

Project: Connolly Barracks, Longford, Co. Longford

Technical Note: Storm Water System Design

FAO: Longford Planning Authority

Project Ref: 241056

Doc Ref: 241056-MPA-X-X-X-XXX-RP-CE-0002 – TN01

Date: 16/06/25

1.0 INTRODUCTION

1.1 Background

- 1.1.1 This technical note contains information relating to the design of the proposed stormwater management system for the Existing Connolly Barracks Building, and associated extension, to be provided in accordance with the previously approved Longford County Council Part 8 - No. 129, - *Proposed Re-development of the former Officers Building, Abbeycarton, Longford, Co. Longford, to a multi-purpose community facility, a Protected Structure, situated within the grounds of Sean Connolly Barracks.*

1.2 Site

- 1.2.1 The proposed site is contained within the confines of Sean Connolly Barrack campus, at the Church Street, Longford, Co. Longford.
- 1.2.2 The subject site area of the development is approximately 0.58 Ha, with the catchment area restricted to the existing roof areas of Connolly Barracks building and the proposed extension with local public realm upgrades (0.218 Ha) as shown in **Figure 1.1**.
- 1.2.3 The gradient across the site varies, with the parade square to the East of the building typically found to be flat, with levels varying slightly from 48.87 – 48.75m AOD in a West East direction, and from 49.09 – 48.36m AOD in a North South direction resulting in a 1:80 fall.
- 1.2.4 Agricultural lands form the Western boundary to the site and extend to the Camlin River. Again, the existing ground levels fall towards the Camlin River, from 44.50m AOD at the boundary to Connolly Barracks Campus, to a low of 41.50m AOD.



Figure 1.1-Storm Catchment Layout

2.0 STORM WATER MANAGEMENT SYSTEM

2.1 General

2.1.1 As noted previously, it is proposed to upgrade the existing Stormwater Management System to include on site Stormwater storage and outfall to the adjoining Camlin River, all of which is to be provided with the redevelopment, and extension works of Connolly Barracks.

2.1.2 The drawings included with the submission are Drawing No.

- 241056-MPA-X-X-X-XXX-DR-CE-0130-Propopsed Storm Drainage Layout
- 241056-MPA-X-X-X-XXX-DR-CE-0200-Propopsed Storm Long Sections
- 241056-MPA-X-X-X-XXX-DR-CE-0300-Propopsed External Works Details

2.2 Existing Services

2.2.1 A CCTV survey was carried out by Glancy Enviro of existing sewers to establish the condition and composition of existing services from source at Connolly Barracks to the connection to the site boundary.

2.2.2 CCTV survey identified that a combined sewer is in use within the site, which would be typical of a building of this age. It was also established that the majority of the Main line pipework installed consists of clay pipes which have displaced joints, longitudinal cracks and are in generally poor condition.

2.2.3 A series on site infiltration testing was completed in April 2024. The testing was scheduled to be completed in accordance with BRE Special Digest 365, which stipulates that the pit should be filled three times and that the final cycle is used to provide the infiltration rate. The time taken for the water level to fall from 75% volume to 25% volume is required to calculate the rate of infiltration.

2.2.4 However, following the opening of the test location, the existing ground was found to be saturated with inflow or ground water recorded, which has prevented the completion of onsite testing as indicated within Appendix A.

2.3 Stormwater Management System Design & Route Selection

2.3.1 With the refurbishment works, it is proposed to provide gravity sewers on site with outflow controlled via a hydrobrake prior to discharge to the Camlin River. All excess volume is to be stored within an attenuation tank located within the curtilage of the site and in turn discharging to the existing Watercourse to the West of the site.

2.3.2 The proposed route to the outfall to the Camlin River was selected to ensure minimal impact on the adjoining lands. The overall drainage required to cross the agricultural lands to the West is seminal in a North – South, and East – West direction, of some 117 and 122m respectively.

2.3.3 The preferred route (N/S) as demonstrated within the enclosed drawings, was selected to minimise the impact on the existing established vegetation and tree line directly to the West of the site which bounds the Camlin River while also avoiding the existing Overhead power lines, stanchions and stay lines adjacent to the river. Therefore, the route of the proposed outfall takes the line of least impact to the adjoining lands.

2.3.4 The storm sewer system has been designed in accordance with the Colebrook-White formulas and the Modified Rational Method, where:

$$Q_p = CiA$$

and

$$Q_p = \text{Peak Flow (l/s)}$$

$$C = C_v \times C_r \text{ (} C_v = 0.75 \text{ \& } C_r = 1.3 \text{)}$$

$$i = \text{Rainfall intensity (mm/hr)}$$

Greenfield Run-Off (Q_{bar})

2.3.5 In order to comply with the requirements of Longford County Council, the maximum level of outfall from the new storm water management system will be restricted to replicate the existing green field runoff from the site.

2.3.6 The level of outfall from the attenuation system has been calculated in accordance with the Institute of Hydrology Report 124: Flood Estimation for Small Catchments as follows:

$$Q_{\text{bar}} = 0.00108 \times \text{Area}^{0.89} \times \text{SAAR}^{1.17} \times \text{Soil}^{2.17}$$

Where

$$Q_{\text{bar}} = \text{mean annual peak flood (m}^3\text{/s)}$$

$$\text{Area} = \text{area of catchment (km}^2\text{)}$$

$$\text{SAAR} = \text{Standard Annual Average Rainfall (mm)}$$

$$\text{Soil} = \text{Soil index based on Winter Rain Acceptance Potential (WRAP)}$$

2.3.7 As noted above, infiltration tests were carried out in April 2025 in accordance with BRE 365 on site groundwater ingress was noted, indicating the site is not suitable for infiltration drainage.

2.3.8 The soil type for the area is soil type 2, which was selected based on the Flood Studies Report and the infiltration results. Producing an allowable discharge for the site of 0.8l/s.

- 2.3.9 A detailed site investigation including laboratory testing was carried out on site in April 2025, it identified the subsoil on site to be a firm to stiff slightly sandy slightly gravelly silty CLAY, with high cobble and low to medium boulder content.
- 2.3.10 As the soil has been classified as a CLAY it is clear that the site contains a soil with low to moderate permeability, more akin to soil type 3 rather the soil type 2 as previously assessed.
- 2.3.11 Additionally, a review of the Geological Survey Ireland (GSI) – Subsoil Permeability maps shows that the that site is within an area of low moderate Subsoil permeability, as illustrated in **Figure 2.1**.

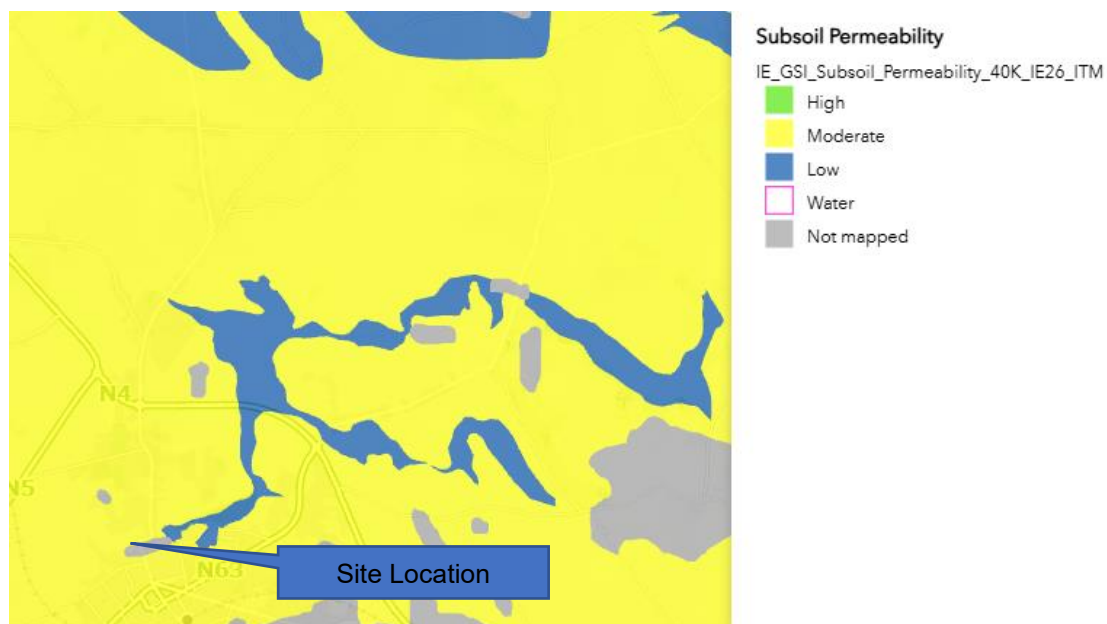


Figure 2.1 – Geological Survey Ireland – Groundwater Subsoil Permeability

- 2.3.12 It is also to be note that the Groundwater recharge for the site was assessed using the GSI data base and it identified that the site is located within the low range of 100-150mm/year as shown in **Figure 2.2**.

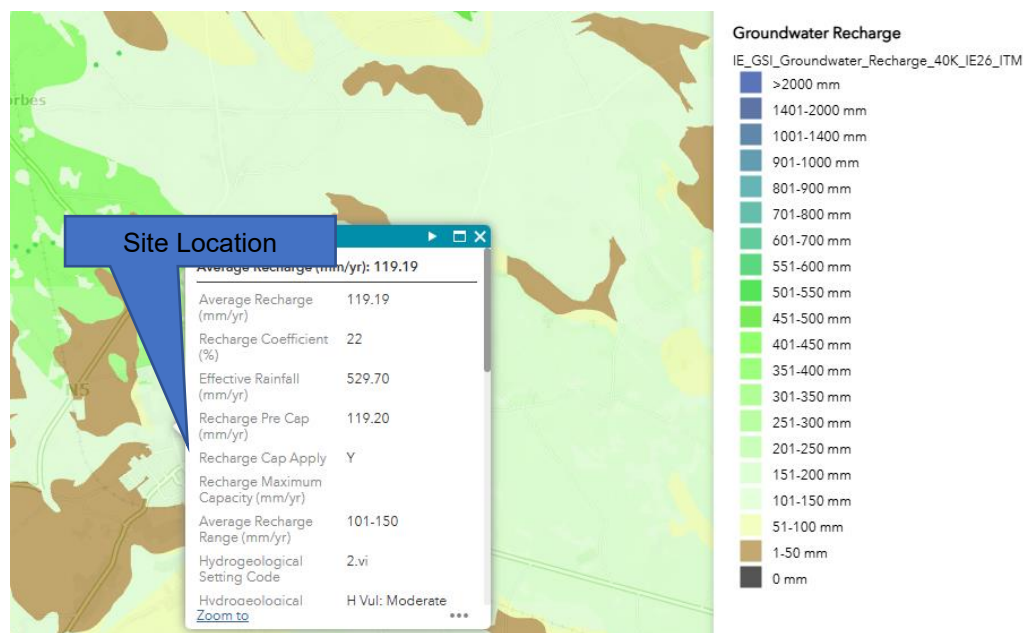


Figure 2.2 - Geological Survey Ireland – Groundwater Recharge

- 2.3.13 Based on the above reviews it can be seen that the classifying the soil on site as soil Type 3 is warranted.
- 2.3.14 From information provided by MET Eireann, SAAR for Longford has been taken to be 977mm and as above the Soil index for the site has been taken as 0.4 for soil type 3 from the Flood Studies Report, The design value of Q_{bar} , for the site, i.e. footprint of the existing and proposed extension to Connolly Barracks, is 1.4l/s as shown in **Appendix B** attached.
- 2.3.15 Therefore, stormwater discharged from Attenuation will be controlled by means of a flow-control hydrobrake with the maximum outflow of 1.41l/s, located downstream of the Storage System.

Attenuation Systems

- 2.3.16 Based on the measured impermeable areas on site and appropriate run off factors, an assessment of the storage volume required on site has been carried out, for the 100-year storm event, as set out within **Appendix C**.
- 2.3.17 The Stormwater Attenuation system is to consist of a sub-terranean geocellular attenuation system, to provide 150m³ of underground storage, as set out within the enclosed 241056-MPA-X-X-X-XXX-DR-CE-0130 – Proposed Storm Drainage Layout and 241056-MPA-X-X-X-XXX-DR-CE-0300 - Proposed External Works Details.

2.4 Gravity System

- 2.4.1 The pipe network serving the development has been designed in accordance with the Modified Rational Method, utilising rainfall data for the Longford area from Met Eireann. The rational design sheet has been included in **Appendix D** of this report.

- 2.4.2 As can be seen from these tables the storm frequency proposed is 1 in 5 years, thereby ensuring an appropriate level of service for the storm drainage system. The time of entry has been taken to be 4 minutes in accordance with Recommendations for Site Development Works. Appropriate pipe roughness coefficients have been taken from the pipe manufacturer's literature.
- 2.4.3 The pipes required to drain the proposed development are between 150mm and 225mm in diameter, all at falls of not less than 1:100.
- 2.4.4 It can be seen in **Appendix D** that all pipes have been designed with adequate capacity and the partial velocities for all pipes are above 0.70 m/s, as per BS EN 752:2008 – Drain & Sewer Systems Outside Buildings, thereby ensuring adequate self-cleansing velocities for the entire system.
- 2.4.5 In general pipes will be laid with a minimum cover of 0.9 m in footpath areas, 0.6m in grass areas and 1.2m in roads and trafficked areas. Where it is not possible to achieve this minimum cover pipes will be provided with a 150mm bedded and surrounded in C20 concrete.

3.0 SUMMARY AND CONCLUSION

3.1 Summary

- 3.1.1 This Technical note which has been prepared by MPA Consulting Engineers at the request of our client Longford County Council, and it contains information on the proposed storm water management system and outfall to be constructed with the proposed redevelopment of Connolly Barracks, Longford, Co. Longford.
- 3.1.2 The storm water management system proposed for the development consists of a piped gravity system discharging to an attenuation system, which will discharge through a flow control device to Camlin River.
- 3.1.3 The design value of Qbar for the entire site is 1.4 l/s (i.e. 5.0l/s/hectare), this is based on the site area of 0.28ha, the entire site area and has been calculated in accordance with the Institute of Hydrology Report 124: Flood Estimation for Small Catchments.
- 3.1.4 Based on the above the attenuation volume required for the 100year return period is 150m³ this is to be provided in a large geocellular attenuation area.

3.2 Conclusions

- 3.2.1 In conclusion the proposed storm water management system is shown to have sufficient capacity, and a connection to the Camlin River can be established, thus ensuring adequate drainage for the proposed development.

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APPENDIX A

Infiltration Testing

SOAKAWAY TEST



Project Reference:	6489
Contract name:	Connolly Barracks
Location:	Longford, Co. Longford
Test No:	BRE01
Date:	08/04/2025

Ground Conditions		
From	To	
0.00	0.10	TOPSOIL.
0.10	0.20	MADE GROUND: grey silty sandy gravel with high cobble content.
0.20	1.05	MADE GROUND: grey brown slightly sandy gravelly silty clay with high cobble content and much red brick fragments (40%).

Remarks:
Archaeological wall identified at 0.90mbgl within pit - pit terminated and relocated.

Elapsed Time (mins)	Fall of Water (m)	Pit Dimensions (m)		
-	-	Length (m)	2.80	m
-	-	Width (m)	0.70	m
-	-	Depth	1.05	m
-	-	Water		
		Start Depth of Water	-	m
		Depth of Water	-	m
		75% Full	-	m
		25% Full	-	m
		75%-25%	-	m
		Volume of water (75%-25%)	-	m3
		Area of Drainage	-	m2
		Area of Drainage (75%-25%)	-	m2
		Time		
		75% Full	-	min
		25% Full	-	min
		Time 75% to 25%	-	min
		Time 75% to 25% (sec)	-	sec

f = $\frac{m}{min}$ or $\frac{m}{s}$

SOAKAWAY TEST



Project Reference:	6489
Contract name:	Connolly Barracks
Location:	Longford, Co. Longford
Test No:	BRE02
Date:	08/04/2025

Ground Conditions

From	To	
0.00	0.10	TOPSOIL.
0.10	0.60	MADE GROUND: grey sandy slightly gravelly silty clay with low cobble
0.60	0.80	Soft brown sandy slightly gravelly silty CLAY.
0.80	2.10	Firm brown grey slightly sandy slightly gravelly silty CLAY with medium cobble content and occasional sand and gravel laminas.

Remarks:

Slow water ingress at 1.80mbgl - soils saturated and unsuitable for soakaway design.

Elapsed Time (mins)	Fall of Water (m)		Pit Dimensions (m)		
-	-		Length (m)	3.00	m
-	-		Width (m)	0.70	m
-	-		Depth	2.10	m
-	-		Water		
			Start Depth of Water	-	m
			Depth of Water	-	m
			75% Full	-	m
			25% Full	-	m
			75%-25%	-	m
			Volume of water (75%-25%)	-	m ³
			Area of Drainage	-	m ²
			Area of Drainage (75%-25%)	-	m ²
			Time		
			75% Full	-	min
			25% Full	-	min
			Time 75% to 25%	-	min
			Time 75% to 25% (sec)	-	sec

$$f = \frac{f}{m/min} \quad \text{or} \quad \frac{f}{m/s}$$

APPENDIX B

Q-Bar Calculation Sheets



Project:
Connolly Barracks, Longfod, Co. Longford

Project No:
241056

Drawing ref.
241056-MPA-X-X-DR-CE-0130

Calc. Sheet No.
Page 1 of 1

Calculations by
POM

Checked by
EJQ

Date
16.05.2025

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QBAR_{RURAL}

Design Data:

Station Name: Longford
Standard Average Annual Rainfall (SAAR): 977 mm

Catchment Details:

Catchment Data:

2,817	m ²
0.2817	Ha
0.002817	km ²

Catchment Area:

0.5	km ²
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Note: 50 hectares to be used for small catchments < 50Ha

Soil Index (G):

Soil Type

Refer to Winter Rain Acceptance Potential Map

Proposed Area Under Soil Type 1, $g_1 = 0.0$
Proposed Area Under Soil Type 2, $g_2 = 0.0$
Proposed Area Under Soil Type 3, $g_3 = 1.0$
Proposed Area Under Soil Type 4, $g_4 = 0.0$
Proposed Area Under Soil Type 5, $g_5 = 0.0$

Classified Area (g) 1.0

Soil Index (G) = $\frac{0.15g_1 + 0.30g_2 + 0.40g_3 + 0.45g_4 + 0.50g_5}{\text{Classified Area (g)}}$

Soil Index (G) = 0.40

QBAR rural:

Mean annual flood QBAR from catchment characteristics for small rural catchments (< 25 km²) from the "Flood estimation for small catchments - Report No. 124", published by the Institute of Hydrology

$QBAR_{\text{rural}} = 0.00108 (\text{AREA}^{0.89} \times \text{SAAR}^{1.17} \times \text{SOIL}^{2.17})$

Site Specific Data:

$QBAR_{\text{rural}} = 5.0$ L/sec/Ha (Based on 50 Ha)

OR

$QBAR_{\text{rural}} = 2.0$ L/sec/Ha

whichever is greater, as per GDSDS Table 6.3, Criterion 4.3 where maximum discharge rate of QBAR or 2l/s/ha for all attenuation storage where separate "long term" storage cannot be provided.

Summary:

$QBAR_{\text{rural}} = 5.0$ L/sec/Ha

$QBAR_{\text{site}} = 1.4$ L/sec

APPENDIX C

Attenuation Storage 100-year



Project:
Connolly Barracks, Longfod, Co. Longford

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Page 1 of 1

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ATTENUATION DESIGN -

Design Data:

Station Name: Longford
Annual Rainfall: 977 mm

Allowable Outflow:

Outflow (O) = 1.4 Litres / sec

Refer to Enclosed Qbar Calculations

Discharge rate is in accordance with GDSDS Criterion 2.1 River Regime Protection

Catchment Details :

Total Area =	2451	(m ²)	@
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Roof Area =	1914	(m ²)	@	95%
Road/Hardstanding =	537	(m ²)	@	80%
Permeable Paving =	0	(m ²)	@	20%
Open Area =	0	(m ²)	@	5%

Effective Area of Catchment (A)

2248	m ²
0.2248	ha

Rainfall Data :

Return Period (Yrs)	100 year
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Storm Duration (D) (min)	Rainfall (R) (mm)
15	21.0
30	28.0
60	34.0
120	42.0
240	50.0
360	59.0
720	72.0
1440	85.0
2880	100.0

Inflow Volume Equation :

Storm Duration (D) (min)	Rainfall (R) (m ³ /ha)	Intensity (mm/hr)	Inflow (I) (m ³)	Outflow (O) (m ³)	Storage Req'd (S) (m ³)
15	273	92.40	61	1	60
30	364	61.60	82	3	79
60	442	37.40	99	5	94
120	546	23.10	123	10	113
240	650	13.75	146	20	126
360	767	10.82	172	30	142
720	936	6.60	210	60	150
1440	1105	3.90	248	121	127
2880	1300	2.29	292	242	50

Rainfall (R) includes a 10% provision for climate change as per GDSDS

GDSDS; Site critical duration storm to be used to assess attenuation storage volume, which satisfies Criterion 2.1 for River Regime Protection

Attenuation Volume Required	150	m ³
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APPENDIX D

Storm Sewer Design Sheets



Project:
Connolly Barracks, Longford, Co.
Longford

Project No:
241056

Drawing Ref.
241056-MPA-X-X-DR-CE-0130

Calc. Sheet No.
Page 1 of 1

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SURFACE WATER NETWORK SCHEDULE

Design Data:

Station Name **Longford** Pipe Material **uPVC**
M_{5-2min} **3.3** Effective Roughness (Ks) = **0.06**
Design Return Period **5**
Time to Entry **4**

US MH Ref:		US MH CL [mod]	US MH IL [mod]	DS MH IL [mod]	Length [m]	Gradient [1 in...]	Pipe Diameter [mm]	Cover to US Soffit [m]	Velocity [m/s]	Time of Flow [min]	Time of Conc. [min]	Rate of Rainfall [mm/hr]	Total Area [m2]	% Imperv.	Imperv. Area [m2]	Cumul. Imperv. Area [m2]	Actual Rate of Flow [m3/s]	Allow. Rate of Flow [m3/s]	Proportional Capacity	Proportional Velocity	Design Velocity [m/s]
S1.0	S1.1	49.10	48.55	48.10	45	100	150	0.400	1.26	0.597	4.597	74	456	100	456	456	0.009	0.022	0.41	1	1.19
S1.1	S1.2	49.10	48.10	48.04	6	100	150	0.850	1.26	0.080	4.080	78	116	100	116	572	0.012	0.022	0.54	1	1.30
S1.2	S1.3	48.90	48.04	47.79	10	40	150	0.710	2.03	0.082	4.082	78	0	100	0	572	0.012	0.036	0.33	1	1.79
S1.3	S1.4	48.60	47.79	47.02	23	30	225	0.585	3.05	0.126	4.126	77	93	100	93	665	0.014	0.121	0.11	1	2.04
S1.4	S1.5	48.11	47.02	46.57	16	35	225	0.862	2.82	0.095	4.095	78	1358	100	1358	2023	0.042	0.112	0.38	1	2.58
S1.5	S1.6	47.63	46.57	46.02	19	35	225	0.839	2.82	0.112	4.112	77	76	100	76	2099	0.044	0.112	0.39	1	2.61
S1.6	S1.7	47.35	46.02	45.60	17	40	225	1.101	2.63	0.108	4.108	77	352	100	352	2451	0.051	0.105	0.49	1	2.64
S1.7	ATT	47.00	45.60	45.56	1.6	40	225	1.176	2.63	0.010	4.010	78	0	100	0	2451	0.052	0.105	0.50	1	2.65
ATT	S1.8	46.05	44.56	44.54	1.6	100	225	1.266	1.63	0.016	4.016	78	0	100	0	2451	0.052	0.065	0.80	1	1.78
S1.8	S1.9	46.05	44.54	42.84	46	27	225	1.282	3.22	0.238	4.238	77	0	100	0	2451	0.001	0.128	0.01	0	0.70*
S1.9	S1.10	44.09	42.84	40.84	80	40	225	1.025	2.63	0.507	4.507	75	0	100	0	2451	0.001	0.105	0.01	0	0.70*
S1.10	S1.11	42.09	40.84	40.62	22	100	225	1.025	1.63	0.225	4.225	77	0	100	0	2451	0.001	0.065	0.02	0	0.70*
S1.11	OUT	41.71	40.62	40.40	21.7	100	225	0.865	1.63	0.222	4.222	77	#REF!	100	#REF!	#REF!	0.001	0.065	0.02	0	0.70*
S2.0	S2.1	48.10	47.55	46.46	38	35	150	0.400	2.18	0.290	4.290	76	150	100	150	150	0.003	0.039	0.08	1	1.22
S2.1	S1.6	47.40	46.46	46.02	44	100	150	0.786	1.26	0.584	4.584	74	202	100	202	352	0.007	0.022	0.32	1	1.09
S3.0	S3.1	49.10	48.55	47.79	38	50	150	0.400	1.81	0.350	4.350	76	1268	100	1268	1268	0.026	0.032	0.81	1	1.98
S3.1	S1.4	49.10	47.79	47.02	44	57	150	1.160	1.68	0.436	4.436	75	90	100	90	1358	0.028	0.030	0.93	1	1.92

Notes: