PICK EVERARD

Surface Water Drainage Strategy

for

Joy Lane Primary School

Kent County Council

Issue Number 02
08-11-16

Document History

Issue	Date	Comment	Author	Chk'd
02	08-11-16	Tank design amended	GAT	PEC
01	08-07-16	First Issue	GAT	PEC

Contents

1.0 Introduction

Joy Lane Primary school is located off Joy Lane in Whitstable, Kent. The original school was constructed in the 1950s and has been extended subsequently.

The site is overall has significant green areas, principally the playing field to the rear of the main school buildings as can be seen in the aerial view below. There are two hard standing playgrounds and several parking areas.

The site slopes gently from south to north. The playing field area is 2-3m above the main school buildings with an embankment along its perimeter. There also several small retaining walls and ramps across the site to manage changes in level.

Aerial View of School

2.0 Existing Ground Conditions

A review of the British Geological Survey (BGS) data indicates that the site is underlain by the London Clay Formation Ground investigations. This has been confirmed by site investigation and the area has a low permeability making SUDS measures such as soakaways ineffective.

3.0 Planning Permission

Planning permission has been granted under application no. CA/15/2596 with the following condition for surface water disposal:-

Development shall not commence until a detailed sustainable surface water drainage scheme for the site has been submitted to and approved in writing by the County Planning Authority. The detailed drainage scheme shall demonstrate that the surface water generated by this proposal (for all rainfall durations up to and including the climate change adjusted critical 100yr storm) can be accommodated and disposed of without increase to the on-site and off-site flood risk. The detailed drainage scheme shall be based on the submitted drainage strategy and discharge rates to the public surface water sewer being agreed with Southern Water.

4.0 Disposal Strategy

The existing surface water run-off discharges into a Southern Water sewer than runs in a northerly direction to the east of the main school building.

The site currently has three impermeable catchment areas that connect via separate pipes to this public sewer.

There are no changes proposed to the existing buildings and these have been excluded from the assessment.

The three current impermeable catchment areas are:-

- Area A - Northern car park
- Area B - Eastern parking
- Area C - Access road to north east corner

These areas total 3963m^2.

The proposed development includes additional impermeable areas for the additional classroom, adjacent hardstanding and additional car park provision, which will increase the overall impermeable area of the site therefore increasing overall runoff.

As previously stated the ground conditions are not suitable for soakaways and other SUDS measures and there no watercourses in the area.

The development will change impermeable areas as follows:-

- Area A – additional parking to northern boundary
- Area B – additional parking to eastern boundary
- Area C – no change

The development will also add the following impermeable area:-

- Area D – additional classroom, MUGA and hardsurfacing

The strategy is to attenuate the total flow from Areas A, B, C and D such that the post-development outflow to the surface water sewer is limited to the outflow from the 15 min, 1 in 30 year storm event for the existing impermeable area of 3963m^2.

A 15min 30 year storm has been chosen as the catchment is small and the 15min duration is the critical storm event for the attenuation tank design.

The post-development flows for each impermeable area will be calculated for a 15 min, 1 in 100 year storm event including a 20% increase for climate change.

Flows from Areas B and C will be discharged to the public sewer without attenuation, and these flows will be deducted from the allowable outflow available when discharging areas A and D.

Sufficient attenuation, under the northern car park, will then be provided to attenuate all flows from Areas A and D whilst maintaining the overall flow to the public sewer to the current discharge rate so there is no increase to the risk of on-site and off-site flooding.

Appendix A includes a drainage area plan.

5.0 Calculations

Appendix B includes outputs from the calculations.

The present outflow from the impermeable area on the site for a 1 in 30 storm event has been calculated for the critical 15min storm duration for a small catchment, and gives a maximum outflow of 88 l/s.

The run-off from the four areas has also been calculated for the 1 in 100 year storm event plus a 20% increase for climate change for up to 15 min storm durations.

Areas B and C have a total maximum outflow of 68 l/s for the 1 in 100 year event, which means that the outflow from areas A and D will be attenuated to 88 – 68 = 20 l/s.

For the 15min, 1 in 100 year storm event plus 20% for climate change the flow from Areas A and D is 171 l/s, i.e. an attenuated flow rate of 151 l/s for the 15minute storm, giving a required storage volume of 137m^3.

6.0 Outputs

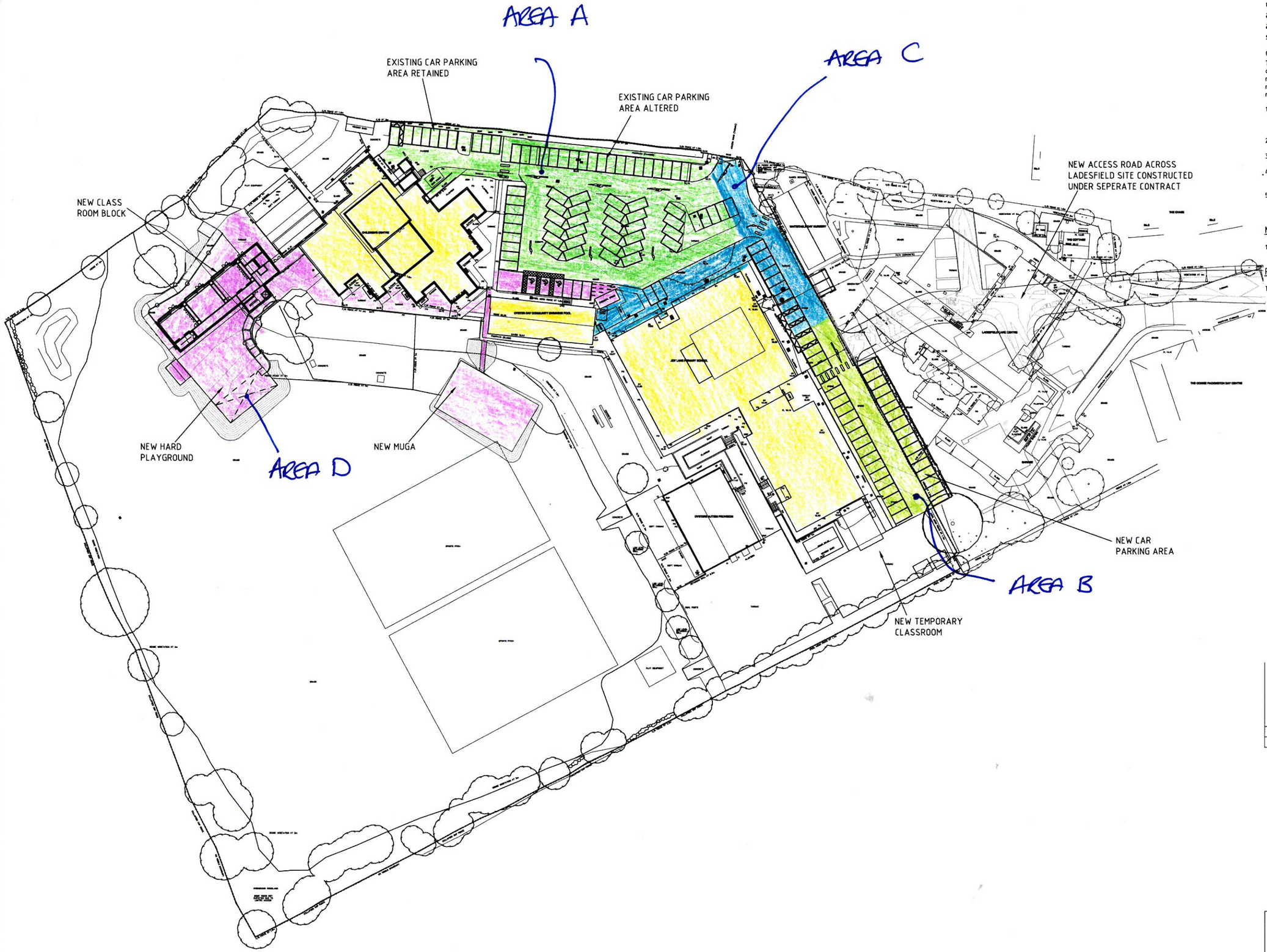
The attenuation tank will be constructed from pre-formed cellular storage blocks, wrapped and sealed in an impermeable membrane.

The tank will be 17m long by 16.5m wide, 0.8m deep, giving a net volume of 224m^3, however due to topography and layout of the site, the full depth is not available for storage. The storage depth is restricted to 0.6m, giving a net volume of 168m^3, i.e. the required volume plus 20% freeboard.

The outflow from the tank to the public sewer will be controlled a 150mm dia outlet pipe to limit the flow to the required 20 l/s to the existing drainage system.

Appendix A

Drawings



NO DIMENSIONS TO BE SCALED FROM THIS DRAWING

CDM - RESIDUAL RISKS

The following are considered to be significant risks relevant to this drawing, which could not be fully mitigated or removed through design. Further possible control measures have been identified within the Design Risk Assessments which may help to mitigate these and other identified risks further during the construction / maintenance process;

1. The school will be open to students and visitors during the construction period. The contractor shall securely fence off site area and take other measures to segregate school vehicles and pedestrians from site areas and construction traffic.
2. Deliveries to site shall be supervised to prevent collisions and congestion. In particular free passage through escape routes to be maintained.
3. Risk of residual asbestos and other hazardous materials from demolished buildings and structures.
4. Underground services in the vicinity of the works which are indicated on the drawings where known. Contractor shall confirm status of services prior to commencing excavations.
5. Existing foul and surface water sewers on site are confined spaces and are hazardous. Hazards include: , working from height, suffocation, disease and poisoned rodent bait.

NOTES.

1.

REFERENCES

To be read in conjunction with other drawings and specifications

C01	Construction Issue	04.07.16	OSF	GAT
Revisions		Date	Drawn	Chk'd

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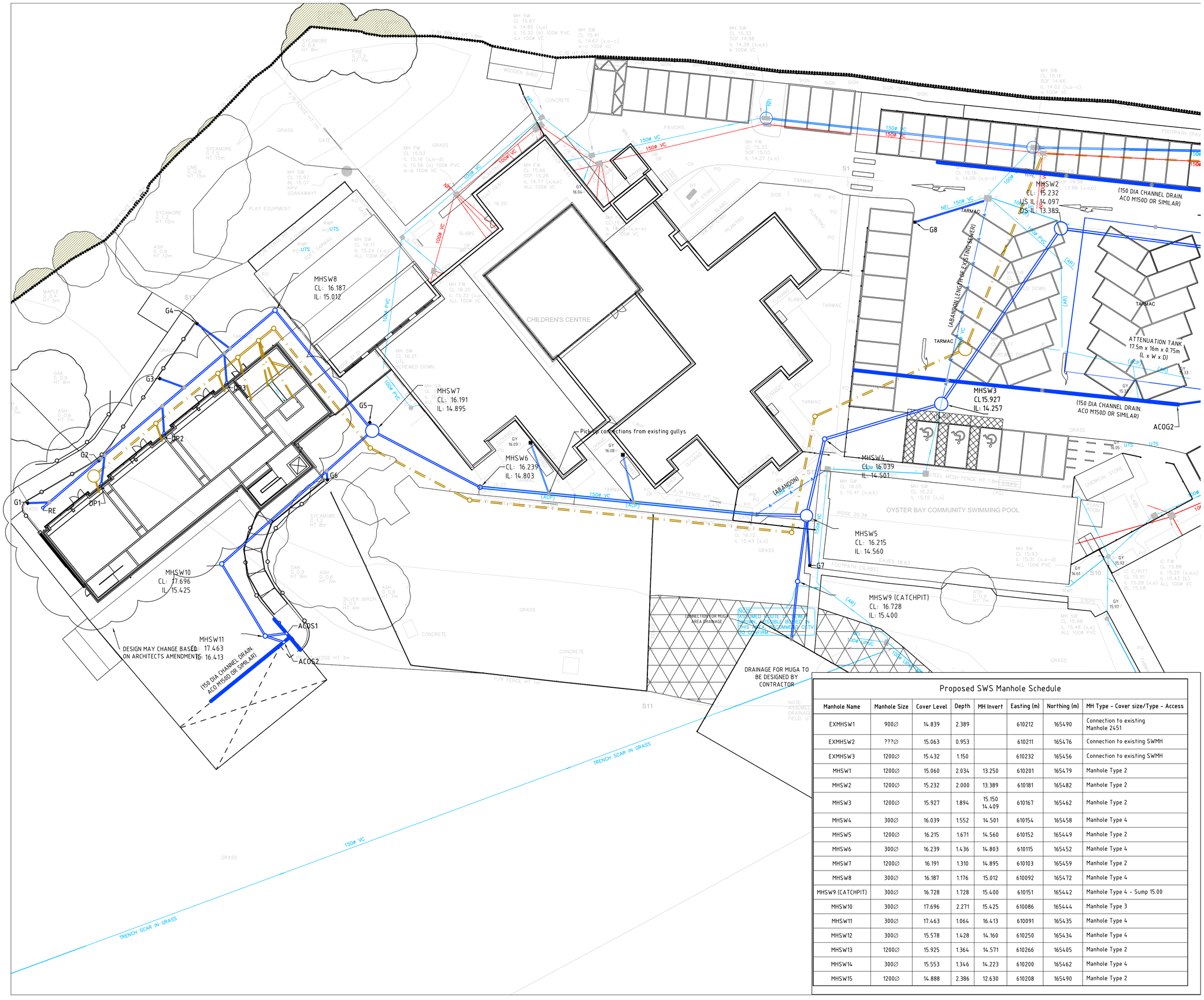
PROJECT
Joy Lane Primary Expansion

DRAWING TITLE: Site Layout	PICK EVERARD PROJECT No.: 160855
	SCALE - unless otherwise stated: 1:500 at A1
	STATUS: A; PURPOSE OF ISSUE: CONSTRUCTION
DRAWING NUMBER: 117-PE-XX-00-DR-C-0101	REV: C01



NO DIMENSIONS TO BE SCALED FROM THIS DRAWING

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5. Existing foul and surface water sewers on site are confined spaces and are hazardous. Hazards include: , working from height, suffocation, disease and poisoned rodent bait.

NOTES.

- The system shall comply with the recommendations contained in BS EN 752. BS EN 12056 and Building Regulations Part H.
- All external pipes, bends and junctions shall be vitrified clay to BS EN295, with flexible joints and kitemark certified.
- All private building drainage shall be constructed in strict accordance with BS EN752. Foul drainage shall be laid no shallower than 1 in 150 and surface water no shallower than 1 in 300.
- Drainage with less than 1200mm cover will have a concrete bed and surround or concrete protection above the granular surround as detailed. Where required, pipework will be protected in accordance with the 'Simplified Tables of External Loads on Buried Pipelines'.
- In any circumstances where pipes are bedded and surrounded in concrete flexible joints should be provided. Compressible boards (fibreboard or polystyrene) shall be provided at a maximum of 8m centres (coinciding with pipe joints). The boards shall be pre-cut to pipe diameter and to a height and width equal to the concrete cross section. A board thickness of 18m for pipes up to 450mm nominal diameter and 36mm for pipes over 450mm nominal diameter.
- Where existing pipes are to be abandoned they shall be either dug out together with any abandoned manholes or backfilled with concrete. Covers/gratings of existing manholes, gullies and other chambers within new or resurfaced areas of paving are to be re-set to suit the new paving level on engineering brickwork and Class 1 mortar bed and haunching.
- New gullies will generally be precast concrete road gullies 150mm outlet, trapped with rodding eye to BS.5911 fitted with heavy duty cast iron gully grate and frame to BS.497: Part 1. Connections to the existing drainage system are to be made at existing manholes or to existing pipe runs using junction insertions or saddles as required. All new areas of paving shall be given suitable falls to direct surface water to existing and new gullies.
- For cover dimension & type, see individual manhole schedules.
- All drainage shall be installed to true and even gradients and shall be laid in straight lines between each manhole.
- Where drainage is required to pass beneath sub-structural perimeter beams, the pipework shall have a minimum of a 50mm space above the pipe which shall be filled with polystyrene, if distance to pipe crown is less then 100mm.
- All connections to manholes shall be swept in the direction of the flow and no swept bend shall be greater than 100 degrees.
- All backdrops to manholes shall be formed externally to the manhole with a horizontal rodding eye taken though the wall.
- All branch connections to manholes shall be made at a level soffit with the outfall drain.
- Inlet and outlet connections to manholes on the main drain shall be at level soffit. Every drain connection to a manhole or inspection chamber shall be via a short length of rocker pipe to enable settlement to take place without damaging the pipe.
- Benching to manholes shall be trowelled to a smooth finish at a gradient of 1 in 12 to the horizontal.
- Channel bends shall be used in all manholes.
- Manhole covers shall be installed on the upstream end of manholes, over the step irons or the access ladder and shall be flush with the internal face of the manhole wall; there shall be no overhang of the manhole cover, which obscures access onto the step irons or the ladder.
- Bends at the base of soil stacks shall be long radius.
- Rodding access should be provided on all soil stacks for maintenance, testing and removal of debris.
- All redundant manholes and pipework to be broken out/ grouted up as appropriate.
- Generally, step irons are to be included in all manholes deeper than 1m. The distance to the first step should be no more then 675mm from cover level.

REFERENCES

To be read in conjunction with other drawings and specifications

KEY

PROPOSED SURFACE WATER SEWER

EXISTING SURFACE WATER SEWER

EXISTING SOUTHERN WATER OWNED SURFACE WATER SEWER

Proposed SWS Manhole Schedule

Manhole Name	Manhole Size	Cover Level	Depth	MH Invert	Easting (m)	Northing (m)	MH Type - Cover size/Type - Access
EXMHSW1	900Ø	14.839	2.389		610212	165490	Connection to existing Manhole 2451
EXMHSW2	???Ø	15.063	0.953		610211	165476	Connection to existing SWMH
EXMHSW3	1200Ø	15.432	1.150		610232	165456	Connection to existing SWMH
MHSW1	1200Ø	15.060	2.034	13.250	610201	165479	Manhole Type 2
MHSW2	1200Ø	15.232	2.000	13.389	610181	165482	Manhole Type 2
MHSW3	1200Ø	15.927	1.894	15.150 14.409	610167	165462	Manhole Type 2
MHSW4	300Ø	16.039	1.552	14.501	610154	165458	Manhole Type 4
MHSW5	1200Ø	16.215	1.671	14.560	610152	165449	Manhole Type 2
MHSW6	300Ø	16.239	1.436	14.803	610115	165452	Manhole Type 4
MHSW7	1200Ø	16.191	1.310	14.895	610103	165459	Manhole Type 2
MHSW8	300Ø	16.187	1.176	15.012	610092	165472	Manhole Type 4
MHSW9 (CATCHPIT)	300Ø	16.728	1.728	15.400	610151	165442	Manhole Type 4 - Sump 15.00
MHSW10	300Ø	17.696	2.271	15.425	610086	165444	Manhole Type 3
MHSW11	300Ø	17.463	1.064	16.413	610091	165435	Manhole Type 4
MHSW12	300Ø	15.578	1.428	14.160	610250	165434	Manhole Type 4
MHSW13	1200Ø	15.925	1.364	14.571	610266	165405	Manhole Type 2
MHSW14	300Ø	15.553	1.346	14.223	610200	165462	Manhole Type 4
MHSW15	1200Ø	14.888	2.386	12.630	610208	165490	Manhole Type 2

Revisions		Date	Drawn	Chk'd
C03	Construction issue with Attenuation Tank Ammendments	12.08.16	MLD	GAT
C02	Updates to Attenuation Tank and Surrounding SWS	03.08.16	MLD	
C01	Construction issue	07.07.16	OSF	GAT

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PROJECT
Joy Lane Primary Expansion

DRAWING TITLE
Surface Water Sewer
General Arrangement Sheet 1 of 2

PICK EVERARD PROJECT No.
160855

SCALE - unless otherwise stated
1:200 at A1

STATUS: A
PURPOSE OF ISSUE: CONSTRUCTION

DRAWING NUMBER
117-PE-XX-00-DR-C-0520

REV
C03

NO DIMENSIONS TO BE SCALED FROM THIS DRAWING

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EXISTING SURFACE WATER SEWER

EXISTING SOUTHERN WATER OWNED SURFACE WATER SEWER

LONGSECTION - EXISITING SWS NORTH
SCALE: H 1:200, V 1:40. DATUM: 10.000

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C04	Construction issue - Ammended Attenuation Details	12.08.16	MLD	GAT
C03	Attenuation Alterations & Additional Gullys	03.08.16	MLD	
C02	Parking Layout Amended	27.07.16	OSF	JH
C01	Construction issue	07.07.16	OSF	GAT
Revisions		Date	Drawn	Chk'd

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PROJECT
Joy Lane Primary Expansion

DRAWING TITLE: Surface Water Sewer General Arrangement Sheet 2 of 2	PICK EVERARD PROJECT No.: 160855
	SCALE - unless otherwise stated: 1:200 at A1
	STATUS: A — PURPOSE OF ISSUE: CONSTRUCTION
DRAWING NUMBER: 117-PE-XX-00-DR-C-0521	REV: C04

Appendix B

Calculations

Design Rainfall

Rainfall Ration, r	0.39	*Ref: Wallingford Procedure Vol 3 Map M5-60: M5-2day)*
Existing Hard Standing (m2)	3963	
M5-60 Rainfall (mm)	20	*Ref: BRE 365*

Duration (min)	Z1	M5 Rainfall (mm)	Z2 Growth Factor							
			LB (mm)	Rainfall above LB (mm)	M1	M10	M20	M30	M50	M100
5	0.37	7.4	5	2.4	0.596	1.262	1.48	1.618	1.776	2.078
10	0.52	10.4	10	0.4	0.614	1.228	1.422	1.532	1.67	1.942
15	0.63	12.6	10	2.6	0.636	1.272	1.488	1.598	1.78	2.118
30	0.8	16	15	1	0.64	1.24	1.45	1.58	1.73	2.03
60	1	20	20	0	0.64	1.24	1.45	1.58	1.73	2.03
120	1.21	24.2	20	4.2	0.724	1.24	1.408	1.538	1.688	1.946
240	1.46	29.2	25	4.2	0.744	1.156	1.356	1.486	1.636	1.842
360	1.62	32.4	30	2.4	0.728	1.148	1.324	1.43	1.556	1.778
600	1.82	36.4	30	6.4	0.808	1.028	1.164	1.23	1.316	1.458
1440	2.28	45.6	40	5.6	0.812	1.078	1.156	1.22	1.304	1.442

30 Year Design Storms					
	Z2	Rainfall (mm)	Inflow (m3)	Duration (s)	Flow Rate (l/s)
M30-5	1.618	11.9732	47.45455693	300	158.1818564
M30-10	1.532	15.9328	63.14802765	600	105.2467128
M30-15	1.598	20.1348	79.80222605	900	88.66914006
M30-30	1.58	25.28	100.1947014	1800	55.66372302
M30-60	1.58	31.6	125.2433768	3600	34.78982689

Design Rainfall

Rainfall Ration, r	0.39	*Ref: Wallingford Procedure Vol 3 Map M5-60: M5-2day)*
Existing Hard Standing (m2)	1856	
M5-60 Rainfall (mm)	20	*Ref: BRE 365*

Duration (min)	Z1	M5 Rainfall (mm)	Z2 Growth Factor							
			LB (mm)	Rainfall above LB	M1	M10	M20	M30	M50	M100
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15	0.63	12.6	10	2.6	0.636	1.272	1.488	1.598	1.78	2.118
30	0.8	16	15	1	0.64	1.24	1.45	1.58	1.73	2.03
60	1	20	20	0	0.64	1.24	1.45	1.58	1.73	2.03
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600	1.82	36.4	30	6.4	0.808	1.028	1.164	1.23	1.316	1.458
1440	2.28	45.6	40	5.6	0.812	1.078	1.156	1.22	1.304	1.442

100 Year Design Storms					
Storm Event	Z2	Rainfall (mm)	Inflow (m3)	Duration (s)	Flow Rate (l/s)
M100-5	2.078	15.3772	28.54451183	300	95.14837278
M100-10	1.942	20.1968	37.49107748	600	62.48512913
M100-15	2.118	26.6868	49.5383866	900	55.04265178
M100-30	1.03	16.48	30.59162624	1800	16.99534791
M100-60	1.03	20.6	38.2395328	3600	10.62209244

Design Rainfall

Rainfall Ration, r 0.39 *Ref: Wallingford Procedure Vol 3 Map M5-60: M5-2day)*
Existing Hard Standing (m2) 1221
M5-60 Rainfall (mm) 20 *Ref: BRE 365*

Duration (min)	Z1	M5 Rainfall (mm)	Z2 Growth Factor							
			LB (mm)	Rainfall above LB	M1	M10	M20	M30	M50	M100
5	0.37	7.4	5	2.4	0.596	1.262	1.48	1.618	1.776	2.078
10	0.52	10.4	10	0.4	0.614	1.228	1.422	1.532	1.67	1.942
15	0.63	12.6	10	2.6	0.636	1.272	1.488	1.598	1.78	2.118
30	0.8	16	15	1	0.64	1.24	1.45	1.58	1.73	2.03
60	1	20	20	0	0.64	1.24	1.45	1.58	1.73	2.03
120	1.21	24.2	20	4.2	0.724	1.24	1.408	1.538	1.688	1.946
240	1.46	29.2	25	4.2	0.744	1.156	1.356	1.486	1.636	1.842
360	1.62	32.4	30	2.4	0.728	1.148	1.324	1.43	1.556	1.778
600	1.82	36.4	30	6.4	0.808	1.028	1.164	1.23	1.316	1.458
1440	2.28	45.6	40	5.6	0.812	1.078	1.044	1.22	1.304	1.442

100 Year Design Storms					
Storm Event	Z2	Rainfall (mm)	Inflow (m3)	Duration (s)	Flow Rate (l/s)
M100-5	2.078	15.3772	18.77705279	300	62.59017596
M100-10	1.942	20.1968	24.66225189	600	41.10375315
M100-15	2.118	26.6868	32.58717142	900	36.20796824
M100-30	1.03	16.48	20.12367856	1800	11.17982142
M100-60	1.03	20.6	25.1545982	3600	6.987388389

Design Rainfall

Rainfall Ration, r	0.39	*Ref: Wallingford Procedure Vol 3 Map M5-60: M5-2day)*
Existing Hard Standing (m2)	688	
M5-60 Rainfall (mm)	20	*Ref: BRE 365*

Duration (min)	Z1	M5 Rainfall (mm)	Z2 Growth Factor							
			LB (mm)	Rainfall above LB	M1	M10	M20	M30	M50	M100
5	0.37	7.4	5	2.4	0.596	1.262	1.48	1.618	1.776	2.078
10	0.52	10.4	10	0.4	0.614	1.228	1.422	1.532	1.67	1.942
15	0.63	12.6	10	2.6	0.636	1.272	1.488	1.598	1.78	2.118
30	0.8	16	15	1	0.64	1.24	1.45	1.58	1.73	2.03
60	1	20	20	0	0.64	1.24	1.45	1.58	1.73	2.03
120	1.21	24.2	20	4.2	0.724	1.24	1.408	1.538	1.688	1.946
240	1.46	29.2	25	4.2	0.744	1.156	1.356	1.486	1.636	1.842
360	1.62	32.4	30	2.4	0.728	1.148	1.324	1.43	1.556	1.778
600	1.82	36.4	30	6.4	0.808	1.028	1.164	1.23	1.316	1.458
1440	2.28	45.6	40	5.6	0.812	1.078	1.156	1.22	1.304	1.442

100 Year Design Storms					
Storm Event	Z2	Rainfall (mm)	Inflow (m3)	Duration (s)	Flow Rate (l/s)
M100-5	2.078	15.3772	10.58103594	300	35.27011981
M100-10	1.942	20.1968	13.89739788	600	23.16232981
M100-15	2.118	26.6868	18.36316039	900	20.403512
M100-30	1.03	16.48	11.33987152	1800	6.299928622
M100-60	1.03	20.6	14.1748394	3600	3.937455389

Design Rainfall

Rainfall Ration, r	0.39	*Ref: Wallingford Procedure Vol 3 Map M5-60: M5-2day)*
Existing Hard Standing (m2)	2976	
M5-60 Rainfall (mm)	20	*Ref: BRE 365*

Duration (min)	Z1	M5 Rainfall (mm)	Z2 Growth Factor							
			LB (mm)	Rainfall above LB	M1	M10	M20	M30	M50	M100
5	0.37	7.4	5	2.4	0.596	1.262	1.48	1.618	1.776	2.078
10	0.52	10.4	10	0.4	0.614	1.228	1.422	1.532	1.67	1.942
15	0.63	12.6	10	2.6	0.636	1.272	1.488	1.598	1.78	2.118
30	0.8	16	15	1	0.64	1.24	1.45	1.58	1.73	2.03
60	1	20	20	0	0.64	1.24	1.45	1.58	1.73	2.03
120	1.21	24.2	20	4.2	0.724	1.24	1.408	1.538	1.688	1.946
240	1.46	29.2	25	4.2	0.744	1.156	1.356	1.486	1.636	1.842
360	1.62	32.4	30	2.4	0.728	1.148	1.324	1.43	1.556	1.778
600	1.82	36.4	30	6.4	0.808	1.028	1.164	1.23	1.316	1.458
1440	2.28	45.6	40	5.6	0.812	1.078	1.156	1.22	1.304	1.442

100 Year Design Storms					
Storm Event	Z2	Rainfall (mm)	Inflow (m3)	Duration (s)	Flow Rate (l/s)
M100-5	2.078	15.3772	45.76346983	300	152.5448994
M100-10	1.942	20.1968	60.10688861	600	100.1781477
M100-15	2.118	26.6868	79.42151801	900	88.24613112
M100-30	1.03	16.48	49.0454688	1800	27.24748267
M100-60	1.03	20.6	61.306836	3600	17.02967667

100 Year Design Storms + 20%									
Storm Event	**Duration (s)**	**Flow Rate (l/s) (excl 20%)**				**Unattenuated flows(B+C) + 20%**	**Remaining outfall flow (88 l/s less unattenuated flows)**	**Attenuated flow (A+D) + 20% less Remaining outflow**	**Tank Volume (m3)**
		Area A	**Area B**	**Area C**	**Area D**				
M100-5	300	95.1	62.6	35.3	152.5	117.4	-29.4	326.7	98.0
M100-10	600	62.5	41.1	23.2	100.2	77.1	10.9	184.3	110.6
M100-15	900	55.0	36.2	20.4	88.2	67.9	20.1	151.9	136.7
M100-30	1800	17.0	11.2	6.3	27.2	21.0	67.0	-13.9	-25.1
M100-60	3600	10.6	7.0	3.9	17.0	13.1	74.9	-41.7	-150.1

Max Vol (m3)	136.7
% Void Ratio	95
Rectangular Tank	
Depth (m)	0.6
Length (m)	17.5
Width (m)	14
Crate Sizes	1.0x0.5x0.4