

Certificate of Analysis

Certificate Number 26-10491-1

Issued: 01-Jun-26

Client Land Quality Management Ltd
Sir Colin Campbell Building
UNIP
Triumph Road
Nottingham
NG7 2TU

Our Reference 26-10491-1

Client Reference ~ (not supplied)

Order No ~ LQM1607/2026/0424

Contract Title ~ Stroud Asbestos

Description 10 Soil samples.

Date Received 28-Apr-26

Date Started 28-Apr-26

Date Completed 01-Jun-26

Test Procedures Identified by prefix DETSn (details on request).

Notes This report supersedes 26-10491; Amendments made to Report: Asbestos Dust Test result table updated for correct units

Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By



Reyhan Irfan
Operations Manager



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Summary of Asbestos Analysis Soil Samples

Our Ref 26-10491-1

Client Ref ~

Contract Title ~ Stroud Asbestos

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2680207	MH 1 A 0.01-0.10	SOIL	Chrysotile	Chrysotile present in visible & microscopic Cement debris	Keith Wilson
2680208	MH 2 A 0.01-0.10	SOIL	NAD	none	Keith Wilson
2680209	MH 3 A 0.01-0.10	SOIL	NAD	none	Keith Wilson
2680210	MH 4 A 0.01-0.10	SOIL	Chrysotile	Chrysotile present in visible Cement debris	Keith Wilson
2680211	MH 5 A 0.01-0.10	SOIL	Chrysotile	Chrysotile present in visible Cement debris & bundles	Keith Wilson
2680212	MH 6 A 0.01-0.10	SOIL	Chrysotile	Chrysotile present in visible Cement debris	Keith Wilson
2680213	MH 7 A 0.01-0.10	SOIL	Chrysotile	Chrysotile present in visible & microscopic Cement debris	Keith Wilson
2680214	MH 8 A 0.01-0.10	SOIL	Chrysotile	Chrysotile present in visible & microscopic Cement debris	Keith Wilson
2680215	MH 9 A 0.01-0.10	SOIL	Chrysotile	Chrysotile present in visible & microscopic Cement debris	Keith Wilson
2680216	MH 10 A 0.01-0.10	SOIL	Chrysotile	Chrysotile present in visible & microscopic Cement debris	Keith Wilson

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * -not included in laboratory scope of accreditation.

Summary of Asbestos Quantification Analysis Soil Samples

Our Ref 26-10491-1

Client Ref ~

Contract Title ~ Stroud Asbestos

Lab No	2680207	2680210	2680211
Sample ID ~	MH 1	MH 4	MH 5
Depth ~	0.01-0.10	0.01-0.10	0.01-0.10
Other ID ~	A	A	A
Sample Type ~			
Sampling Date ~	23/04/2026	23/04/2026	23/04/2026
Sampling Time ~	1606	1609	1610

Test	Method	LOQ	Units			
Total Mass% Asbestos (a+b+c)	DETSC 1102	< 0.001	Mass %	0.046	0.057	0.366
Gravimetric Quantification (a)	DETSC 1102	< 0.001	Mass %	0.046	0.057	0.363
Detailed Gravimetric Quantification (b)	DETSC 1102	< 0.001	Mass %	na	na	0.002
Quantification by PCOM (c)	DETSC 1102	< 0.001	Mass %	na	na	na
Potentially Respirable Fibres (d)	DETSC 1102	< 0.001	Fibres/g	na	na	na
Breakdown of Gravimetric Analysis (a)						
Mass of Sample			g	417.29	557.51	595.49
ACMs present*			type	Cement	Cement	Cement
Mass of ACM in sample			g	1.2730	2.1100	14.4300
% ACM by mass			%	0.305	0.378	2.423
% asbestos in ACM			%	15	15	15
% asbestos in sample			%	0.046	0.057	0.363
Breakdown of Detailed Gravimetric Analysis (b)						
% Amphibole bundles in sample			Mass %	na	na	na
% Chrysotile bundles in sample			Mass %	na	na	0.002
Breakdown of PCOM Analysis (c)						
% Amphibole fibres in sample			Mass %	na	na	na
% Chrysotile fibres in sample			Mass %	na	na	na
Breakdown of Potentially Respirable Fibre Analysis (d)						
Amphibole fibres			Fibres/g	na	na	na
Chrysotile fibres			Fibres/g	na	na	na

* Denotes test or material description outside of UKAS accreditation.
% asbestos in Asbestos Containing Materials (ACMs) is determined by
by reference to HSG 264.
Recommended sample size for quantification is approximately 1kg
denotes deviating sample
The results are based on dry weight.

Summary of Asbestos Quantification Analysis

Soil Samples

Our Ref 26-10491-1

Client Ref ~

Contract Title ~ Stroud Asbestos

Lab No	2680212	2680213	2680214
Sample ID ~	MH 6	MH 7	MH 8
Depth ~	0.01-0.10	0.01-0.10	0.01-0.10
Other ID ~	A	A	A
Sample Type ~			
Sampling Date ~	23/04/2026	23/04/2026	23/04/2026
Sampling Time ~	1611	1612	1616

Test	Method	LOQ	Units			
Total Mass% Asbestos (a+b+c)	DETSC 1102	< 0.001	Mass %	0.503	0.343	0.431
Gravimetric Quantification (a)	DETSC 1102	< 0.001	Mass %	0.503	0.343	0.431
Detailed Gravimetric Quantification (b)	DETSC 1102	< 0.001	Mass %	na	na	na
Quantification by PCOM (c)	DETSC 1102	< 0.001	Mass %	na	na	na
Potentially Respirable Fibres (d)	DETSC 1102	< 0.001	Fibres/g	na	na	na
Breakdown of Gravimetric Analysis (a)						
Mass of Sample			g	415.78	549.14	626.69
ACMs present*			type	Cement	Cement	Cement
Mass of ACM in sample			g	13.9500	12.5719	17.9892
% ACM by mass			%	3.355	2.289	2.871
% asbestos in ACM			%	15	15	15
% asbestos in sample			%	0.503	0.343	0.431
Breakdown of Detailed Gravimetric Analysis (b)						
% Amphibole bundles in sample			Mass %	na	na	na
% Chrysotile bundles in sample			Mass %	na	na	na
Breakdown of PCOM Analysis (c)						
% Amphibole fibres in sample			Mass %	na	na	na
% Chrysotile fibres in sample			Mass %	na	na	na
Breakdown of Potentially Respirable Fibre Analysis (d)						
Amphibole fibres			Fibres/g	na	na	na
Chrysotile fibres			Fibres/g	na	na	na

* Denotes test or material description outside of UKAS accreditation.
 % asbestos in Asbestos Containing Materials (ACMs) is determined by
 by reference to HSG 264.
 Recommended sample size for quantification is approximately 1kg
 # denotes deviating sample
 The results are based on dry weight.

Summary of Asbestos Quantification Analysis Soil Samples

Our Ref 26-10491-1

Client Ref ~

Contract Title ~ Stroud Asbestos

Lab No	2680215	2680216
Sample ID ~	MH 9	MH 10
Depth ~	0.01-0.10	0.01-0.10
Other ID ~	A	A
Sample Type ~		
Sampling Date ~	23/04/2026	23/04/2026
Sampling Time ~	1618	1619

Test	Method	LOQ	Units		
Total Mass% Asbestos (a+b+c)	DETSC 1102	< 0.001	Mass %	0.075	0.578
Gravimetric Quantification (a)	DETSC 1102	< 0.001	Mass %	0.075	0.578
Detailed Gravimetric Quantification (b)	DETSC 1102	< 0.001	Mass %	na	na
Quantification by PCOM (c)	DETSC 1102	< 0.001	Mass %	na	na
Potentially Respirable Fibres (d)	DETSC 1102	< 0.001	Fibres/g	na	na
Breakdown of Gravimetric Analysis (a)					
Mass of Sample			g	554.81	465.69
ACMs present*			type	Cement	Cement
Mass of ACM in sample			g	2.7825	17.9308
% ACM by mass			%	0.502	3.850
% asbestos in ACM			%	15	15
% asbestos in sample			%	0.075	0.578
Breakdown of Detailed Gravimetric Analysis (b)					
% Amphibole bundles in sample			Mass %	na	na
% Chrysotile bundles in sample			Mass %	na	na
Breakdown of PCOM Analysis (c)					
% Amphibole fibres in sample			Mass %	na	na
% Chrysotile fibres in sample			Mass %	na	na
Breakdown of Potentially Respirable Fibre Analysis (d)					
Amphibole fibres			Fibres/g	na	na
Chrysotile fibres			Fibres/g	na	na

* Denotes test or material description outside of UKAS accreditation.
% asbestos in Asbestos Containing Materials (ACMs) is determined by
by reference to HSG 264.
Recommended sample size for quantification is approximately 1kg
denotes deviating sample
The results are based on dry weight.

Summary of Asbestos Quantification Analysis Soil Samples

Our Ref 26-10491-1
Client Ref ~
Contract Title ~ Stroud Asbestos

Lab No	2680207	2680210	2680211	2680212
Sample ID ~	MH 1	MH 4	MH 5	MH 6
Depth ~	0.01-0.10	0.01-0.10	0.01-0.10	0.01-0.10
Other ID ~	A	A	A	A
Sample Type ~				
Sampling Date ~	23/04/2026	23/04/2026	23/04/2026	23/04/2026
Sampling Time ~	1606	1609	1610	1611

Test	Method	Units				
Fibres in respirable dust	DETSC 1104*	f/mg	12769	11492	15323	29369
fibres/ml at 4 mg/m ³	DETSC 1104*	f/ml	0.051	0.046	0.061	0.117
fibres/ml at 2 mg/m ³	DETSC 1104*	f/ml	0.026	0.023	0.031	0.059
fibres/ml at 0.5 mg/m ³	DETSC 1104*	f/ml	0.006	0.006	0.008	0.015
Dustiness needed to get to 0.01 f/ml	DETSC 1104*	mg/m3	0.783	0.870	0.653	0.340
Dustiness needed to get to 0.1 f/ml	DETSC 1104*	mg/m3	7.831	8.702	6.526	3.405

* Denotes test or material description outside of UKAS accreditation.
% asbestos in Asbestos Containing Materials (ACMs) is determined by
by reference to HSG 264.
Recommended sample size for quantification is approximately 1kg
denotes deviating sample
The results are based on dry weight.

Summary of Asbestos Quantification Anal Soil Samples

Our Ref 26-10491-1
Client Ref ~
Contract Title ~ Stroud Asbestos

Lab No	2680213	2680214	2680215	2680216
Sample ID ~	MH 7	MH 8	MH 9	MH 10
Depth ~	0.01-0.10	0.01-0.10	0.01-0.10	0.01-0.10
Other ID ~	A	A	A	A
Sample Type ~				
Sampling Date ~	23/04/2026	23/04/2026	23/04/2026	23/04/2026
Sampling Time ~	1612	1616	1618	1619

Test	Method	Units				
Fibres in respirable dust	DETSC 1104*	f/mg	15323	14046	45968	58737
fibres/ml at 4 mg/m ³	DETSC 1104*	f/ml	0.061	0.056	0.184	0.235
fibres/ml at 2 mg/m ³	DETSC 1104*	f/ml	0.031	0.028	0.092	0.117
fibres/ml at 0.5 mg/m ³	DETSC 1104*	f/ml	0.008	0.007	0.023	0.029
Dustiness needed to get to 0.01 f/ml	DETSC 1104*	mg/m3	0.653	0.712	0.218	0.170
Dustiness needed to get to 0.1 f/ml	DETSC 1104*	mg/m3	6.526	7.120	2.175	1.702

* Denotes test or material description outside of UKAS accreditation.
% asbestos in Asbestos Containing Materials (ACMs) is determined by
by reference to HSG 264.
Recommended sample size for quantification is approximately 1kg
denotes deviating sample
The results are based on dry weight.

Information in Support of the Analytical Results

Our Ref 26-10491-1
Client Ref ~
Contract ~ Stroud Asbestos

Containers Received & Deviating Samples

Lab No	Sample ID ~	Date Sampled ~	Containers Received	Holding time exceeded for tests	Incorrect container for tests
2680207	MH 1 0.01-0.10 SOIL	23/04/26	PT 1L		
2680208	MH 2 0.01-0.10 SOIL	23/04/26	PT 1L		
2680209	MH 3 0.01-0.10 SOIL	23/04/26	PT 1L		
2680210	MH 4 0.01-0.10 SOIL	23/04/26	PT 1L		
2680211	MH 5 0.01-0.10 SOIL	23/04/26	PT 1L		
2680212	MH 6 0.01-0.10 SOIL	23/04/26	PT 1L		
2680213	MH 7 0.01-0.10 SOIL	23/04/26	PT 1L		
2680214	MH 8 0.01-0.10 SOIL	23/04/26	PT 1L		
2680215	MH 9 0.01-0.10 SOIL	23/04/26	PT 1L		
2680216	MH 10 0.01-0.10 SOIL	23/04/26	PT 1L		

Key: P-Plastic T-Tub

Normec DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-
Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

APPENDIX 6 LABORATORY RESULTS: FIBRE RELEASE



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Analytical Report Number : 26-030919

Replaces Analytical Report Number: 26-030919, issue no. 1

Result correction by laboratory.

Comment on the Certificate of Analysis updated on all samples by laboratory.

Project / Site name:	26-13067	Samples received on:	10/06/2026
Your job number:		Samples instructed on/ Analysis started on:	10/06/2026
Your order number:	2004077	Analysis completed by:	30/06/2026
Report Issue Number:	2	Report issued on:	30/06/2026
Samples Analysed:	10 soil samples		

Signed:

Renata Walachnia
Senior Customer Services Advisor
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting
air	- once the analysis is complete

Excel copies of reports are only valid when accompanied by this PDF certificate.

Retention period for records and reports is minimum 6 years from the date of issue of the final report.
Some records may be kept for longer according to other legal/best practice requirements.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.



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Analytical Report Number: 26-030919

Project / Site name: 26-13067

Your Order No: 2004077

Lab Sample Number				945487	945488	945489	945490	945491
Sample Reference				2695107	2695108	2695109	2695110	2695111
Sample Number				MH 1 As received	MH 2 As received	MH 3 As received	MH 4 As received	MH 5 As received
Water Matrix				N/A	N/A	N/A	N/A	N/A
Depth (m)				0.01-0.10	0.01-0.10	0.01-0.10	0.01-0.10	0.01-0.10
Date Sampled				23/04/2026	23/04/2026	23/04/2026	23/04/2026	23/04/2026
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status					
Mass of stone >10mm	%	0.1	NONE	60.8	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	16	23	38	27	18
Whole Sample Crushed	N/A	N/A	NONE	Crushed	-	-	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected



Analytical Report Number: 26-030919
 Project / Site name: 26-13067
 Your Order No: 2004077

Lab Sample Number	945492	945493	945494	945495	945496
Sample Reference	2695112	2695113	2695114	2695115	2695116
Sample Number	MH 6 As received	MH 7 As received	MH 8 As received	MH 9 As received	MH 10 As received
Water Matrix	N/A	N/A	N/A	N/A	N/A
Depth (m)	0.01-0.10	0.01-0.10	0.01-0.10	0.01-0.10	0.01-0.10
Date Sampled	23/04/2026	23/04/2026	23/04/2026	23/04/2026	23/04/2026
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status		
Mass of stone >10mm	%	0.1	NONE	27.7	< 0.1
Moisture Content	%	0.01	NONE	28	25
Whole Sample Crushed	N/A	N/A	NONE	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Client: NOR-DETS

Site: 26-13067

Sample date: 23/04/2026

Sample received: 10/06/2026

Sample instructed: 10/06/2026

Analysis Completed: 17/06/2026

Certificate of Analysis - Asbestos Dustiness

Analytical Report no. 26-030919, Sample Number 945487

The analysis was carried out in accordance to in house method A007- PL, using rotating dustiness drum adapted BS EN 15051-2:2013 + A1:2016 (Workplace exposure - Measurement of the dustiness of bulk material) for asbestos contaminated soils and phase-contrast microscopy (PCM).

Analytical Results:

The same sample was examined 3 times and dust was collected on the 3 separate filters.

Asbestos Analyst ID: MJN

Results tabulated below:

Sample ID		2695107			General Sample Description				Brown loam and sand with vegetation and stones		
Other ID		MH 1 As received									
Depth		0.01-0.10			Moisture content of 'As received' sample				16		
Run no.	Volume (L)	Respirable fibres counted	Graticules counted	LOQ Fibre concentration in drum (f/ml)	Actual calculated fibre concentration in drum (f/ml)	Reported fibre concentration in drum (f/ml)	LOQ Dust in drum (mg/m3)	Dust in drum (mg/m ³)	Respirable dustiness mass fraction (mg/kg)	Mean of Respirable dustiness mass fraction (mg/kg)	RSD of Respirable dustiness mass fraction (%)
1	14.4	1.0	200	2.50	0.13	<2.50	6	277	14	39	57
2	14.4	0.0	200	2.50	0.00	<2.50	6	371	49		
3	14.4	2.0	200	2.50	0.25	<2.50	6	389	55		

Comments

Alternative parameters were used due to poor dust release at standard flow rate; as per contract review. Conditions used 3.6 min. Note the alternative parameters decreased the LoQ of the method.

Table 1. Classification scheme for rotating drum method (in accordance with BS EN 15051-2:2013 + A1:2016)

Category of dustiness	Respirable dustiness mass fraction (mg/kg)
Very low	< 10
Low	10 to 60
Moderate	> 60 to 210
High	> 210

Client: NOR-DETS

Site: 26-13067

Sample date: 23/04/2026

Sample received: 10/06/2026

Sample instructed: 10/06/2026

Analysis Completed: 17/06/2026

Certificate of Analysis - Asbestos Dustiness

Analytical Report no. 26-030919, Sample Number 945488

The analysis was carried out in accordance to in house method A007- PL, using rotating dustiness drum adapted BS EN 15051-2:2013 + A1:2016 (Workplace exposure - Measurement of the dustiness of bulk material) for asbestos contaminated soils and phase-contrast microscopy (PCM).

Analytical Results:

The same sample was examined 3 times and dust was collected on the 3 separate filters.

Asbestos Analyst ID: MJN

Results tabulated below:

Sample ID		2695108			General Sample Description				Brown loam and sand with gravel and vegetation		
Other ID		MH 2 As received									
Depth		0.01-0.10			Moisture content of 'As received' sample				23		
Run no.	Volume (L)	Respirable fibres counted	Graticules counted	LOQ Fibre concentration in drum (f/ml)	Actual calculated fibre concentration in drum (f/ml)	Reported fibre concentration in drum (f/ml)	LOQ Dust in drum (mg/m3)	Dust in drum (mg/m ³)	Respirable dustiness mass fraction (mg/kg)	Mean of Respirable dustiness mass fraction (mg/kg)	RSD of Respirable dustiness mass fraction (%)
1	14.4	0.0	200	2.50	0.00	<2.50	6	290	19	29	31
2	14.4	0.0	200	2.50	0.00	<2.50	6	290	32		
3	14.4	0.0	200	2.50	0.00	<2.50	6	288	36		

Comments

Alternative parameters were used due to poor dust release at standard flow rate; as per contract review. Conditions used 3.6 min. Note the alternative parameters decreased the LoQ of the method.

Table 1. Classification scheme for rotating drum method (in accordance with BS EN 15051-2:2013 + A1:2016)

Category of dustiness	Respirable dustiness mass fraction (mg/kg)
Very low	< 10
Low	10 to 60
Moderate	> 60 to 210
High	> 210

Client: NOR-DETS

Site: 26-13067

Sample date: 23/04/2026

Sample received: 10/06/2026

Sample instructed: 10/06/2026

Analysis Completed: 18/06/2026

Certificate of Analysis - Asbestos Dustiness

Analytical Report no. 26-030919, Sample Number 945489

The analysis was carried out in accordance to in house method A007- PL, using rotating dustiness drum adapted BS EN 15051-2:2013 + A1:2016 (Workplace exposure - Measurement of the dustiness of bulk material) for asbestos contaminated soils and phase-contrast microscopy (PCM).

Analytical Results:

The same sample was examined 3 times and dust was collected on the 3 separate filters.

Asbestos Analyst ID: SCA

Results tabulated below:

Sample ID		2695109			General Sample Description				Brown loam and sand with gravel and vegetation		
Other ID		MH 3 As received									
Depth		0.01-0.10			Moisture content of 'As received' sample				38		
Run no.	Volume (L)	Respirable fibres counted	Graticules counted	LOQ Fibre concentration in drum (f/ml)	Actual calculated fibre concentration in drum (f/ml)	Reported fibre concentration in drum (f/ml)	LOQ Dust in drum (mg/m3)	Dust in drum (mg/m ³)	Respirable dustiness mass fraction (mg/kg)	Mean of Respirable dustiness mass fraction (mg/kg)	RSD of Respirable dustiness mass fraction (%)
1	14.4	0.0	200	2.50	0.00	<2.50	6	47	4	9	50
2	14.4	0.0	200	2.50	0.00	<2.50	6	97	11		
3	14.4	3.0	200	2.50	0.38	<2.50	6	139	12		

Comments

Alternative parameters were used due to poor dust release at standard flow rate; as per contract review. Conditions used 3.6 min. Note the alternative parameters decreased the LoQ of the method.

Table 1. Classification scheme for rotating drum method (in accordance with BS EN 15051-2:2013 + A1:2016)

Category of dustiness	Respirable dustiness mass fraction (mg/kg)
Very low	< 10
Low	10 to 60
Moderate	> 60 to 210
High	> 210

Client: NOR-DETS

Site: 26-13067

Sample date: 23/04/2026

Sample received: 10/06/2026

Sample instructed: 10/06/2026

Analysis Completed: 18/06/2026

Certificate of Analysis - Asbestos Dustiness

Analytical Report no. 26-030919, Sample Number 945490

The analysis was carried out in accordance to in house method A007- PL, using rotating dustiness drum adapted BS EN 15051-2:2013 + A1:2016 (Workplace exposure - Measurement of the dustiness of bulk material) for asbestos contaminated soils and phase-contrast microscopy (PCM).

Analytical Results:

The same sample was examined 3 times and dust was collected on the 3 separate filters.

Asbestos Analyst ID: SCA

Results tabulated below:

Sample ID		2695110			General Sample Description				Brown loam and sand with gravel and vegetation		
Other ID		MH 4 As received									
Depth		0.01-0.10			Moisture content of 'As received' sample				27		
Run no.	Volume (L)	Respirable fibres counted	Graticules counted	LOQ Fibre concentration in drum (f/ml)	Actual calculated fibre concentration in drum (f/ml)	Reported fibre concentration in drum (f/ml)	LOQ Dust in drum (mg/m3)	Dust in drum (mg/m ³)	Respirable dustiness mass fraction (mg/kg)	Mean of Respirable dustiness mass fraction (mg/kg)	RSD of Respirable dustiness mass fraction (%)
1	14.4	2.0	200	2.50	0.25	<2.50	6	280	7	5	31
2	14.4	1.0	200	2.50	0.13	<2.50	6	155	5		
3	14.4	0.0	200	2.50	0.00	<2.50	6	231	4		

Comments

Alternative parameters were used due to poor dust release at standard flow rate; as per contract review. Conditions used 3.6 min. Note the alternative parameters decreased the LoQ of the method.

Table 1. Classification scheme for rotating drum method (in accordance with BS EN 15051-2:2013 + A1:2016)

Category of dustiness	Respirable dustiness mass fraction (mg/kg)
Very low	< 10
Low	10 to 60
Moderate	> 60 to 210
High	> 210

Client: NOR-DETS

Site: 26-13067

Sample date: 23/04/2026

Sample received: 10/06/2026

Sample instructed: 10/06/2026

Analysis Completed: 19/06/2026

Certificate of Analysis - Asbestos Dustiness

Analytical Report no. 26-030919, Sample Number 945491

The analysis was carried out in accordance to in house method A007- PL, using rotating dustiness drum adapted BS EN 15051-2:2013 + A1:2016 (Workplace exposure - Measurement of the dustiness of bulk material) for asbestos contaminated soils and phase-contrast microscopy (PCM).

Analytical Results:

The same sample was examined 3 times and dust was collected on the 3 separate filters.

Asbestos Analyst ID: JSW

Results tabulated below:

Sample ID		2695111		General Sample Description					Brown loam and sand with gravel and vegetation		
Other ID		MH 5 As received									
Depth		0.01-0.10		Moisture content of 'As received' sample					18		
Run no.	Volume (L)	Respirable fibres counted	Graticules counted	LOQ Fibre concentration in drum (f/ml)	Actual calculated fibre concentration in drum (f/ml)	Reported fibre concentration in drum (f/ml)	LOQ Dust in drum (mg/m3)	Dust in drum (mg/m ³)	Respirable dustiness mass fraction (mg/kg)	Mean of Respirable dustiness mass fraction (mg/kg)	RSD of Respirable dustiness mass fraction (%)
1	14.4	2.0	200	2.50	0.25	<2.50	6	<6.00	0	4	136
2	14.4	0.0	200	2.50	0.00	<2.50	6	<6.00	2		
3	14.4	0.0	200	2.50	0.00	<2.50	6	<6.00	10		

Comments

Alternative parameters were used due to poor dust release at standard flow rate; as per contract review. Conditions used 3.6 min. Note the alternative parameters decreased the LoQ of the method.

Table 1. Classification scheme for rotating drum method (in accordance with BS EN 15051-2:2013 + A1:2016)

Category of dustiness	Respirable dustiness mass fraction (mg/kg)
Very low	< 10
Low	10 to 60
Moderate	> 60 to 210
High	> 210

Client: NOR-DETS

Site: 26-13067

Sample date: 23/04/2026

Sample received: 10/06/2026

Sample instructed: 10/06/2026

Analysis Completed: 19/06/2026

Certificate of Analysis - Asbestos Dustiness

Analytical Report no. 26-030919, Sample Number 945492

The analysis was carried out in accordance to in house method A007- PL, using rotating dustiness drum adapted BS EN 15051-2:2013 + A1:2016 (Workplace exposure - Measurement of the dustiness of bulk material) for asbestos contaminated soils and phase-contrast microscopy (PCM).

Analytical Results:

The same sample was examined 3 times and dust was collected on the 3 separate filters.

Asbestos Analyst ID: JSW

Results tabulated below:

Sample ID		2695112			General Sample Description				Brown loam and sand with vegetation and stones		
Other ID		MH 6 As received									
Depth		0.01-0.10			Moisture content of 'As received' sample				28		
Run no.	Volume (L)	Respirable fibres counted	Graticules counted	LOQ Fibre concentration in drum (f/ml)	Actual calculated fibre concentration in drum (f/ml)	Reported fibre concentration in drum (f/ml)	LOQ Dust in drum (mg/m3)	Dust in drum (mg/m ³)	Respirable dustiness mass fraction (mg/kg)	Mean of Respirable dustiness mass fraction (mg/kg)	RSD of Respirable dustiness mass fraction (%)
1	14.4	0.0	200	2.50	0.00	<2.50	6	149	2	1	173
2	14.4	0.0	200	2.50	0.00	<2.50	6	251	0		
3	14.4	0.0	200	2.50	0.00	<2.50	6	292	0		

Comments

Alternative parameters were used due to poor dust release at standard flow rate; as per contract review. Conditions used 3.6 min. Note the alternative parameters decreased the LoQ of the method.

Table 1. Classification scheme for rotating drum method (in accordance with BS EN 15051-2:2013 + A1:2016)

Category of dustiness	Respirable dustiness mass fraction (mg/kg)
Very low	< 10
Low	10 to 60
Moderate	> 60 to 210
High	> 210

Client: NOR-DETS

Site: 26-13067

Sample date: 23/04/2026

Sample received: 10/06/2026

Sample instructed: 10/06/2026

Analysis Completed: 24/06/2026

Certificate of Analysis - Asbestos Dustiness

Analytical Report no. 26-030919, Sample Number 945493

The analysis was carried out in accordance to in house method A007- PL, using rotating dustiness drum adapted BS EN 15051-2:2013 + A1:2016 (Workplace exposure - Measurement of the dustiness of bulk material) for asbestos contaminated soils and phase-contrast microscopy (PCM).

Analytical Results:

The same sample was examined 3 times and dust was collected on the 3 separate filters.

Asbestos Analyst ID: MWI

Results tabulated below:

Sample ID		2695113		General Sample Description					Brown loam and sand with gravel and vegetation		
Other ID		MH 7 As received									
Depth		0.01-0.10		Moisture content of 'As received' sample					25		
Run no.	Volume (L)	Respirable fibres counted	Graticules counted	LOQ Fibre concentration in drum (f/ml)	Actual calculated fibre concentration in drum (f/ml)	Reported fibre concentration in drum (f/ml)	LOQ Dust in drum (mg/m ³)	Dust in drum (mg/m ³)	Respirable dustiness mass fraction (mg/kg)	Mean of Respirable dustiness mass fraction (mg/kg)	RSD of Respirable dustiness mass fraction (%)
1	14.4	1.0	200	2.50	0.13	<2.50	6	<6.00	0	0	N/A
2	14.4	0.0	200	2.50	0.00	<2.50	6	<6.00	0		
3	14.4	0.0	200	2.50	0.00	<2.50	6	<6.00	0		

Comments

Alternative parameters were used due to poor dust release at standard flow rate; as per contract review. Conditions used 3.6 min. Note the alternative parameters decreased the LoQ of the method.

Table 1. Classification scheme for rotating drum method (in accordance with BS EN 15051-2:2013 + A1:2016)

Category of dustiness	Respirable dustiness mass fraction (mg/kg)
Very low	< 10
Low	10 to 60
Moderate	> 60 to 210
High	> 210

Client: NOR-DETS

Site: 26-13067

Sample date: 23/04/2026

Sample received: 10/06/2026

Sample instructed: 10/06/2026

Analysis Completed: 24/06/2026

Certificate of Analysis - Asbestos Dustiness

Analytical Report no. 26-030919, Sample Number 945494

The analysis was carried out in accordance to in house method A007- PL, using rotating dustiness drum adapted BS EN 15051-2:2013 + A1:2016 (Workplace exposure - Measurement of the dustiness of bulk material) for asbestos contaminated soils and phase-contrast microscopy (PCM).

Analytical Results:

The same sample was examined 3 times and dust was collected on the 3 separate filters.

Asbestos Analyst ID: MWI

Results tabulated below:

Sample ID		2695114			General Sample Description				Brown loam and sand with gravel and vegetation		
Other ID		MH 8 As received									
Depth		0.01-0.10			Moisture content of 'As received' sample				21		
Run no.	Volume (l)	Respirable fibres counted	Graticules counted	LOQ Fibre concentration in drum (f/ml)	Actual calculated fibre concentration in drum (f/ml)	Reported fibre concentration in drum (f/ml)	LOQ Dust in drum (mg/m3)	Dust in drum (mg/m ³)	Respirable dustiness mass fraction (mg/kg)	Mean of Respirable dustiness mass fraction (mg/kg)	RSD of Respirable dustiness mass fraction (%)
1	14.4	0.0	200	2.50	0.00	<2.50	6	<6.00	0	0	N/A
2	14.4	0.0	200	2.50	0.00	<2.50	6	67	0		
3	14.4	0.0	200	2.50	0.00	<2.50	6	<6.00	0		

Comments

Alternative parameters were used due to poor dust release at standard flow rate; as per contract review. Conditions used 3.6 min. Note the alternative parameters decreased the LoQ of the method.

Table 1. Classification scheme for rotating drum method (in accordance with BS EN 15051-2:2013 + A1:2016)

Category of dustiness	Respirable dustiness mass fraction (mg/kg)
Very low	< 10
Low	10 to 60
Moderate	> 60 to 210
High	> 210

Client: NOR-DETS

Site: 26-13067

Sample date: 23/04/2026

Sample received: 10/06/2026

Sample instructed: 10/06/2026

Analysis Completed: 25/06/2026

Certificate of Analysis - Asbestos Dustiness

Analytical Report no. 26-030919, Sample Number 945495

The analysis was carried out in accordance to in house method A007- PL, using rotating dustiness drum adapted BS EN 15051-2:2013 + A1:2016 (Workplace exposure - Measurement of the dustiness of bulk material) for asbestos contaminated soils and phase-contrast microscopy (PCM).

Analytical Results:

The same sample was examined 3 times and dust was collected on the 3 separate filters.

Asbestos Analyst ID: MMI

Results tabulated below:

Sample ID		2695115			General Sample Description				Brown loam and sand with gravel and vegetation		
Other ID		MH 9 As received									
Depth		0.01-0.10			Moisture content of 'As received' sample				24		
Run no.	Volume (L)	Respirable fibres counted	Graticules counted	LOQ Fibre concentration in drum (f/ml)	Actual calculated fibre concentration in drum (f/ml)	Reported fibre concentration in drum (f/ml)	LOQ Dust in drum (mg/m3)	Dust in drum (mg/m ³)	Respirable dustiness mass fraction (mg/kg)	Mean of Respirable dustiness mass fraction (mg/kg)	RSD of Respirable dustiness mass fraction (%)
1	14.4	0.0	200	2.50	0.00	<2.50	6	201	9	3	173
2	14.4	0.0	200	2.50	0.00	<2.50	6	<6.00	0		
3	14.4	0.0	200	2.50	0.00	<2.50	6	<6.00	0		

Comments

Alternative parameters were used due to poor dust release at standard flow rate; as per contract review. Conditions used 3.6 min. Note the alternative parameters decreased the LoQ of the method.

Table 1. Classification scheme for rotating drum method (in accordance with BS EN 15051-2:2013 + A1:2016)

Category of dustiness	Respirable dustiness mass fraction (mg/kg)
Very low	< 10
Low	10 to 60
Moderate	> 60 to 210
High	> 210

Client: NOR-DETS

Site: 26-13067

Sample date: 23/04/2026

Sample received: 10/06/2026

Sample instructed: 10/06/2026

Analysis Completed: 25/06/2026

Certificate of Analysis - Asbestos Dustiness

Analytical Report no. 26-030919, Sample Number 945496

The analysis was carried out in accordance to in house method A007- PL, using rotating dustiness drum adapted BS EN 15051-2:2013 + A1:2016 (Workplace exposure - Measurement of the dustiness of bulk material) for asbestos contaminated soils and phase-contrast microscopy (PCM).

Analytical Results:

The same sample was examined 3 times and dust was collected on the 3 separate filters.

Asbestos Analyst ID: MMI

Results tabulated below:

Sample ID		2695116			General Sample Description				Brown loam and sand with gravel and vegetation		
Other ID		MH 10 As received									
Depth		0.01-0.10			Moisture content of 'As received' sample				34		
Run no.	Volume (L)	Respirable fibres counted	Graticules counted	LOQ Fibre concentration in drum (f/ml)	Actual calculated fibre concentration in drum (f/ml)	Reported fibre concentration in drum (f/ml)	LOQ Dust in drum (mg/m3)	Dust in drum (mg/m ³)	Respirable dustiness mass fraction (mg/kg)	Mean of Respirable dustiness mass fraction (mg/kg)	RSD of Respirable dustiness mass fraction (%)
1	14.4	0.0	200	2.50	0.00	<2.50	6	<6.00	0	0	N/A
2	14.4	0.0	200	2.50	0.00	<2.50	6	8	0		
3	14.4	0.0	200	2.50	0.00	<2.50	6	<6.00	0		

Comments

Alternative parameters were used due to poor dust release at standard flow rate; as per contract review. Conditions used 3.6 min. Note the alternative parameters decreased the LoQ of the method.

Table 1. Classification scheme for rotating drum method (in accordance with BS EN 15051-2:2013 + A1:2016)

Category of dustiness	Respirable dustiness mass fraction (mg/kg)
Very low	< 10
Low	10 to 60
Moderate	> 60 to 210
High	> 210



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Analytical Report Number : 26-030919

Project / Site name: 26-13067

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
945487	2695107	MH 1 As received	0.01-0.10	Brown loam and sand with vegetation and stones
945488	2695108	MH 2 As received	0.01-0.10	Brown loam and sand with gravel and vegetation
945489	2695109	MH 3 As received	0.01-0.10	Brown loam and sand with gravel and vegetation
945490	2695110	MH 4 As received	0.01-0.10	Brown loam and sand with gravel and vegetation
945491	2695111	MH 5 As received	0.01-0.10	Brown loam and sand with gravel and vegetation
945492	2695112	MH 6 As received	0.01-0.10	Brown loam and sand with vegetation and stones
945493	2695113	MH 7 As received	0.01-0.10	Brown loam and sand with gravel and vegetation
945494	2695114	MH 8 As received	0.01-0.10	Brown loam and sand with gravel and vegetation
945495	2695115	MH 9 As received	0.01-0.10	Brown loam and sand with gravel and vegetation
945496	2695116	MH 10 As received	0.01-0.10	Brown loam and sand with gravel and vegetation



Supplementary Information – Asbestos Dustiness

Method:

The analysis was carried out in accordance to in house method A007- PL, using rotating dustiness drum adapted BS EN 15051-2:2013 + A1:2016 (Workplace exposure - Measurement of the dustiness of bulk material) for asbestos contaminated soils and phase-contrast microscopy (PCM).

Approximately 50 g of each sample was loaded into the rotating drum and three subsequent dust samples were obtained. Dust was extracted from the sample in accordance with the membrane filter method (adapted from BS EN 15051-2:2013 + A1:2016 ISBN: 1 920763 81 3).

Fibre measurement and counting was carried out in accordance with HSG248

This method is accredited to ISO 17025.

This method was carried out by i2 Analytical Ltd at ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Information about the method and use of data

This method is a laboratory test and should not be relied upon as a measure of potential exposure to airborne asbestos fibres in the field and that the LoQ is significantly higher than the control level for asbestos and the clearance indicator level.

The respirable dust mass fraction refers to the mass fraction collected on the membrane filter and has no reported relation to the amount of airborne asbestos present. The calculated airborne fibre concentration is reported in accordance with HSG 248 requirements. Where this is below LoQ this is also presented on the report.

The airborne fibre concentration reported represents respirable fibres, which may include both asbestos and non asbestos fibres. Further information regarding any breakdown is available from the laboratory on request.

Quality Control:

Each sample is preceded by a blank sample.

Method References:

1. BS EN 15051-2:2013 + A1:2016 Workplace exposure - Measurement of the dustiness of bulk material
2. EH40/2005 – Workplace exposure limits in UK
3. Development and validation of an analytical method to determine the amount of asbestos in soils and loose aggregates; Addison et al.; HSE Contract Research Report No. 83/1996;
4. Asbestos: The Analysts' Guide; HSG248, HSE; 2021



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Analytical Report Number : 26-030919

Project / Site name: 26-13067

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters Heating/Cooling (PrW) DI Process Water (DI PrW)

Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Whole Sample Crushed	Either: Client specific preparation instructions - sample(s) crushed whole prior to analysis OR Sample unsuitable for standard preparation and therefore crushed whole prior to analysis	In house method, applicable to dry samples only	L019B	D	NONE
Asbestos Dustiness in Soil	See Attached Dustiness Report	Asbestos Dustiness Testing - In-house Method A007	A007B	D	ISO 17025
Moisture Content (Wet Weight)	Moisture content (% wet weight), determined gravimetrically (up to 30°C)	In-house-procedure based on BS EN 12880:2000	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Sample available for Asbestos Dustiness analysis		In-house method	A007B	D	NONE
Soil Descriptions	Textural classification	In-house method	L019B	W	NONE

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30°C.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Quality control parameter failure associated with individual result applies to calculated sum of individuals.

The result for sum should be interpreted with caution

APPENDIX 7 RISK ASSESSMENT OUTPUTS

Calculation Sheet for risk from cumulative exposure to asbestos in air

Based on The quantitative risks of mesothelioma and lung cancer in relation to asbestos exposure, John T. Hodgson and Andrew Darnton, Ann Occup Hyg (2000) 44 (B): 565-601, and personal communication with Andrew Darnton and should be read in conjunction with SoBRA's Discussion Paper on Guidelines for Airborne Concentrations of Asbestos Fibres in Ambient Air: Implications for Quantitative Risk Assessment (SoBRA, 2021)

Default parameters

Asbestos type	Chrysotile
Mesothelioma model	Linear
Lung cancer model	Non-Linear
Lung cancer base risk population	All - population average
Receptor expected lifetime	Lifetime 90 years
Lung cancer age adjustment	Age adjustment based on latency

Risk estimation for site visitors aged from birth to age 20

Concentration in air

onstant average asbestos exposure

Chrysotile

5.00E-02

Exposure over five year tranches

Age	Concentration in air f/ml	Exposure Days per year	Hours per day	Years (Actual)	Exposure time hrs per year hrs/year	Exposure over each 5 year tranche (includes adjustment to occupational years (equal to 2000hrs of exposure per year)) f/ml.yr	X- Cumulative exposure in f/ml.yr =Concentration in air x Exposure time hrs per year x Time period /2000 (hrs in an occupational year) to top of age group
0-5	5.00E-02	104	4	5	4.16E+02	5.20E-02	5.20E-02
5-10	5.00E-02	104	4	5	4.16E+02	5.20E-02	1.04E-01
10-15	5.00E-02	104	4	5	4.16E+02	5.20E-02	1.56E-01
15-20	5.00E-02	104	4	5	4.16E+02	5.20E-02	2.08E-01
20-25	5.00E-02	104	4	5	4.16E+02	5.20E-02	2.60E-01
25-30	5.00E-02	104	4	5	4.16E+02	5.20E-02	3.12E-01
30-35	5.00E-02	104	4	5	4.16E+02	5.20E-02	3.64E-01
35-40	5.00E-02	104	4	5	4.16E+02	5.20E-02	4.16E-01
40-45	5.00E-02	104	4	5	4.16E+02	5.20E-02	4.68E-01
45-50	5.00E-02	104	4	5	4.16E+02	5.20E-02	5.20E-01
50-55	5.00E-02	104	4	5	4.16E+02	5.20E-02	5.72E-01
55-60	5.00E-02	104	4	5	4.16E+02	5.20E-02	6.24E-01

Mesothelioma Risk

$$P_M = A_{pl}X^r + A_{pt}X^t$$

 P_M Percent excess mortality from Mesothelioma (in percent) A_{pl} Constant of proportionality for Pleural risk A_{pt} Constant of proportionality for peritoneal risk X Cumulative exposure in f/ml.yr r Pleural slope of exposure response (on a log-log scale) t Peritoneal slope of exposure response (on a log-log scale)

$$\hat{O}_M = \frac{(A_{pl}X^r + A_{pt}X^t)E_{adj}}{100}$$

 $\hat{O}_M$ the observed meso deaths E_{adj} the expected mortality from all causes adjusted to an age at start of exposure of 30.

r old worker exposed for a five year period with cumulative exposure above.
tes consistent with Table 11 for extended exposures, Hodgson and Darnton 2000

Best Estimate	Chrysotile	Reference
Asbestos type		
A_{pl}	0.001	H&D 2000 Table 1 Mesothelioma risk expressed as percentage total expected mortality per f/ml.yr - Adjusted for age at first exposure.
r_{meso}	1	Linear model
A_{pt}	1E-20	H&D 2000 Table 8 Best estimate slope (n=75, t=2.1)
t	2.1	H&D 2000 Table 8 Best estimate slope (n=75, t=2.1)
Expected mortality from all causes adjusted to an age at start of exposure of 30	0.7	H&D 2000 p. 584 "Absolute risk estimates can therefore be derived from the PM value for a given exposure by multiplying by a factor of 0.7"

Age	Age adjustment Factor for mesothelioma risk Lifetime 90 years	Reference	P_M (%)*	Risk	Risk age adjusted assuming Lifetime 90 years
			5.2E-05	3.6E-07	4.1E-06
			5.2E-05	3.6E-07	3.2E-06
			5.2E-05	3.6E-07	2.5E-06
			5.2E-05	3.6E-07	1.9E-06
			5.2E-05	3.6E-07	1.5E-06
			5.2E-05	3.6E-07	1.1E-06
			5.2E-05	3.6E-07	7.6E-07
			5.2E-05	3.6E-07	2.2E-07
			5.2E-05	3.6E-07	1.5E-07
			5.2E-05	3.6E-07	1.1E-07
			5.2E-05	3.6E-07	7.3E-08
	0.1		5.2E-05	3.6E-07	3.6E-08

* To get the contribution to the risk for the second period alone the risk due to the cumulative dose from the first period is subtracted... and so on.
Developing risk estimates consistent with Table 11 for extended periods, Hodgson and Darnton 2000

Cumulative risk	Chrysotile	Lifetime 90 years 1.6E-05
-----------------	------------	------------------------------

Lung Cancer

$$P_L = A_L \cdot X^r$$

P_L Percentage excess of expected lung cancer mortality

A_L Constant of proportionality for lung cancer risk

r Lung cancer slope of exposure response (on a log-log scale)

X Cumulative exposure in f/ml.yr

$$\text{Predicted excess risk} = O_L - E_L = \frac{A_L \cdot X^r \cdot E_L}{100}$$

E_L Proportion of the specific population that will die of lung cancer between age 40-79

ear old worker exposed for a five year period with cumulative exposure above.
ates consistent with Table 11 for extended exposures, Hodgson and Darnton 2000

Best Estimate		
	Chrysotile	Reference
A_L	0.028	H&D 2000 Table 10 Best (r=1.3)
r_{lung}	1.3	H&D 2000 Table 10 Best (r=1.3)
Proportion of the specific population that will die of lung cancer between age 40-79	0.033	Based on Average 2016-2018 populations statistics

Age	Age adjustment	Age adjustment reference	P_L (%)	Risk (age adjusted)
			6.0E-04	2.0E-07
			8.8E-04	2.9E-07
			1.0E-03	3.4E-07
			1.1E-03	3.7E-07
			1.2E-03	4.0E-07
			1.3E-03	4.3E-07
			1.4E-03	4.5E-07
			1.4E-03	4.7E-07
			1.5E-03	4.8E-07
			1.5E-03	3.8E-07
			1.6E-03	2.6E-07
			1.6E-03	1.3E-07
	0.25			

Cumulative risk	Chrysotile	4.2E-06
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Cumulative lifetime Risk Estimate

Asbestos type	Chrysotile		
Risk from Mesothelioma	Lifetime 90 years	Linear	1.6E-05
Risk from Lung Cancer	All - population average	Non-Linear	4.2E-06
TOTAL			2.0E-05

Limitations

This spreadsheet is offered as a free available resource by SoBRA to improve the consistency in, and adoption of, the use of the Hodgson and Darnton algorithms for estimating lifetime cancer risk for low level environmental exposures to airborne asbestos fibres. It has been developed by members of the SoBRA Asbestos-in-soil sub-group acting in a voluntary capacity, and constitutes the work of the individual authors, not those of their employers. Users of this spreadsheet must satisfy themselves that the content is appropriate for the intended use and no guarantee of suitability is made.

Feedback on this spreadsheet is welcome and should be sent to info@sobra.org.uk

Calculation Sheet for risk from cumulative exposure to asbestos in air

Based on The quantitative risks of mesothelioma and lung cancer in relation to asbestos exposure, John T. Hodgson and Andrew Darnton, Ann Occup Hyg (2000) 44 (8): 565-601, and personal communication with Andrew Darnton and should be read in conjunction with SoBRA's Discussion Paper on Guidelines for Airborne Concentrations of Asbestos Fibres in Ambient Air: Implications for Quantitative Risk Assessment (SoBRA, 2021)

Default parameters

Asbestos type	Chrysotile
Mesothelioma model	Linear
Lung cancer model	Non-Linear
Lung cancer base risk population	All - population average
Receptor expected lifetime	Lifetime 90 years
Lung cancer age adjustment	Age adjustment based on Latency

Risk estimation for ground workers aged from 20 to 60

Concentration in air

Constant average asbestos exposure

Chrysotile

5.00E+00

Exposure over five year tranches

Age	Concentration in air f/ml	Exposure Days per year	Hours per day	Years (Actual)	Exposure time hrs per year hrs/year	Exposure over each 5 year tranche (Includes adjustment to occupational years (equal to 2000hrs of exposure per year)) f/ml.yr	X - Cumulative exposure in f/ml.yr = Concentration in air x Exposure time hrs per year x Time period /2000 (hrs in an occupational year) to top of age group
0-5	5.00E+00				0.00E+00	0.00E+00	0.00E+00
5-10	5.00E+00				0.00E+00	0.00E+00	0.00E+00
10-15	5.00E+00				0.00E+00	0.00E+00	0.00E+00
15-20	5.00E+00				0.00E+00	0.00E+00	0.00E+00
20-25	5.00E+00	13	2	5	2.60E+01	3.25E-01	3.25E-01
25-30	5.00E+00	13	2	5	2.60E+01	3.25E-01	6.50E-01
30-35	5.00E+00	13	2	5	2.60E+01	3.25E-01	9.75E-01
35-40	5.00E+00	13	2	5	2.60E+01	3.25E-01	1.30E+00
40-45	5.00E+00	13	2	5	2.60E+01	3.25E-01	1.63E+00
45-50	5.00E+00	13	2	5	2.60E+01	3.25E-01	1.95E+00
50-55	5.00E+00	13	2	5	2.60E+01	3.25E-01	2.28E+00
55-60	5.00E+00	13	2	5	2.60E+01	3.25E-01	2.60E+00

Mesothelioma Risk

$$P_M = A_{pl} X^r + A_{pr} X^t$$

 P_M Percent excess mortality from Mesothelioma (in percent) A_{pl} Constant of proportionality for Pleural risk A_{pr} Constant of proportionality for Peritoneal risk X Cumulative exposure in f/ml.yr r Pleural slope of exposure response (on a log-log scale) t Peritoneal slope of exposure response (on a log-log scale)

$$\hat{O}_M = \frac{(A_{pl} X^r + A_{pr} X^t) E_{adj}}{100}$$

 $\hat{O}_M$ the observed meso deaths E_{adj} the expected mortality from all causes adjusted to an age at start of exposure of 30.

r old worker exposed for a five year period with cumulative exposure above
tes consistent with Table 11 for extended exposures, Hodgson and Darnton 2000

Best Estimate	Chrysotile	Reference
Asbestos type	Chrysotile	Reference
A_{pl}	0.001	H&D 2000 Table 1. Mesothelioma risk expressed as percentage total expected mortality per f/ml.yr - Adjusted for age at first exposure.
r meso	1	Linear model
A_{pr}	1E-20	H&D 2000 Table 8 Best estimate slope ($r=0.75$, $t=2.1$)
t	2.1	H&D 2000 Table 8 Best estimate slope ($r=0.75$, $t=2.1$)
Expected mortality from all causes adjusted to an age at start of exposure of 30	0.7	H&D 2000 p. 584 "Absolute risk estimates can therefore be derived from the PM value for a given exposure by multiplying by a factor of 0.7."

Age	Age adjustment Factor for mesothelioma risk Lifetime 90 years	Reference	P_M (%)*	Risk	Risk age adjusted assuming Lifetime 90 years
			0.0E+00	0.0E+00	0.0E+00
			0.0E+00	0.0E+00	0.0E+00
			0.0E+00	0.0E+00	0.0E+00
			0.0E+00	0.0E+00	0.0E+00
			3.3E-04	2.3E-06	9.1E-06
			3.3E-04	2.3E-06	6.8E-06
			3.3E-04	2.3E-06	4.8E-06
			3.3E-04	2.3E-06	1.4E-06
			3.3E-04	2.3E-06	9.1E-07
			3.3E-04	2.3E-06	6.8E-07
			3.3E-04	2.3E-06	4.8E-07
	0.1		3.3E-04	2.3E-06	2.3E-07

* To get the contribution to the risk for the second period alone the risk due to the cumulative dose from the first period is subtracted... and so on.
Developing risk estimates consistent with Table 11 for extended periods, Hodgson and Darnton 2000

Cumulative risk	Chrysotile	Lifetime 90 years 2.4E-05
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Lung Cancer

$$P_L = A_L X^r$$

P_L : Percentage excess of expected lung cancer mortality

A_L : Constant of proportionality for lung cancer risk

r : Lung cancer slope of exposure response (on a log-log scale)

X : Cumulative exposure in f/ml.yr

$$\text{Predicted excess risk} = O_L - E_L = \frac{A_L X^r E_L}{100}$$

E_L : Proportion of the specific population that will die of lung cancer between age 40-79

ear old worker exposed for a five year period with cumulative exposure above.
ates consistent with Table 11 for extended exposures, Hodgson and Darnton 2000

Best Estimate		
	Chrysotile	Reference
A_L	0.028	H&D 2000 Table 10 Best (r=1.3)
r_{lung}	1.3	H&D 2000 Table 10 Best (r=1.3)
Proportion of the specific population that will die of lung cancer between age 40-79	0.033	Based on Average 2016-2018 populations statistics

Age	Age adjustment	Age adjustment reference	P_L (%)	Risk (age adjusted)
			0.0E+00	0.0E+00
			0.0E+00	0.0E+00
			0.0E+00	0.0E+00
			0.0E+00	0.0E+00
			6.5E-03	2.1E-06
			9.5E-03	3.1E-06
			1.1E-02	3.6E-06
			1.2E-02	4.0E-06
			1.3E-02	4.3E-06
			1.4E-02	3.5E-06
			1.5E-02	2.4E-06
	0.25		1.5E-02	1.3E-06

Cumulative risk	Chrysotile	2.4E-05
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Cumulative Lifetime Risk Estimate

Asbestos type	Chrysotile		
Risk from Mesothelioma	Lifetime 90 years	Linear	2.4E-05
Risk from Lung Cancer	All - population average	Non-Linear	2.4E-05
TOTAL			4.9E-05

Limitations

This spreadsheet is offered as a free available resource by SoBRA to improve the consistency in, and adoption of, the use of the Hodgson and Darnton algorithms for estimating lifetime cancer risk for low level environmental exposures to airborne asbestos fibres. It has been developed by members of the SoBRA Asbestos-in-soil sub-group acting in a voluntary capacity, and constitutes the work of the individual authors, not those of their employers. Users of this spreadsheet must satisfy themselves that the content is appropriate for the intended use and no guarantee of suitability is made.

Feedback on this spreadsheet is welcome and should be sent to info@sobra.org.uk

APPENDIX 8 JIWG RISK ASSESSMENT OUTPUTS

Decision Support Tool for CAR2012 Work C

Project Reference

1607

Site Name

Chalford Vale Play Area

Client

Stroud DC

Run by

CPN

Date

22-Jul-26

Scenario details

G WITH STROUND DC AND CHALFORD PC Mowing grass passing over occasional molehills with ACM

Stage 1 Hazard Factors		Score
Select ACM type (run model for each type to generate 'Worst Case' output)		
Extent of degradation of ACMs at outset of work		4
Friability and degree of bonding by matrix (ACM matrix, not ground materials)		4
Distribution of Visible Asbestos Across Affected Area		2
Amount of asbestos fibre in selected ACM/fibre type as % of host material		2
Sub-total		15
Hazard ranking		Medium

No warranty, expressed or implied, or reliance, is provided in relation to the use of this tool. It is contingent on users to satisfy themselves that the output from the tool is relevant and appropriate to the assessment being made.

Stage 2 Exposure Factors		Score
Anticipated airborne fibre concentration - Co	<0.1 fibres/ml (4 Hr TWA) or <0.6 fibres/ml (10 minute STEL)	2
Anticipated duration of exposure to asbestos	< 1 hour for any one person in any week (e.g. Short Duration Work)	1
Activity type and effect on deterioration of ACMs during work	Not low intensity, significant deterioration expected	4
Best description of primary host material matrix (soil/made ground)	Coarse to Fine Sand	2
Respirable fibre index for ACM - RIVM report 711701034 (2003)	High	4
Sub-total		13
Exposure ranking		Medium
Combined	28	Medium

Stage 3 Risk Assessment Outputs	
Probable Licensing Status RPE*	Non-Licensed Work
Dust Suppression**	EN140 with P3 filter half mask
Hygiene/Decontamination***	Manual/localised dust suppression
	Localised and basic personal decontamination facilities

*Where RPE has to be worn continuously for long periods (e.g. more than 1 hour), then powered RPE may be necessary.

**Reduction in control measures possible if natural mitigation factors are present (e.g. raining, wet ground)

***Guide only; suitability of selected personal hygiene measures may be reviewed on a site/contamination-specific basis