

Technical Note: 001

Date: 9th November 2019

Site: Pennine Filling Station Huddersfield

Reference: 2019/2497

Pennine Filling Station off Bradley Road Huddersfield
Surface Water Onsite Runoff

Existing Runoff from the Site

The total site area affected by this development has been estimated at approximately 960m² (0.096 ha). The site was previously occupied by a commercial development. The building has been demolished; however, the paved areas are still visible and also a formalised surface water and foul water drainage system. The existing site plan is provided at Appendix A.

The existing impermeable area within the site has been estimated at 761m².

There is combined sewer located within Bradley Road adjacent to the site entrance. The sewer is 375mm in diameter and Yorkshire Water could not provide a sewer depth. The Yorkshire Water sewer plan is provided at Appendix B of this report.

During the site visit manholes were lifted and the site appears to discharge into the combined sewer via a 150mm diameter pipe. The pipe is approximately 1.3m deep within the manhole.

There are no open or culverted watercourse close to the site.

The site is within an area with an SPR value of 38.9% suggesting that the site will not allow adequate infiltration.

Table 1: Modified Rational Method flows from existing site 0.0761 hectares

Return Period	Flow in litres per second (l/s)
1 in 1 year	9.06
1 in 30 year	31.78
1 in 100 year	46.02

The Modified Rational Method has been used to calculate the existing peak runoff from the site. The calculation sheet is provided at Appendix C of this report.

The LLFA have requested a 30% reduction in peak runoff rate. Therefore, a peak discharge rate of 6.3l/s has been adopted for this development.

Discharge to combined water sewer

It is proposed that the roofed and paved areas within the site is directed to the combined sewer located within Bradley Road via a crate tank located within the site. The discharge into the combined sewer will be restricted to 6.3l/s. The impermeable area has been calculated at 930m² (0.093 hectares). This area will be 100% roofed and paved.

An assessment of the required balance volume has been made using the estimated post development impermeable area of 0.093 hectares discharging to the combined 375mm diameter sewer at a peak rate of 6.3ls. Using WinDes Source Control software developed by

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Microdrainage the required attenuation has been calculated for the 1 in 100 year plus climate change (30%) event.

Reference should be made to Appendix E where the calculation sheets are provided. The attenuation size has been tabulated below in Table 2. It is estimated that during the 1 in 100 year plus climate change (30%) event that 30.1m³ of storage will be required. This will be provided within a 0.8m deep crate tank. The drainage strategy drawing provided at Appendix D shows the drainage design for the site which includes the tank.

Table 2: WinDes 1 in 100 year+CC Storage Volume

Return Period	Required Attenuation	Approx Volume (m ³)
1 in 100 year + CC	36m ² of 0.8m deep crate tank	30.1

Foul Sewerage

It is proposed that the foul sewerage will be directed to the combined sewer located within Bradley Road to the south of the site.

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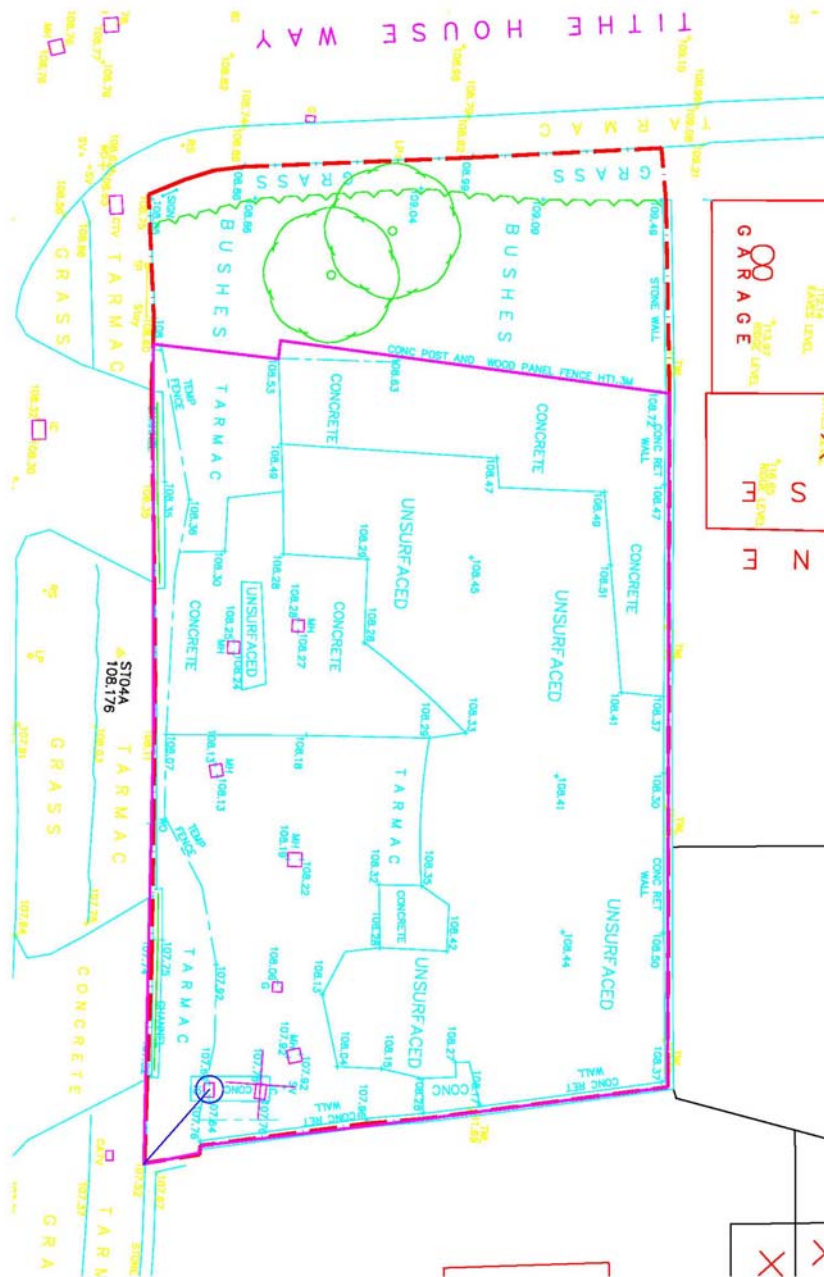
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Attachment A – Existing Site Plan



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Attachment B – Yorkshire Water Sewer Plan



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Attachment C – Modified Rational Runoff Calculation

Modified Rational Method				Return Period		Flood		1		2	
				Post Development		Rainfall		Effective		Rainfall Intensity	
				Rainfall Duration (hours)	Rainfall Duration (days)	Rainfall Depth (mm)	Effective Depth (mm)	Depth (mm)		(mm/hr)	
Length (m)	37	m		0.15	0.006	6.3	6.3	22.0		9.1	
Area (ha)	0.076	ha		0.25	0.010	8.22	8.4	32.9		7.1	
Max Height	108.7	m	MAOD	0.5	0.021	10.52	10.7	21.0		4.5	
Min Height	107.5	m	MAOD	0.75	0.031	12.13	12.4	16.2		3.5	
DeltaH	1.2	m		1	0.042	13.42	13.7	13.4		2.9	
Slope (%)	3.27	%		1.25	0.052	14.51	14.8	11.6		2.5	
Ta (mins)	8.68	mins		1.5	0.063	15.46	15.8	10.3		2.2	
ARF	0.999			1.75	0.073	16.31	16.6	9.3		2.0	
SAAR	816.000	mm		2	0.083	17.09	17.4	8.5		1.8	
UCWI	80	mm		2.25	0.094	17.8	18.2	7.9		1.7	
PIMP	100.0	%		2.5	0.104	18.46	18.8	7.4		1.6	
SOIL	0.40	%		2.75	0.115	19.08	19.5	6.9		1.5	
Percentage Runoff PR	76.44	%		3	0.125	19.67	20.1	6.6		1.4	
DEEPSTOR	0.40	%		3.25	0.135	20.22	20.6	6.2		1.3	
Cv	0.7644			3.5	0.146	20.74	21.1	5.9		1.3	
Cr	1.3			3.75	0.156	21.24	21.7	5.7		1.2	
30 year outflow	9.06	%		4	0.167	21.72	22.1	5.4		1.2	
1 year	9.06	%		4.25	0.177	22.18	22.6	5.2		1.1	

Modified Rational Method				Return Period		Flood		30		50	
				Post Development		Rainfall		Effective		Rainfall Intensity	
				Rainfall Duration (hours)	Rainfall Duration (days)	Rainfall Depth (mm)	Effective Depth (mm)	Depth (mm)		(mm/hr)	
Length (m)	37	m		0.15	0.006	22.1	22.1	147.3		31.6	
Area (ha)	0.076	ha		0.25	0.010	26.8	27.3	107.2		23.1	
Max Height	108.7	m	MAOD	0.5	0.021	32.34	33.0	64.7		14.0	
Min Height	107.5	m	MAOD	0.75	0.031	36.94	38.5	48.1		10.4	
DeltaH	1.2	m		1	0.042	38.9	39.7	38.9		8.4	
Slope (%)	3.27	%		1.25	0.052	41.27	42.1	33.0		7.1	
Ta (mins)	8.68	mins		1.5	0.063	43.3	44.2	28.9		6.2	
ARF	0.999			1.75	0.073	45.09	46.0	25.6		5.6	
SAAR	816.000	mm		2	0.083	46.7	47.6	23.4		5.0	
UCWI	80	mm		2.25	0.094	48.17	49.1	21.4		4.6	
PIMP	100.0	%		2.5	0.104	49.51	50.5	19.8		4.3	
SOIL	0.40	%		2.75	0.115	50.76	51.8	18.5		4.0	
Percentage Runoff PR	76.44	%		3	0.125	51.93	53.0	17.3		3.7	
DEEPSTOR	0.40	%		3.25	0.135	53.03	54.1	16.3		3.5	
Cv	0.7644			3.5	0.146	54.06	55.1	15.4		3.3	
Cr	1.3			3.75	0.156	55.04	56.1	14.7		3.2	
50 year outflow	31.78	%		4	0.167	55.97	57.1	14.0		3.0	
100 year	31.78	%		4.25	0.177	56.86	58.0	13.4		2.9	

Modified Rational Method				Return Period		Flood		100		140	
				Post Development		Rainfall		Effective		Rainfall Intensity	
				Rainfall Duration (hours)	Rainfall Duration (days)	Rainfall Depth (mm)	Effective Depth (mm)	Depth (mm)		(mm/hr)	
Length (m)	37	m		0.15	0.006	32	32.6	213.2		46.0	
Area (ha)	0.076	ha		0.25	0.010	37.9	38.6	151.6		32.7	
Max Height	108.7	m	MAOD	0.5	0.021	44.94	45.8	99.9		19.4	
Min Height	107.5	m	MAOD	0.75	0.031	49.59	50.6	66.1		14.3	
DeltaH	1.2	m		1	0.042	53.14	54.2	53.1		11.5	
Slope (%)	3.27	%		1.25	0.052	56.06	57.2	44.8		9.7	
Ta (mins)	8.68	mins		1.5	0.063	58.55	59.7	39.0		8.4	
ARF	0.999			1.75	0.073	60.74	61.9	34.7		7.5	
SAAR	816.000	mm		2	0.083	62.7	63.9	31.4		6.8	
UCWI	80	mm		2.25	0.094	64.48	65.8	28.7		6.2	
PIMP	100.0	%		2.5	0.104	66.11	67.4	26.4		5.7	
SOIL	0.40	%		2.75	0.115	67.52	69.0	24.6		5.3	
Percentage Runoff PR	76.44	%		3	0.125	69.02	70.4	23.0		5.0	
DEEPSTOR	0.40	%		3.25	0.135	70.34	71.7	21.6		4.7	
Cv	0.7644			3.5	0.146	71.58	73.0	20.5		4.4	
Cr	1.3			3.75	0.156	72.75	74.2	19.4		4.2	
100 year outflow	45.02	%		4	0.167	73.87	75.3	18.5		4.0	
150 year	45.02	%		4.25	0.177	74.93	76.4	17.6		3.9	

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Attachment D – Drainage Drawings

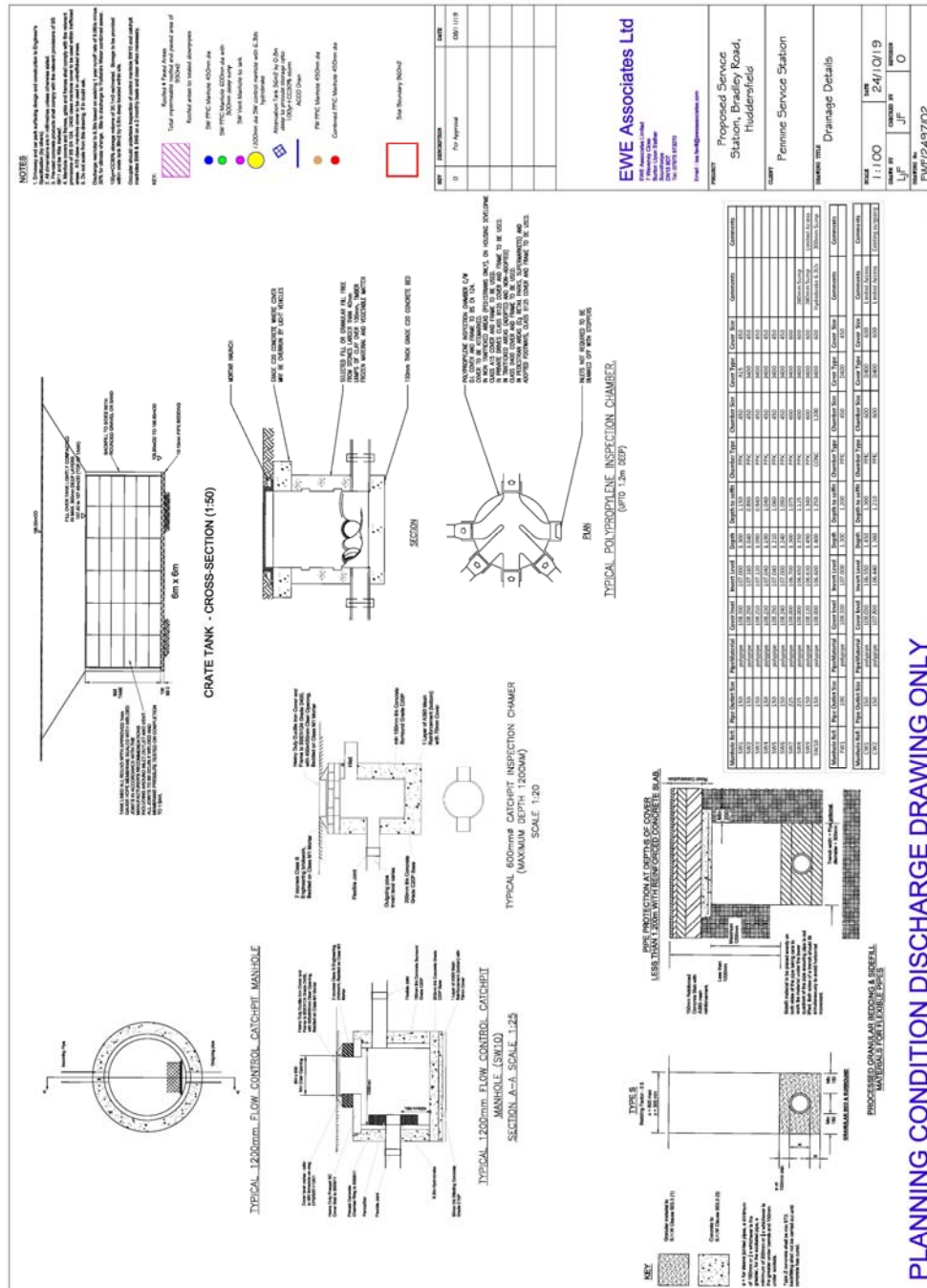


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Attachment E – WinDes Calculations discharge to combined sewer

EWE Associates Ltd

Windy Ridge Barn

Thealby Lane

Winterton DN15 9TG

Date 08/11/2019 16:43

File 100yr+CC30% tank ...

Micro Drainage

Designed By Windows7

Checked By

Source Control W.12.4

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Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	107.287	0.687	5.6	24.7	O K
30 min Summer	107.334	0.734	5.8	26.4	O K
60 min Summer	107.332	0.732	5.8	26.4	O K
120 min Summer	107.288	0.688	5.6	24.8	O K
180 min Summer	107.232	0.632	5.4	22.8	O K
240 min Summer	107.177	0.577	5.3	20.8	O K
360 min Summer	107.077	0.477	5.3	17.2	O K
480 min Summer	106.983	0.383	5.3	13.8	O K
600 min Summer	106.881	0.281	5.3	10.1	O K
720 min Summer	106.807	0.207	5.3	7.4	O K
960 min Summer	106.760	0.160	4.9	5.8	O K
1440 min Summer	106.727	0.127	4.0	4.6	O K
2160 min Summer	106.705	0.105	3.1	3.8	O K
2880 min Summer	106.693	0.093	2.5	3.4	O K
4320 min Summer	106.678	0.078	1.8	2.8	O K
5760 min Summer	106.669	0.069	1.4	2.5	O K
7200 min Summer	106.663	0.063	1.2	2.3	O K
8640 min Summer	106.658	0.058	1.0	2.1	O K
10080 min Summer	106.655	0.055	0.9	2.0	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	163.309	17
30 min Summer	96.460	30
60 min Summer	56.975	48
120 min Summer	33.653	82
180 min Summer	24.732	116
240 min Summer	19.877	150
360 min Summer	14.608	218
480 min Summer	11.741	282
600 min Summer	9.910	338
720 min Summer	8.628	384
960 min Summer	7.072	494
1440 min Summer	5.342	736
2160 min Summer	4.036	1100
2880 min Summer	3.308	1468
4320 min Summer	2.374	2188
5760 min Summer	1.876	2904
7200 min Summer	1.562	3616
8640 min Summer	1.346	4368
10080 min Summer	1.186	5040

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EWE Associates Ltd

Windy Ridge Barn

Thealby Lane

Winterton DN15 9TG

Date 08/11/2019 16:43

File 100yr+CC30% tank ...

Designed By Windows7

Checked By

Source Control W.12.4

Page 2

Micro Drainage

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	107.376	0.776	5.9	27.9	O K
30 min Winter	107.440	0.840	6.2	30.1	O K
60 min Winter	107.437	0.837	6.2	30.0	O K
120 min Winter	107.368	0.768	5.9	27.6	O K
180 min Winter	107.283	0.683	5.6	24.6	O K
240 min Winter	107.200	0.600	5.3	21.6	O K
360 min Winter	107.047	0.447	5.3	16.1	O K
480 min Winter	106.861	0.261	5.3	9.4	O K
600 min Winter	106.772	0.172	5.1	6.2	O K
720 min Winter	106.746	0.146	4.6	5.3	O K
960 min Winter	106.724	0.124	3.8	4.5	O K
1440 min Winter	106.702	0.102	2.9	3.7	O K
2160 min Winter	106.687	0.087	2.2	3.1	O K
2880 min Winter	106.678	0.078	1.8	2.8	O K
4320 min Winter	106.666	0.066	1.3	2.4	O K
5760 min Winter	106.658	0.058	1.0	2.1	O K
7200 min Winter	106.653	0.053	0.9	1.9	O K
8640 min Winter	106.650	0.050	0.7	1.8	O K
10080 min Winter	106.647	0.047	0.7	1.7	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Winter	163.309	17
30 min Winter	96.460	30
60 min Winter	56.975	50
120 min Winter	33.653	88
180 min Winter	24.732	126
240 min Winter	19.877	162
360 min Winter	14.608	232
480 min Winter	11.741	288
600 min Winter	9.910	324
720 min Winter	8.628	376
960 min Winter	7.072	492
1440 min Winter	5.342	736
2160 min Winter	4.036	1100
2880 min Winter	3.308	1468
4320 min Winter	2.374	2160
5760 min Winter	1.876	2896
7200 min Winter	1.562	3672
8640 min Winter	1.346	4344
10080 min Winter	1.186	5136

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EWE Associates Ltd		Page 3				
Windy Ridge Barn Thealby Lane Winterton DN15 9TG						
Date 08/11/2019 16:43	Designed By Windows7					
File 100yr+CC30% tank ...	Checked By					
Micro Drainage		Source Control W.12.4				
<u>Rainfall Details</u>						
Rainfall Model FEH						
Return Period (years) 100						
Site Location 417350 419950 SE 17350 19950						
C (1km) -0.026						
D1 (1km) 0.360						
D2 (1km) 0.428						
D3 (1km) 0.301						
E (1km) 0.307						
F (1km) 2.368						
Summer Storms Yes						
Winter Storms Yes						
Cv (Summer) 0.750						
Cv (Winter) 0.840						
Shortest Storm (mins) 15						
Longest Storm (mins) 10080						
Climate Change % +30						
<u>Time / Area Diagram</u>						
Total Area (ha) 0.093						
<table><thead><tr><th>Time (mins)</th><th>Area (ha)</th></tr></thead><tbody><tr><td>0-4</td><td>0.093</td></tr></tbody></table>			Time (mins)	Area (ha)	0-4	0.093
Time (mins)	Area (ha)					
0-4	0.093					
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EWE Associates Ltd			Page 4				
Windy Ridge Barn Thealby Lane Winterton DN15 9TG							
Date 08/11/2019 16:43							
File 100yr+CC30% tank ...							
Micro Drainage			Source Control W.12.4				
<u>Model Details</u>							
Storage is Online Cover Level (m) 108.000							
<u>Tank or Pond Structure</u>							
Invert Level (m) 106.600							
Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	36.0	1.400	0.0	2.800	0.0	4.200	0.0
0.200	36.0	1.600	0.0	3.000	0.0	4.400	0.0
0.400	36.0	1.800	0.0	3.200	0.0	4.600	0.0
0.600	36.0	2.000	0.0	3.400	0.0	4.800	0.0
0.800	36.0	2.200	0.0	3.600	0.0	5.000	0.0
1.000	0.0	2.400	0.0	3.800	0.0		
1.200	0.0	2.600	0.0	4.000	0.0		
<u>Hydro-Brake® Outflow Control</u>							
Design Head (m)		0.900	Hydro-Brake® Type		Md4	Invert Level (m) 106.600	
Design Flow (l/s)		6.3	Diameter (mm)		93		
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.8	1.200	7.4	3.000	11.6	7.000	17.8
0.200	5.2	1.400	7.9	3.500	12.6	7.500	18.4
0.300	4.4	1.600	8.5	4.000	13.4	8.000	19.0
0.400	4.4	1.800	9.0	4.500	14.2	8.500	19.6
0.500	4.8	2.000	9.5	5.000	15.0	9.000	20.1
0.600	5.2	2.200	10.0	5.500	15.7	9.500	20.7
0.800	6.0	2.400	10.4	6.000	16.4		
1.000	6.7	2.600	10.8	6.500	17.1		
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