

Project:	The Paddock, DYFFRYN, NEATH, SA10 7BQ		
Document	Additional Information in Relation to Mining Constraints P2025/0689		
Client:	Andrew Follant and Sam Toone		
Ref.:	Q1813-TN1	Date:	22nd October, 2025

Background

As part of the Planning Process to seek approval for the development at the site at The Paddock, Dyffryn, Neath, the Coal Authority / Mining Remediation Authority, as a consultee, has expressed concerns over the risk to the development from the effects of shallow mineworkings. Our Client requires additional supporting information in relation to the risk to the site from shallow mine workings to the building foundations.

This Technical Note presents a discussion of these potential constraints in order to provide supporting information to demonstrate that the mitigation proposed is suitable and adequate.

This additional technical note should be read in conjunction with Spencer Quantum's previous reports on the site, namely:

1. Q1813/GIR THE PADDOCK, DYFFRYN, NEATH, SA10 7BQ Phase II: Ground Investigation Interpretative Report Report No. Q1813/GIR September 2025
2. BC/MB/04.22.02 Coal Mining Risk Assessment: Land at The Paddocks, Bryn Coch, Neath, Bladford Consulting Ltd, April 2022

Shallow Mine Workings

The borehole logs and site plan presented in Report Q1813/GIR are included in Appendix I.

Evidence of solid coal and workings believed to be associated with the Mynyddislwyn Big Rider coal seam has been proven in the seam encountered in all three boreholes. Soft drill, interpreted to be collapsed mine workings / ground was encountered from 21.5m to 24.0m and from 21.0 to 23.0m in Boreholes BH01 and BH03 respectively, whilst coal was encountered between 22.0 and 23.0mbgl in Borehole BH02. No open voids have been proven.

Within Borehole BH01 10m of Superficial deposits were proven, with 11.5m of solid roof cover proven above the collapsed mine workings / ground. Within Borehole BH03 9.5m of Superficial deposits were proven, again with 11.5m of solid roof cover proven above the collapsed mine workings / ground.

The worst-case scenario with the shallow workings identified in BH01 with 2.5m thick collapsed mine workings / ground with 11.5m solid roof cover of Mudstone with Sandstone bands.

The risk to the development is defined by the likelihood of the workings present migrating towards the surface to an extent that affects the dwellings. The migration of any collapsed workings, or voids if present, is dependent upon the actual depth of any workings, the thickness of the workings, the nature of any infilling and the quality/strength of the overlying solid strata.

A relationship which defines the maximum height to which a void can migrate above workings was developed by Price, Malkin and Knill¹ (over page).

This is given by: $H = h / (B - 1)$ where H = Height to which a void can migrate (m)

¹ Price, D, Malkin, A, & Knill, J, 1969, Foundations of multi-storey blocks on the Coal Measures with special reference to old mine workings. QJEG Vol.1. 1969

h = Thickness of seam (m)

B = Measurement of the bulking effect of the rock.

The ratio B will vary according to the rock type present. For sandstone it may be 1.5, whereas for a mudstone it would be 1.2. Using this method of calculation, for the shallowest workings / thickest workings / collapsed ground, 1.98m extraction thickness at a depth of 11.5m, conservatively assuming a roof comprising only of Mudstone, then theoretical collapse of any roof material into an *open* void might migrate some 9.9m before arresting.

Healy and Head² presented data that the extent to which a void may migrate from the roof of any workings is governed by the structure and form of deformation and disintegration of the roof material. The geometry of collapse, they proposed, could be due to *rectangular* collapse, *wedge* collapse or *conical* collapse. The maximum height of potential collapse is then related to the bulking factor, as discussed, for the three differing modes of failure. From the data presented in CIRIA SP32 for the lowest bulking factor and the worst-case failure type (Conical), the height to which a void may migrate may reach 10 times the seam or workings thickness. At the maximum thickness of workings found of 2.5m, then collapse may migrate 25m above such a void before becoming arrested. This would suggest migration of voids reaching the surface.

The revision of CIRIA SP32, CIRIA C758³, does refer to the 10 times roof cover 'rule of thumb' but clearly qualifies this as being the exceptional case, stating that 2 times to 5 times rock cover is a better figure to adopt. Taking the higher bound figure then workings could theoretically migrate c.9.9m above a collapse, based on the recorded extraction thickness of 1.98m.

C758 also refers to the work undertaken by Statham & Scott⁴, that in their study specifically of numerous South Wales drill and grout contracts quantified that there was no 'significant tendency for a migration of more than 2 times' the coal/workings thickness. They found that migration of voids to any significant distance above the level of the original workings was hardly ever encountered. Furthermore, they noted that subsidence incidents in South Wales are rare and most relate to mine entries or outcrop workings and their effects are generally limited to a small area. Adopting a figure of 10 times is therefore overly conservative in the South Wales Coalfield.

It is important to note that the boreholes have proved the collapsed ground has only extended to a thickness of 2.5m in BH1, in comparison to a recorded extraction height of 1.98m and a proven coal seam thickness of 1m in BH2. This mirrors the findings of Statham & Scott. This provides strong evidence that any collapse has arrested. No broken or fractured ground was noted in the boreholes in the roof cover that could allow further propagation of any void migration. In addition to no voids have been proved.

It is also apparent that the rule of thumb presented in CIRIA C758 of migration of voids to 10-times the seam thickness is extremely conservative when reviewing the evidence of this site. The two-times cover suggested by Statham and Scott, from study of drill & grout schemes in South Wales, is in fact conservative in comparison to the evidence on this site.

Taking an overall risk-based approach to the theory and findings of the site under review, we consider that the following are reasonable conclusions to draw.

- Given the length of time since any workings may have taken place (last worked in 1936) it is considered likely that ground movements associated with such workings will have ceased.
- No voids have been proved; only solid coal or collapsed ground.
- While the most conservative theory of the ten-times cover rule of thumb does indicate that any voids may migrate to the surface, the evidence in the boreholes contradicts this with any collapse being arrested less than one seam thickness above the workings.

² Healy & Head, 1982, Construction Over Abandoned Mineworkings, CIRIA SP32.

³ Parry & Chiverrell (Eds.), 2020, Abandoned mine workings manual, CIRIA C758D.

⁴ Statham & Scott, 1992, An Analysis of Drill and Grout Contracts in the South Wales Coalfield. Proc. Grouting in the Ground Conference, ICE.

- By Price, Malkin & Knill, the thickness of the mixed Sandstone/Mudstone roof cover above the coal seam and workings, indicates that there is at worst only a marginal risk of development of collapse to an extent that will affect the surface of the site.

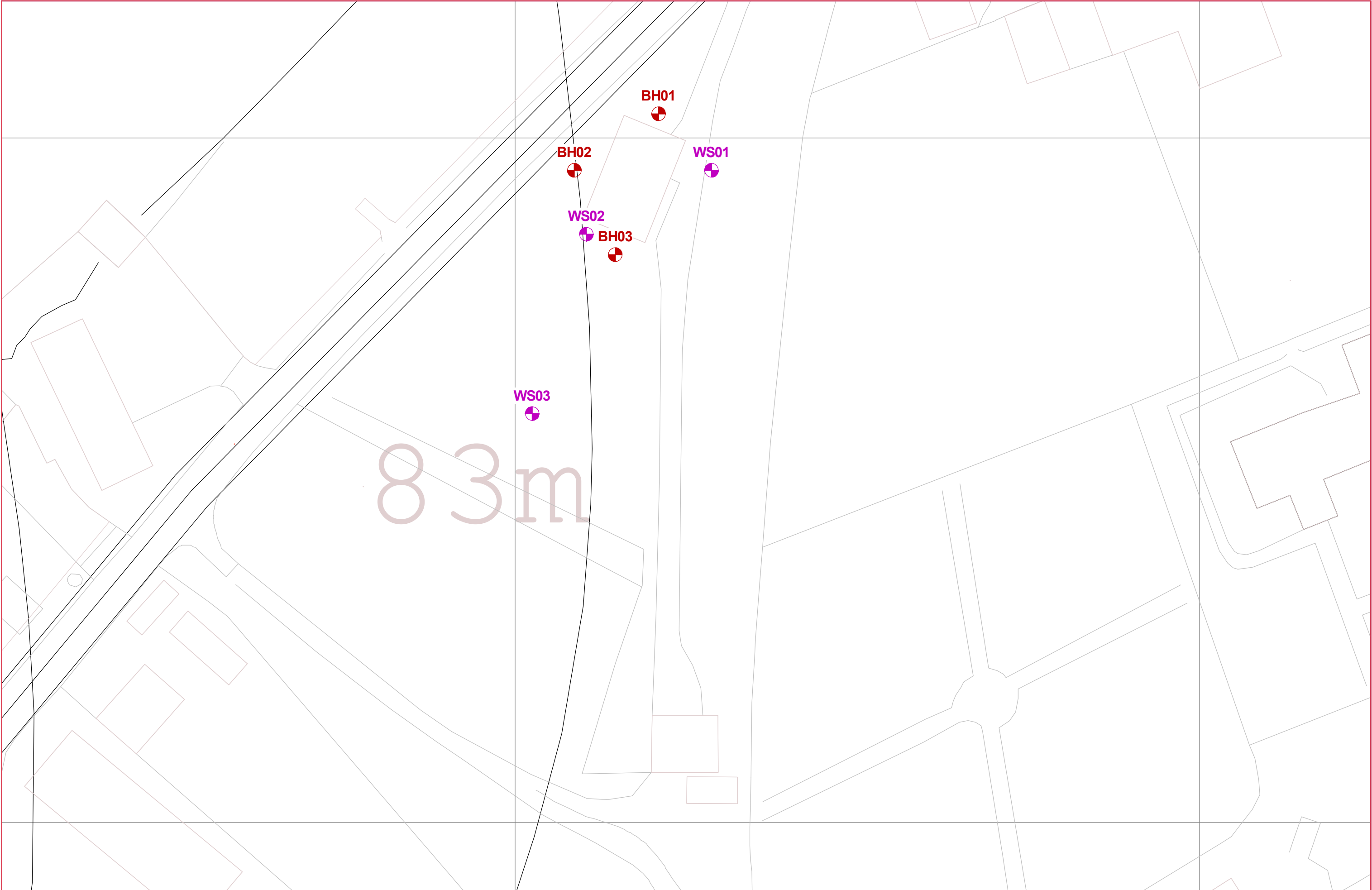
On the balance of this evidence, the use of fully reinforced foundations for the structures, designed to span a 3m void, therefore provides adequate mitigation of the risk.

For and on behalf of
SPENCER QUANTUM LTD



P. Darby
Principal / Chartered Engineering Geologist

APPENDIX 1 – SITE PLAN & BOREHOLE RECORDS



KEY	 Borehole	 Trial Pit	 Dynamic Probe	 In-situ Test
	 Window Sample	 Sampling Point	 Historical Borehole	

PROJECT THE PADDOCK

DRAWING TITLE: EXPLORATORY HOLE LOCATION PLAN
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JOB NO. Q1813	FIGURE NO. 1
DATE 11/09/25	SCALE 1:500

Contract : The Paddock Client : Mr and Mrs Pollard											Borehole No. BH01		
Dates : 16/7/25 - 17/7/25 Location : The Paddock					Job Number : Q1813 Engineer : SQL					Ground Level : Coordinates: 273720.97 E 199903.52 N <i>Co-ordinates to National Grid</i>			

m B.G.L.	Run Details				Fractures		Samples		Strata				Water	Install/ Backfill
	Core Run	TCR %	SCR %	RQD %	Min Avg Max	FI	Depth	Type No. Blows	Depth (Thick-ness)	Description	Legend	Depth (Thick-ness)		
0									(0.20)	Brick and Concrete Fill - Drillers Description (Demolition Material - Engineers interpretation)		(0.20)		
1									0.20			0.20		
2									(0.30)	Topsoil - Drillers Description		(0.30)		
3									0.50	Clay, Cobbles and Boulders (Glacial Till) - Driller Description		0.50		
4														
5														
6									(9.50)			(9.50)		
7														
8														
9														
10									10.00	Mudstone and Sandstone Bands - Drillers Description		10.00		
11														
12														
13														
14														
15														
16									(11.50)			(11.50)		
17														
18														
19														
20														
21														
22									21.50	Soft Drill - Drillers Description (Possible weak coal or collapsed mine workings - Engineers Interpretation)		21.50		
23									(2.50)			(2.50)		
24									24.00	Hard Drill with loss of flush - Drillers Description		24.00		
25														
26									(3.00)			(3.00)		
27									27.00	Terminated at 27.0mbgl		27.00		
28														
29														
30														
31														
32														
33														
34														

Hole Progress / Water Obs				Casing		Groundwater				Flush		
Date / Time	H. Depth	C. Depth	Water	Depth	Diam.	Struck	Rose To	Behaviour	Sealed	Depth	Type	Returns
								No Groundwater Encountered		0.00 - 24.00	Water	100
										24.00 - 27.00	Water	0

Plant: Commachio 450
Remarks:

	Plas Newydd SA4 0FQ Tel: 01554 744880 email: enquiries@spencerquantum.co.uk	Operator:	Logged By.	Sheet No.	m Per Page	All measurements in metres unless otherwise stated	
		SQL	R Morgan	1 Of 1	35		

Contract : The Paddock											Borehole No. BH02		
Client : Mr and Mrs Pollard													
Dates : 14/7/25 - 15/7/25						Job Number : Q1813				Ground Level :			
Location : The Paddock						Engineer : SQL				Coordinates: 273708.66 E 199895.26 N <i>Co-ordinates to National Grid</i>			

m B.G.L.	Run Details				Fractures		Samples		Strata				Water	Install/ Backfill
	Core Run	TCR %	SCR %	RQD %	Min Avg Max	FI	Depth	Type No. Blows	Depth (Thick-ness)	Description	Legend	Depth (Thick-ness)		
0									(0.40)	Topsoil - Drillers Description		(0.40)		
1									0.40	Clay and Boulders (Glacial Till) - Drillers Description		0.40		
2														
3														
4														
5														
6									(9.60)			(9.60)		
7														
8														
9														
10									10.00	Mudstone and Sandstone Bands - Drillers Description		10.00		
11														
12														
13														
14														
15									(10.50)			(10.50)		
16														
17														
18														
19														
20									20.50	Mudstone - Drillers Description		20.50		
21									(1.50)			(1.50)		
22									22.00	Coal - Drillers Description		22.00		
23									(1.00)			(1.00)		
24									23.00	Mudstone - Drillers Description		23.00		
25														
26														
27									(6.75)			(6.75)		
28														
29														
30									29.75	Sandstone - Drillers Description		29.75		
31									(0.25)	Terminated at 30.0mbgl		(0.25)		
32									30.00			30.00		
33														
34														

Hole Progress / Water Obs				Casing		Groundwater				Flush		
Date / Time	H. Depth	C. Depth	Water	Depth	Diam.	Struck	Rose To	Behaviour	Sealed	Depth	Type	Returns
								No Groundwater Encountered		0.00 - 30.00	Water	100

Plant: Commachio 450
Remarks:

	Plas Newydd SA4 0FQ Tel: 01554 744880 email: enquiries@spencerquantum.co.uk	Operator:	Logged By.	Sheet No.	m Per Page	All measurements in metres unless otherwise stated	
		SQL	P Darby	1 Of 1	35		

Contract : The Paddock Client : Mr and Mrs Pollard											Borehole No. BH03		
Dates : 15/7/25 - 16/7/25 Location : The Paddock					Job Number : Q1813 Engineer : SQL					Ground Level : Coordinates: 273714.64 E 199882.94 N <i>Co-ordinates to National Grid</i>			

m B.G.L.	Run Details				Fractures		Samples		Strata				Water	Install/ Backfill
	Core Run	TCR %	SCR %	RQD %	Min Avg Max	FI	Depth	Type No. Blows	Depth (Thick-ness)	Description	Legend	Depth (Thick-ness)		
0									(0.40)	Topsoil - Drillers Description		(0.40)		
1									0.40	Clay and Boulders (Glacial Till) - Drillers Description		0.40		
2														
3														
4														
5									(9.10)			(9.10)		
6														
7														
8														
9														
10									9.50	Mudstone and Sandstone Bands - Drillers Description		9.50		
11														
12														
13														
14														
15									(11.50)			(11.50)		
16														
17														
18														
19														
20														
21									21.00	Soft Drill with loss of flush - Drillers Description		21.00		
22									(2.00)	(Possible weak coal or collapsed mine workings - Engineers Interpretation)		(2.00)		
23									23.00	Hard Drill - Drillers Description		23.00		
24														
25									(4.00)			(4.00)		
26														
27									27.00	Terminated at 27.0mbgl		27.00		
28														
29														
30														
31														
32														
33														
34														

Hole Progress / Water Obs				Casing		Groundwater				Flush		
Date / Time	H. Depth	C. Depth	Water	Depth	Diam.	Struck	Rose To	Behaviour	Sealed	Depth	Type	Returns
								No Groundwater Encountered		0.00 - 21.00	Water	100
										21.00 - 27.00	Water	0

Plant: Commachio 450
Remarks:

	Plas Newydd SA4 0FQ Tel: 01554 744880 email: enquiries@spencerquantum.co.uk	Operator:	Logged By:	Sheet No.	m Per Page	All measurements in metres unless otherwise stated	
		SQL	R Morgan	1 Of 1	35		