it may be sensible to consider precluding access to the caverns.

Kind regards

  
**Wardell Armstrong LLP**

Sir Henry Doulton House  
Forge Lane  
Etruria  
Stoke on Trent  
Staffordshire  
ST1 5BD

  
[www.wardell-armstrong.com](http://www.wardell-armstrong.com)

Wardell Armstrong LLP. England OC307138, VAT No: GB108224347.

Wardell Armstrong International Limited. England 3813172, VAT No: GB108224347.

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Interservefm Ltd.

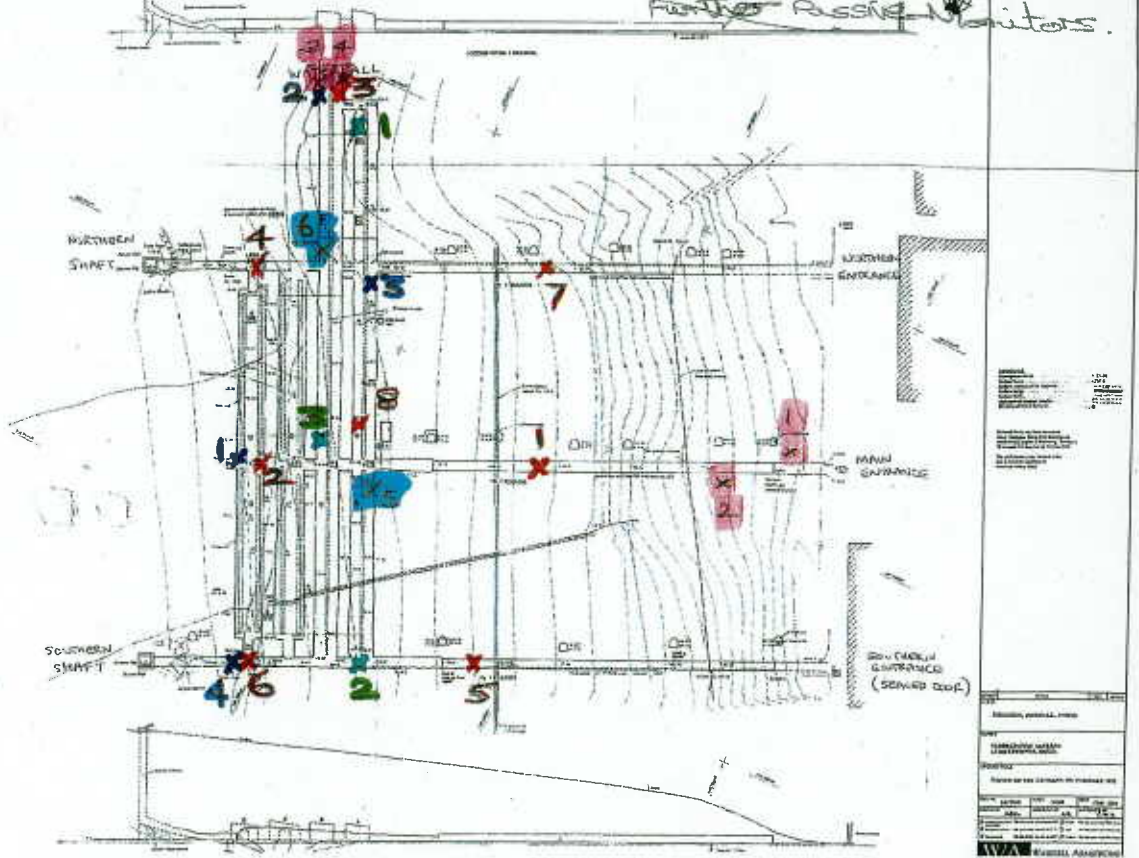
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Registered Office :Capital Tower, 91 Waterloo Road, London SE1 8RT.

# MAFF TUNNELS NL 00910

21<sup>st</sup> February 2013 - March 2013.

- X Red Crosses = Real Time AlphaGuard Monitoring Locations  
08/21/02/2013.
- X Blue Crosses = Passive Monitor Locations
- X Green Crosses = Static AlphaGuard Locations for 3 weeks.
- X Pink Crosses = Proposed Locations for 4 Personal Monitoring Badges
- X Blue Crosses = Proposed Locations for 2 Further Passive Monitors.



- |       |      |       |
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| 2 ✓   | 2    | 2     |
| 3 ✓   | 3    | 3     |
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- ⑨ Wanted 83/84?

25/2/2013  
26



[REDACTED]

**From:** [REDACTED]  
**Sent:** 01 October 2013 13:30  
**To:** [REDACTED]  
**Cc:** [REDACTED]  
**Subject:** RE: FOI 5726 - Tunnel Complex, Rhydymwyn  
**Attachments:** LWLNEW-Sharpscan@wardell-armstrong.com\_20121123\_145218.pdf.pdf; LWL-Sharpscan@wardell-armstrong.com\_20130124\_173143.pdf

[REDACTED]

Starting with the bottom paragraph first. I will respond to the other questions under a separate cover.

This relates to a meeting held on site after i had first received a proposal letter on the 23rd Nov 2012, ( LWLNEW attached) this shows the proposal and cost for the forthcoming inspection. We held the meeting on the 20th Dec 12 to discuss adding works to the original proposal. I then received the amended cost and proposal letters on the 24th Jan 2013 (LWL attached). All works were approved and work commenced 28th Feb 2013.

I have no correspondence about the meetings other than attached.

[REDACTED]

[REDACTED]

Interserve Facilities Manager  
17 Nant Alyn Road  
Rhydymwyn  
Nr Mold  
Flintshire  
CH7 5HQ

[REDACTED]

-----Original Message-----

**From:** [REDACTED]  
**Sent:** 01 October 2013 12:42  
**To:** [REDACTED]  
**Cc:** [REDACTED]  
**Subject:** FOI 5726 - Tunnel Complex, Rhydymwyn

[REDACTED]

We received further correspondence following the FoI response releasing the 2013 Wardell Armstrong Caverns inspection report below.

I've checked the WA report & the comments below re Para 2.33 & 2.35 are correct. Para 4.7 also confirms no elevated levels of Radon.

The WA report refers to a 3 week monitoring period carried out during the inspection, with the results being passed to the HPA to provide a separate report, Para 3.35 Is this report available yet?

Para 2.36 refers to proposals to carry out 12 months passive monitoring.

Can we provide a statement on the progress of this & the future management / action of the Radon risk.

There is also reference to a meeting held on 20 December 2012, I assume about the forthcoming 2013 WA tunnel inspection & works. Can you provide details & any correspondence related to this meeting.

Regards

[REDACTED]  
[REDACTED]  
[REDACTED]  
Defra Estates  
Foss House, Kings Pool  
1-2 Peasholme Green  
YORK. YO1 7PX.  
[REDACTED]  
[REDACTED]

-----Original Message-----

From: [REDACTED]  
Sent: 24 September 2013 10:59  
To: Estates Correspondence (LCS-EST)  
Subject: RE: FOI 5726 - Tunnel Complex, Rhydymwyn

Dear Estates Correspondence (LCS-EST),  
We received this message today

"Dear all,  
During a recent Cavern Inspection, It was discovered through testing, that the cavern complex has high levels of Radon Gas throughout the system.  
I have therefore been advised to close the entrance to the caverns and prevent any further access, until such time we have consulted with experts on this matter.  
Please could you inform your members that entrance to the caverns "viewing area" will not be allowed with immediate effect.

Regards,"

I can find no reference to high radon levels in the documentation provided by this Freedom of Information Request and in the Wardell Armstrong Report dated 21 March 2013 at sections 2.33 to 2.35 it states there are no significant levels of radon encountered.  
My questions are has full disclosure been given?  
If there is further information why was it not disclosed?  
Further to this there are many references to a meeting concerning the tunnels on 20th December 2012 but very little documentation provided, please could I be provided with all documentation?

Yours sincerely,

-----Original Message-----

<<FOI 5726 Additional Report on Inspection210313.pdf>> <<FOI 5726.pdf>>  
<<5726 Rhydy Tunnels.pdf>>

Dear [REDACTED]

Please find the response and additional correspondence in answering this FOI.

Regards,

[email address]

Department for Environment, Food and Rural Affairs (Defra)

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Interservefm Ltd.

Registered in England, Number : 2820560.

Registered Office: Capital Tower, 91 Waterloo Road, London SE1 8RT.

[REDACTED]

---

**From:** [REDACTED]  
**Sent:** 01 October 2013 14:47  
**To:** [REDACTED]  
**Cc:** [REDACTED]  
**Subject:** RE: MAFF Cavern Radon Monitoring Results

[REDACTED]

I think you should be able to make it out from 20130227\_112828pdf(686)kb attached on previous mail. In case you can't I'll try and explain:-  
No 1 was set at the end of the main tunnel in the "central alcove".  
No 2 In cavern "F" near the "waterfall".  
No3 On the junction with cavern "A" north and northern tunnel.  
No4 Near the southern tunnel Sump or air shaft.  
The readings are calculated on the other attachment where you can see (as expected) No4 has a low reading because if it placed in or near a draught.  
Protocols dictate that they should be placed about a meter off the ground (though i don't know why radon is heavier than air) and out of draughts.  
Hope this helps.

[REDACTED]

[REDACTED]

[REDACTED]

17 Nant Alyn Road  
Rhydymwyn  
Nr Mold  
Flintshire  
CH7 5HQ

[REDACTED]

[REDACTED]

---

**From:** [REDACTED]  
**Sent:** 01 October 2013 14:06  
**To:** [REDACTED]  
**Cc:** [REDACTED]  
**Subject:** RE: MAFF Cavern Radon Monitoring Results

[REDACTED] thank you, this is perfect. One further question, the readings shown on the report of the 18<sup>th</sup> September quote sentries set at four different locations. Where approximately where these placed? (i.e. whereabouts was position 1 (highest reading) , position 2 etc.)

Regards

[REDACTED]

---

**From:** [REDACTED]  
**Sent:** 01 October 2013 13:56  
**To:** [REDACTED]  
**Cc:** [REDACTED]  
**Subject:** FW: MAFF Cavern Radon Monitoring Results  
**Importance:** High

[REDACTED]

Please find below and attached.

Scan 0013 shows radon levels 20 meters into the tunnel over the weekend 23<sup>rd</sup> Aug, an Alpha guard (real-time) monitor was placed there at the same time the passive monitors were replaced, and picked up again on the 27<sup>th</sup> when TL Excavations returned to work in a local mine.

[REDACTED]

Below should answer the remainder questions, and with the letter received from [REDACTED] Wardell Armstrong) on the 19<sup>th</sup> Sept.

Radon is still being monitored with passive's and the full report will not be known until next March-April. Radon is also being monitored in the gate house with interim report due in 3 months, final report April-May.

Please advise if I have missed anything.

[REDACTED]

[REDACTED]

[REDACTED]

17 Nant Alyn Road  
Rhydymwyn  
Nr Mold  
Flintshire  
CH7 5HQ

[REDACTED]

[REDACTED]

---

**From:** [REDACTED]  
**Sent:** 19 September 2013 12:05  
**To:** [REDACTED]  
**Cc:** Bates, [REDACTED]  
**Subject:** MAFF Cavern Radon Monitoring Results  
**Importance:** High

Dear [REDACTED]

Further to [REDACTED] speaking to you a few minutes ago, the text that follows, summarises our current understanding of the radon situation at your site.

As you are aware on 21st February 2013 in conjunction with a Radiation Protection Advisor (RPA) from the Health Protection Agency, Wardell Armstrong undertook a day of "real time" monitoring of radon concentrations in the MAFF Caverns, using a Saphymo Alphaguard monitor. During the visit radon concentrations were measured at 8 locations within the caverns and these monitored locations are identified by the red crosses on the plan that forms the second attachment above.

The Alphaguard monitoring identified radon concentrations ranging between 4 Bqm<sup>-3</sup> and 33 Bqm<sup>-3</sup> and the average measured radon concentration was taken to be some 16 Bqm<sup>-3</sup>.

As these "winter time" readings were significantly below the 400 Bqm<sup>-3</sup> action value, stipulated by the Ionising Radiation Regulations 1999 (IRR99), it was considered in conjunction the RPA that no formal action was required. However, this decision would be subject to review, as we were aware that "summer time" values in underground workings have a tendency to be significantly higher. To establish if this was the case, 4 passive radon monitors were installed that day (21/02/2013) to register the ongoing radon concentrations being developed in the caverns. The locations where the passive monitors were installed are identified by the dark blue crosses on the plan that forms the second attachment above.

The 4 passive monitors were subsequently taken out of the caverns by [REDACTED] on 23<sup>rd</sup> August 2013 and a copy of the report giving their results forms the first attachment above. The recorded radon concentrations

measured represent the average radon concentrations detected at each of the four locations during the 6 month period 21/02/2013 to 23/08/2013.

It can be seen that the passive monitors' results are significantly higher than the real time monitoring values obtained in February, as the four measured radon concentrations during the period ranged from 310 Bqm<sup>-3</sup> to 1800 Bqm<sup>-3</sup> and had an average value of some 909 Bqm<sup>-3</sup>, a value that exceeds the 400 Bqm<sup>-3</sup> action value, that is discussed above. Consequentially in line with the requirements of the IRR99 there is now a requirement for Interserve, as the owners of the caverns, to undertake measures that include the following:

- Assess the risk posed by the radon to individuals entering the caverns;
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- The appointment of a Radiation Protection Supervisor (RPS);
- Designation of Supervised /Controlled Areas dependent on potential radon dose;
- Undertake appropriate radon monitoring;
- Preparation of Local Rules to minimise exposure to radon;
- Designation of Classified Persons (if appropriate).

Trusting that the above is clear. Please be in touch if you require clarification of any points.

Regards

[REDACTED]  
[REDACTED]  
[REDACTED]  
**Wardell Armstrong LLP**

2 The Avenue  
Leigh  
Greater Manchester  
WN7 1ES

Tel: [REDACTED]  
Fax: [REDACTED]  
[www.wardell-armstrong.com](http://www.wardell-armstrong.com)

[REDACTED]  
It was good to speak with you earlier, glad you are well.

You will see from [REDACTED]'s email that the Radon results from the recent monitoring are elevated and shall need to be considered for future works / entry. [REDACTED]'s email provides some details on the potential way forward and we would be happy to help you address it.

As discussed the monitoring shall continue to obtain results for a full yearly cycle. Nevertheless it would be prudent to take account of these results and, until a set of Local Rules are in place, it may be sensible to consider precluding access to the caverns.

Kind regards

[REDACTED]  
**Wardell Armstrong LLP**

Sir Henry Doulton House  
Forge Lane  
Etruria  
Stoke on Trent  
Staffordshire

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Interservefm Ltd.

Registered in England, Number : 2820560.

Registered Office :Capital Tower, 91 Waterloo Road, London SE1 8RT.

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Our ref: DCW/RB/SL/NL00910/J69

Date: 23 November 2012

Your ref:

[REDACTED]  
[REDACTED]  
17 Nant Alyn Road  
Rhydymwyn  
Nr Mold  
Flintshire  
CH7 5HQ  
[REDACTED]

### MAFF Buffer Depot, Rhydymwyn, Mold

Further to our recent discussions, please find below our fee proposal for the following:

- 2013 inspection of the underground caverns;
- additional remedial works in accordance with the recommendations made in our report entitled "Report on Stability Inspection and Remedial Works" dated November 2012.

### UNDERGROUND INSPECTION 2013

#### Scope of Work

It is proposed to undertake the following work:

- visual inspection of the caverns, ventilation shafts and ventilation shaft 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/egress tunnels;
- clear the floor of fallen debris.

The inspection will be carried out in accordance with the method specified in our 'Report on Cavern Inspection and Repair Works' dated May 1997. Appropriate health and safety measures will be implemented, including provision of gas monitoring equipment and personal self rescuers in accordance with our Code of Practice issued with our letter of 9 April 1999; preparation of a Designers Risk Assessment and reviewing the Contractor's Method Statement and Risk Assessments.

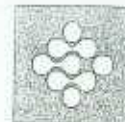
As such the proposed inspection will be undertaken by two engineers on a single day who will be assisted by TL Excavations Ltd. TL Excavations Ltd will be on site for 2 days to complete the roof and tunnel sounding inspection works.

#### Costs

The estimated costs to undertake the work are as follows (all costs include disbursements and expenses but exclude VAT):







*Wardell Armstrong*

Provide a two person team for inspection including arranging, supervising of contractors, managing, and reporting.

**£2,950.00**

*T L Excavations Ltd*

Supervisor, underground technician and surface safety co-ordinator to undertake sounding inspection, clear debris and assist with inspection. An inspection of the concrete roof at the main entrance portal will be carried out. The cost includes for the hire of a mobile access platform, gas monitor and self rescuers, subsistence, travel and provision of basic equipment.

**£3,875.00**

**REMEDIAL WORKS**

**Investigation and Remedial Works to Cavern B Drainage System**

The drainage system is overflowing in Cavern B, and it is suspected that the outlet pipes may have become blocked. It is proposed to carry out a visual investigation of the outlet pipes including the pond outfall to ascertain the reason behind the overflowing waters. These works could be carried out by Wardell Armstrong following the annual inspection and is anticipated to take half a day to complete.

The costs to undertake this work is as follows:

*Wardell Armstrong*

To inspect the drainage system.

**£250.00**

**Installation of Metal Mesh to Prevent Spalling of Concrete into Cavern Entrance Portal**

It has become apparent that the concrete above the Caverns entrance is eroding and that small pieces of concrete are spalling onto the Cavern floor. This has health and safety implications to both site workers and visitors. It is therefore recommended that the portal roof is cleared of debris, and then a suitable mesh installed to prevent spalled material falling onto the floor. These works could be carried out by TL Excavations Ltd following the annual inspection and is anticipated to take a day to complete. WA will also supervise and inspect the works.

The costs to undertake this work are as follows:

*Wardell Armstrong*

To arrange, supervise and inspect the work.

**£550.00**

*T L Excavations Ltd*

To install metal mesh.

**£6,969.00**

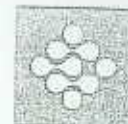
**Limescale Build-up on Metal Floor Grilles**

Several of the metal grilles in the floor have been covered with limescale which has made distinguishing them from the concrete floors difficult. As these grilles are extremely dangerous to walk on it is imperative they are easily identified. Therefore it is proposed that these grilles are completely cleared of limescale. These works could be carried out by Wardell Armstrong following the annual inspection and would take half a day to complete.

*Wardell Armstrong*

To clean off limescale from floor grilles.

**£250.00**



### Radon Monitoring

The caverns are located in an area which is reported (Health Protection Agency report HPA-RPD-033) to be at high risk of radon gas, which can accumulate in enclosed spaces, especially in underground environments. It is understood that Interserve require this matter to be investigated further to understand any prevailing risk of radon build up in the caverns. Due to the potential health and safety implications of exposure to this radioactive gas it is recommended that Radon is monitored in the Caverns.

We therefore suggest passive monitors are installed throughout the Cavern system to assess background Radon levels, and then to actively monitor Radon levels when the inspection and remedial works are being carried out. This work can be carried out by trained Wardell Armstrong personnel. The findings of the radon monitoring will be included in the subsequent report.

*Wardell Armstrong*

Hire of Radon Alpha Guard Detector and 5 personal and passive radon monitors, **£800**  
interpretation of results and reporting.

### Summary of Proposed Works Costs

Item	Wardell Armstrong	TL Excavations
1. Annual Underground Inspection 2013	£2,950.00	£3,875.00
2. Investigate drainage system	£250.00	-
3. Install metal mesh at entrance	£550	£6,969.00
4. Descale metal grilles	£250.00	-
5. Radon monitoring	£800.00	-

The contractor has indicated that the works have been priced on the basis that all the works would form one contract. This assumes that the additional works would be undertaken immediately after the annual inspection. If there was an intention for some items to be undertaken at a later date, the above costs would need to be re-measured to account for additional mobilisation costs.

It is assumed that Interserve will be responsible for the payment of T L Excavations Ltd's invoices directly, subject to our verification.

We trust the above proposal meets with your approval, however, if you have any queries please do not hesitate to contact us. If you wish us to proceed as indicated please confirm by returning one signed copy of the attached Terms of Engagement for our files.

Yours sincerely

**for Wardell Armstrong LLP**

Enc

Our ref: DCW/RB/SL/NL00910/J71  
Your ref:

Date: 24 January 2013

[REDACTED]  
[REDACTED]  
17 Nant Alyn Road  
Rhydymwyn  
Nr Mold  
Flintshire  
CH7 5HQ  
[REDACTED]

### MAFF Buffer Depot, Rhydymwyn, Mold: Additional Work Items

Further to our meeting on 20 December 2012, we provide the costs associated with the additional work items discussed at the meeting. The costs below are in addition to those presented in our previous costed proposal dated 23 November 2012 and assume that the works will be carried out during a single phase of operations.

#### Preliminary Radon Monitoring and Preliminary Radon Risk Assessment

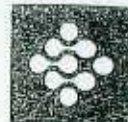
The Ionising Radiation Regulations (IRR) 1999 apply to any work being undertaken in an atmosphere containing radon 222 gas at a concentration in air, averaged over any 24 hour period, exceeding 400 Bq/m<sup>3</sup>. It is understood that previous passive monitoring indicates that this concentration is very likely to be exceeded in the caverns. Wardell Armstrong have also recently been undertaking inspections of the Milwr Tunnel that passes beneath the caverns and elevated radon levels have been encountered here resulting in the requirement to comply with the IRR.

The IRR establish a framework for ensuring that exposure to ionising radiation arising from work activities, is kept as low as is reasonably practicable (ALARP). It specifies dose limits that must not be exceeded by individuals. The IRR have various requirements on the Employers of personnel working in radon affected environments, the most relevant of these are:

- Preparation of radon risk assessment for the works;
- Appointment of a Radiation Protection Advisor (RPA) to provide expert advice;
- Appointment of Radiation Protection Supervisor (RPS);
- Designation of Supervised /Controlled Areas dependent on potential radon dose;
- Undertake radon monitoring;
- Preparation of Local Rules to minimise exposure to radon;
- Designation of Classified Persons ( if appropriate).

Due to the lack of current data relating to radon concentrations, the object of the study will be to ascertain measurements of radon concentrations in the cavern at various locations and under varying conditions (airflow direction, doors open/closed) using an Alpha Guard active (real time) monitor. The monitor can be left unattended to record concentrations and the data subsequently downloaded. This information may be supplemented by long term passive monitors and personal monitoring. This information will then be used to prepare a comprehensive Radon Risk Assessment and Local Rules that are used to determine the requirements for future access to the caverns.





Wardell Armstrong, in association with the Health Protection Agency, is able to provide the specialist expertise to undertake the study. The Health Protection Agency would be appointed as the project RPA, subcontracted through Wardell Armstrong. We would propose the following methodology:

- Prepare preliminary Radon Risk Assessment based upon the results of the previous radon monitoring, including Local Rules;
- Appoint RPA and get approval of our proposed risk assessment;
- Hire Alpha Guard active radon monitor from Germany for duration of underground works, say 3 weeks;
- 1 day underground inspection by WA/HPA team to assess airflow movements, undertake initial monitoring, train underground team in monitor operation and prepare monitoring schedule;
- Update Local Rules based on initial monitoring, if necessary;
- Commence active monitoring in accordance with agreed schedule and download data;
- Issue personal exposure badges to underground team;
- Install long term passive monitors in the caverns (for three months);
- Prepare updated Radon Risk Assessment and Local Rules based on new monitoring information.

The costs are estimated as follows (ex VAT):

*Wardell Armstrong*

WA fees: £7,500

WA expenses: £250

Disbursements: Appointment of Health Protection Agency as RPA (1 year contract) £1,750;

Hire of Alpha Guard active monitor (assume 3 weeks) £2,000;

Personal badges (assume 8) £300;

Passive monitors (assume 4) £100.

**Total Wardell Armstrong costs: £11,900 (exc. VAT)**

*TL Excavations*

Assisting Wardell Armstrong with initial monitoring of radon using Alphaguard active monitoring equipment. This will be carried out one week prior to contractual work in the caverns.

1 day to accompany Wardell Armstrong to undertake preliminary monitoring at various locations in the caverns.

**TL Excavations Cost: £400 (exc. VAT)**

The Alphaguard will then be left in-situ at a representative location to record radon levels under differing ventilation conditions over a longer period.

*Contingency Costs for Ventilation*

If, based on preliminary monitoring, it is evident that the radon levels are outside safe working parameters, it is likely that it will be necessary to ventilate the caverns during the contractual work and a fan and generator will be mobilised to site.

Once the longer term monitoring is analysed a final decision will be made on the requirement and extent of ventilation measures.



The potential ventilation requirements could require the provision and installation of a 20hp fan and ducting, 60kva diesel generator & fuel, cable and switch gear, sheeting material for bratticing.

**TL Excavations Contingency Costs:**

**Establishment: £2,600 (exc. VAT)**

**Per week: £1,180 (exc. VAT), say £3,540 for 3 weeks**

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

Removal and disposal of existing water catchment system and replacement with a 1.5m x 1.5m hot dipped galvanised hopper, utilising existing pipework and re-support from the roof.

**TL Excavation costs: £5,000 exc. VAT**

**Wardell Armstrong costs to supervise and validate: £1,100 exc. VAT.**

**Installation of Second Water Catchment Hopper**

Installation of 1.5m x 1.5m hot dipped galvanised hopper with associated pipework:

**TL Excavations costs: £3,150 exc. VAT**

**Wardell Armstrong costs to supervise and validate: £550 exc. VAT.**

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

Remove and dispose of existing door and replace with steel hot dipped galvanised door.

**TL Excavations costs: £1,960 exc. VAT.**

**Wardell Armstrong costs to supervise and validate: £550 exc. VAT.**

**Paint Main Entrance Doors**

Prepare steelwork and paint green on both sides:

**TL Excavation costs: £70 exc. VAT**

**Wardell Armstrong costs: Included.**

**Paint Internal Barrier**

Prepare steelwork and paint black with yellow stripe:

**TL Excavation costs: £70 exc. VAT**

**Wardell Armstrong costs: Included.**

**Steel Access Decking**

Provide and install 27m x 1m steel decking to provide pedestrian access to the main entrance including ground preparation (excluding any drainage amendments).

**TL Excavations costs: £8,780 exc. VAT**

**Wardell Armstrong costs to supervise and validate (including Senior Structural Engineer to inspect and validate on completion): £2,500 exc. VAT.**

A summary of the costs are presented in Table 1 below:



<b>Item</b>	<b>Wardell Armstrong Costs (exc. VAT)</b>	<b>TL Excavations Ltd Costs (exc. VAT)</b>
Radon Monitoring and Risk Assessment	£11,900	£400*
Replacement of Cavern Roof Drainage	£1,100	£5,000
Installation of Second Water Hopper	£550	£3,150
Replacement Door	£550	£1,960
Paint Main Door	£0.00	£70
Paint Internal Barrier	£0.00	£70
Steel Access Decking	£2,500	£8,780

\* excludes contingency for ventilation.

The above assumes that Interserve will be responsible for the payment of TL Excavation Ltd's invoices directly, subject to our verification.

It is understood that this work must be complete by the end of March and therefore we would be grateful for instruction to proceed at your earliest opportunity.

We trust the above meets with your approval, however, if you have any queries please do not hesitate to contact us.

Yours sincerely  
for Wardell Armstrong LLP