

12421/RH

18 November 2019

NHBC Building Control Services
NHBC House
Davy Avenue
Knowlhill
Milton Keynes
MK5 8FP

For the attention of Miss Emma Jones

Dear Sirs,

**Former Merthyr Vale Colliery, Golwg Yr Afon, Merthyr Vale, Merthyr Tydfil, CF48 4ST
NHBC Job Ref: 211366: Plots 34, 35 and 39.**

We write on behalf of our client Lovell Partnerships (South Wales) with regard to the above site and the most recent NHBC Engineering Schedule of Outstanding Conditions:

LQ Conditions Condition 2 and 3

Plots 34, 35 and 39 have recently been inspected on the 5th November 2019 in accordance with the remediation strategy for the site and found to have the required total of 600mm of clean cover over a geotextile in garden areas, see attached photographs.

Photographs of capping depth in Appendix A.

Samples of the 'as placed' topsoil and subsoil soil materials in the above garden areas of plot 34 covering plots 34, 35 and 39 have been sampled and sent to the accredited laboratories of i2 Analytical for chemical analysis. The results are now available and attached with this report all contaminants of concern have been found to be below all threshold limits.

This report therefore confirms that the garden capping soils that have been inspected and tested are deemed suitable for their intended end use with respect to the protection of human health.

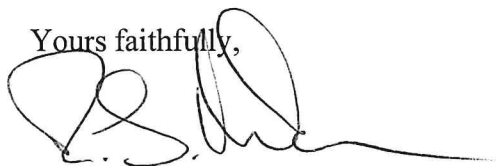
Chemical soil test reports attached in Appendix B.

The results of the topsoil and subsoils sampled from within plots above have been summarised and compared to the appropriate screening criteria for a residential end use. The results have been compared to appropriate Category 4 Screening Levels (C4SL) in the first instance. In their absence, the results will have been compared to the Suitable 4 Use Levels (S4ULs) derived by LQM, Soil Guideline Values (SGVs) and Soil Screening Values (SSVs) derived by Atkins ATRISKsoil for residential with the consumption of home grown produce end use, to assess the potential risk to human health.

Summary of chemical testing results attached in Appendix C.

We trust that the above is to your satisfaction. However, if you have any queries or require any further information, please do not hesitate to contact us.

Yours faithfully,

A handwritten signature in black ink, appearing to read 'R. Hawkins', with a long horizontal flourish extending to the right.

Roger Hawkins

For

Intégral Géotechnique (Wales) Limited

c.c. Shane Jay Lovell Partnerships Limited (South Wales)

Encs.

APPENDIX A

FIGURES



Plot 34 Topsoil And Subsoil Exposure



Plot 34 Garden Capping Depth Check

Garden Capping Validation.

Plot 34 Former Merthyr Vale Colliery

Intégral
Géotechnique

Integral House
Castlegate Business Park
Caerphilly
CF83 2AX
Tel: 029 20807991
Fax: 029 20862176



Plot 34 Membrane Exposure (High Water Ingress)



Plot 34 Membrane Presence Through Water Ingress

Garden Capping Validation.

Plot 34 Former Merthyr Vale Colliery

Intégral
Géotechnique

Integral House
Castlegate Business Park
Caerphilly
CF83 2AX
Tel: 029 20807991
Fax: 029 20862176

APPENDIX B

SOIL TEST RESULTS



Roger Hawkins

Integral Geotechnique
Integral House
7 Beddau Way
Castlegate Business Park
CF83 2AX

t: 02920807991
f: 02920862176
e: roger@integralgeotec.com



i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 19-70466

Project / Site name:	Riverside Merthyr	Samples received on:	07/11/2019
Your job number:	12421	Samples instructed on:	07/11/2019
Your order number:		Analysis completed by:	15/11/2019
Report Issue Number:	1	Report issued on:	15/11/2019
Samples Analysed:	2 soil samples		

Signed: 

Zina Abdul Razzak
Senior Quality Specialist

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

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

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.

Iss No 19-70466-1 Riverside Merthyr 12421

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 19-70466

Project / Site name: Riverside Merthyr

Lab Sample Number				1354669	1354670			
Sample Reference				Plot 34 Topsoil	Plot 34 Subsoil			
Sample Number				None Supplied	None Supplied			
Depth (m)				0.10	0.40			
Date Sampled				05/11/2019	05/11/2019			
Time Taken				1235	1245			
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1			
Moisture Content	%	N/A	NONE	27	31			
Total mass of sample received	kg	0.001	NONE	0.30	0.50			

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected			
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General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.1	7.3			
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1			
Total Sulphate as SO ₄	mg/kg	50	MCERTS	2400	890			
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.94	0.033			
Sulphide	mg/kg	1	MCERTS	< 1.0	< 1.0			
Total Sulphur	mg/kg	50	MCERTS	1300	580			
Total Organic Carbon (TOC)	%	0.1	MCERTS	4.9	4.7			
Loss on Ignition @ 450°C	%	0.2	MCERTS	11.6	13.1			

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0			
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.56	1.2			
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Phenanthrene	mg/kg	0.05	MCERTS	1.0	1.2			
Anthracene	mg/kg	0.05	MCERTS	0.25	0.31			
Fluoranthene	mg/kg	0.05	MCERTS	2.0	2.9			
Pyrene	mg/kg	0.05	MCERTS	1.6	2.1			
Benzo(a)anthracene	mg/kg	0.05	MCERTS	1.4	2.2			
Chrysene	mg/kg	0.05	MCERTS	1.2	2.5			
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	1.9	0.8			
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.70	1.1			
Benzo(a)pyrene	mg/kg	0.05	MCERTS	1.3	1.9			
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.71	1.1			
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.19	0.13			
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.67	1.0			

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	13.6	20.8			
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	17	19			
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.82	0.95			
Boron (water soluble)	mg/kg	0.2	MCERTS	0.7	0.8			
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.5	0.6			
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0			
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	16	19			
Copper (aqua regia extractable)	mg/kg	1	MCERTS	42	190			
Lead (aqua regia extractable)	mg/kg	1	MCERTS	85	100			
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3			
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	21	24			
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0			
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	26	29			
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	100	120			

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Analytical Report Number: 19-70466

Project / Site name: Riverside Merthyr

Lab Sample Number				1354669	1354670			
Sample Reference				Plot 34 Topsoil	Plot 34 Subsoil			
Sample Number				None Supplied	None Supplied			
Depth (m)				0.10	0.40			
Date Sampled				05/11/2019	05/11/2019			
Time Taken				1235	1245			
Analytical Parameter (Soil Analysis)				Units	Limit of detection	Accreditation Status		

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001			
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001			
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001			
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	17	< 1.0			
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	58	< 2.0			
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	70	< 8.0			
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	130	< 8.0			
TPH-CWG - Aliphatic >EC16 - EC35	mg/kg	10	MCERTS	200	< 10			
TPH-CWG - Aliphatic > EC35 - EC44	mg/kg	8.4	NONE	14	< 8.4			
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	280	< 10			
TPH-CWG - Aliphatic (EC5 - EC44)	mg/kg	10	NONE	290	< 10			

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001			
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001			
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001			
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	4.0			
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	14			
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	20			
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	31	56			
TPH-CWG - Aromatic >EC35 - EC40	mg/kg	10	NONE	17	19			
TPH-CWG - Aromatic > EC35 - EC44	mg/kg	8.4	NONE	17	19			
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	40	94			
TPH-CWG - Aromatic (EC5 - EC44)	mg/kg	10	NONE	57	110			

TPH Total C5 - C44	mg/kg	10	NONE	350	110			
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Analytical Report Number : 19-70466

Project / Site name: Riverside Merthyr

* 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 *
1354669	Plot 34 Topsoil	None Supplied	0.10	Brown loam and clay with gravel and vegetation.
1354670	Plot 34 Subsoil	None Supplied	0.40	Brown loam and clay with gravel and vegetation.

Analytical Report Number : 19-70466

Project / Site name: Riverside Merthyr

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L047-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In-house method based on BS1377 Part 2, 1990, Classification tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
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.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L009-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE

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The results included within the report are representative of the samples submitted for analysis.

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Analytical Report Number : 19-70466

Project / Site name: Riverside Merthyr

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' 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 30oC.

APPENDIX C

SUMMMARY OF CHEMICAL TESTING RESULTS

SUMMARY OF LABORATORY SOIL TEST RESULTS

METALS AND SEMI-METALS

Job No.: 12421
Site: Riverside, Merthyr Vale
Soil Type: Topsoil/subsoil
Soil Organic Matter: 1%

No.	Location	Depth (m)	Arsenic (mg/kg)	Boron (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Chromium (VI) (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (Elemental) (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
21	Plot 34 Topsoil	0.10	17	0.7	0.82	0.5	16	< 4.0	42	85	< 0.3	21	< 1.0	26	100
22	Plot 34 Subsoil	0.40	19	0.8	0.95	0.6	19	< 4.0	190	100	< 0.3	24	< 1.0	29	120
Screening Criteria Value			37.0	290.0	1.7	22.0	-	21.0	2400.0	200.0	1.2	130.0	250.0	410.0	3700.0
Source of Screening Criteria Value			C4SL	S4UL	S4UL	C4SL	-	C4SL	S4UL	C4SL	S4UL	S4UL	S4UL	S4UL	S4UL

SUMMARY OF LABORATORY SOIL TEST RESULTS

INORGANIC CHEMICALS & OTHERS

Job No.: 12421
 Site: Riverside, Merthyr Vale
 Soil Type: Topsoil/subsoil
 Soil Organic Matter: 1%

No.	Location	Depth (m)	Cyanide (mg/kg)	Loss on ignition, dried solids (%)	Moisture content at 30 C (%)	Phenol (mg/kg)	pH (pH units)	Water Soluble Sulphate (g/l)	Sulphate Total as SO4 (mg/kg)	Sulphide (mg/kg)	Total Sulphur (mg/kg)	TOC by Ignition in O2 (%)	Equivalent SOM (%)	Asbestos in Soil	Asbestos Quantification (%)
21	Plot 34 Topsoil	0.10	< 1	11.6	27	< 1.0	7.1	0.94	2400	< 1.0	1300	4.9	8.43	Not-detected	#N/A
22	Plot 34 Subsoil	0.40	< 1	13.1	31	< 1.0	7.3	0.033	890	< 1.0	580	4.7	6.08	Not-detected	#N/A
Screening Criteria Value			34.0	-	-	280.0	-	-	-	-	-	-	-	-	0.001
Source of Screening Criteria Value			ATRISK	-	-	S4UL	-	-	-	-	-	-	-	-	ICM

SUMMARY OF LABORATORY SOIL TEST RESULTS

POLYAROMATIC HYDROCARBONS (PAH)

Job No.: 12421
 Site: Riverside, Merthyr Vale
 Soil Type: Topsoil/subsoil
 Soil Organic Matter: 1%

No.	Location	Depth (m)	Acenaphthene (mg/kg)	Acenaphthylene (mg/kg)	Anthracene (mg/kg)	Benzo(a)anthracene (mg/kg)	Benzo(a)pyrene (mg/kg)	Benzo(b)fluoranthene (mg/kg)	Benzo(ghi)perylene (mg/kg)	Benzo(k)fluoranthene (mg/kg)	Chrysene (mg/kg)	Dibenzo(ah)anthracene (mg/kg)	Fluoranthene (mg/kg)	Fluorene (mg/kg)	Indeno(123cd)pyrene (mg/kg)	Naphthalene (mg/kg)	Phenanthrene (mg/kg)	Pyrene (mg/kg)
21	Plot 34 Topsoil	0.10	< 0.05	< 0.05	0.25	1.4	1.3	1.9	0.67	0.70	1.2	0.19	2.0	< 0.05	0.71	0.56	1.0	1.6
22	Plot 34 Subsoil	0.40	< 0.05	< 0.05	0.31	2.2	1.9	0.8	1.0	1.1	2.5	0.13	2.9	< 0.05	1.1	1.2	1.2	2.1
Screening Criteria Value			210.0	170.0	2400.0	7.2	5.0	2.6	320.0	77.0	15.0	0.2	280.0	170.0	27.0	2.3	95.0	620.0
Source of Screening Criteria Value			S4UL	S4UL	S4UL	S4UL	C4SL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL

SUMMARY OF LABORATORY SOIL TEST RESULTS

PETROLEUM HYDROCARBONS

Job No.: 12421
 Site: Riverside, Merthyr Vale
 Soil Type: Topsoil/subsoil
 Soil Organic Matter: 1%

No.	Location	Depth (m)	Aliphatic C5-C6 (mg/kg)	Aliphatic C6-C8 (mg/kg)	Aliphatic C8-C10 (mg/kg)	Aliphatic C10- C12 EPH (mg/kg)	Aliphatic C12- C16 EPH (mg/kg)	Aliphatic C16-C35 EPH (mg/kg)	Aliphatic C35- C44 EPH (mg/kg)	Aromatic C5-C7 (mg/kg)	Aromatic C7-C8 (mg/kg)	Aromatic C8-C10 (mg/kg)	Aromatic C10- C12 EPH (mg/kg)	Aromatic C12- C16 EPH (mg/kg)	Aromatic C16- C21 EPH (mg/kg)	Aromatic C21- C35 EPH (mg/kg)	Aromatic C35- C40 EPH (mg/kg)
21	Plot 34 Topsoil	0.10	< 0.001	< 0.001	< 0.001	17	58	200	14	< 0.001	< 0.001	< 0.001	< 1.0	< 2.0	< 10	31	17
22	Plot 34 Subsoil	0.40	< 0.001	< 0.001	< 0.001	< 1.0	< 2.0	< 10	< 8.4	< 0.001	< 0.001	< 0.001	4.0	14	20	56	19
Screening Criteria Value			42.0	100.0	27.0	130.0	1100.0	65000.0	65000.0	0.9	130.0	34.0	74.0	140.0	250.0	1100.0	1100.0
Source of Screening Criteria Value			S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	C4SL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL