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ENGINEERING DRAINAGE REPORT FOR PLANNING SUBMISSION

Proposed Extensions at Millbrook Manor Nursing Home Slade Road, Coolmines, Saggart, Co. Dublin

Reference: 38-89A
Date: 27 October 2021

ENGINEERS IRELAND

ACEI
Association of Consulting Engineers Ireland

OBA Consulting Engineers Ltd
The School Yard
1 Grantham Street
Dublin 8
Tel +353 1 535 0084
Web www.obaconsulting.ie

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APPENDICES

1. INTRODUCTION

1.1.General Description

The subject site is located approximately 0.5 km south of Saggart on the Slade Road. The entire site is approximately 2 ha, with half being undeveloped greenfield site and an area of approximately 1 ha consisting of developed vehicular access, parking and (Millbrook Manor) double storey building, inclusive of small basement.

Millbrook Manor comprises 59 Unit Nursing Home (57 Single bed & 2 Double bed units), with a total roof area of 1900 m^2 with a landscaped central courtyard of area 310 m^2.

The site has approved planning ref. SD20A/0153 for a 609m^2, 16 bed extension and 8 parking spaces car parking.

This is a new planning proposal with modifications to the existing building by providing a 789m^2 (increase of 180m^2 from previously approved SD20A/0153), 22 bed (20 single and 1 double bed units) extension and additional 12 parking spaces total.

1.2.Scope of this Report

This report describes the proposed civil engineering infrastructure for the development and how it connects to the existing infrastructure serving the site. In particular, Foul and Surface Water Drainage and Water supply aspects are considered. This report should be read in conjunction with the following drawings submitted with the Planning Application (Additional Information):

38-89A-C01 Roads & Parking Layout Plan & Typical Cross Section;

38-89A-C02 Foul & SW Drainage Layout Plan;

38-89A-C03 Watermain Layout Plan;

38-89-C04A SW Soakaway & Petrol Interceptor Details; and

38-89A-C05 CFRAM Fluvial Map overlaid on Topographical Survey Map.

2. SURFACE WATER DRAINAGE SYSTEM

2.1.Existing Surface Water Infrastructure

The existing site is served by two separate SW systems.

The first caters for the existing vehicular access system and parking area and discharges to an existing soakaway located beneath the existing car parking area. It is proposed to retain this system unaltered (extend this system to cater for the extension to the car park area).

The second system caters for the existing building roof and central courtyard area. This comprises of attenuation within 230 m of 675mm diameter oversized pipes, with limited discharge rate (hydrobrake rate of 6 l/s) to the Camac River. SW Attenuation based on the existing infrastructure show that this system can cater for (marginally below) the 100-year return storm (+20% for climate change), please refer to Appendix II for the existing SW Attenuation calculations for further clarity.

2.2.Proposed Site Surface Water Drainage System

The new roof extensions and 2 No. carpark spaces requires that the existing 675mm diameter oversized pipe attenuation is extended, as is proposed on OBA drawing number 38-89A-C02. The roof area draining to the oversized attenuation pipes increases by 159 m^2 and the 2 No. car park increases the existing road area by 31m^2 and this is catered for by extending the overall length of the oversized pipe attenuation. Calculations contained in Appendix III show the attenuation volume capacity of the new (extended) oversized pipe attenuation to be in excess of the required 100-year return storm (+20% for climate change). It needs to be noted that the design and calculations have been based on the Greater Dublin Strategic Drainage Study (GDSDS), whereby the limiting factor for the discharge rate is the equivalent greenfield runoff rate. Although the total site area is 2 ha, only 1 ha (being the extent of the development area fenced off) has been used in calculating the maximum discharge rate. The green field runoff rate has been determined to be 7.9 l/s. The existing hydrobrake (6 l/s) is to be replaced with a new hydrobrake with maximum 7.9 l/s discharge rate.

The proposed extension to the west of the existing building is to be collected separately and discharged to a purpose-built SW soakaway. The soakaway location ensures minimum setback distances of 8m from the existing bulk watermain and 15m from the bank of the Camac River are adhered to..

The proposed new (extended) parking area to the east is to be discharged through an existing petrol interceptor to a purpose-built SW soakaway (extension of existing). The soakaway has been provided with an overflow discharging to the Camac at a level above the 100-year return fluvial flood level.

Both soakaways have been sized using an infiltration rate as determined by on-site test undertaken by Rankin Engineering on 25/01/2019, submitted with the original planning submission. Soakaway calculations are included in Appendix IV.

3. FOUL DRAINAGE SYSTEM

3.1.Existing Foul Drain Infrastructure

The existing site is served by a dedicated foul drains system comprising:

- A 100/150/225mm diameter foul drains gravitating eastwards to an existing foul pump chamber; and
- A foul pump chamber, inclusive of 24-hour emergency storage tank, valve chamber and approximately 650m of existing 100mm diameter foul rising main, discharging to an existing standoff manhole located on Castle Road, within Saggart.

3.2.Proposed Foul Sewer System

It is proposed to provide 100/150mm diameter foul drain extension / diversions to collect all foul from the new extensions.

The existing foul pumps, 24-hour storage and rising main were evaluated in context of the increased loading due the proposed extensions and confirmed to be adequate without the need to upgrade. Submissions were made to Irish Water inclusive of the proposed drainage and existing foul pump system. Confirmation of Feasibility letter is contained in Appendix V together with relevant existing foul pump chamber related drawings and evaluation calculations.

Refer to drawing no. 38-89A-C02, Foul & SW Drainage Layout Plan for further clarity.

4. WATER SUPPLY

4.1.Existing Watermain Infrastructure

An existing 1600mm diameter trunk watermain traverse the site north of the existing building.

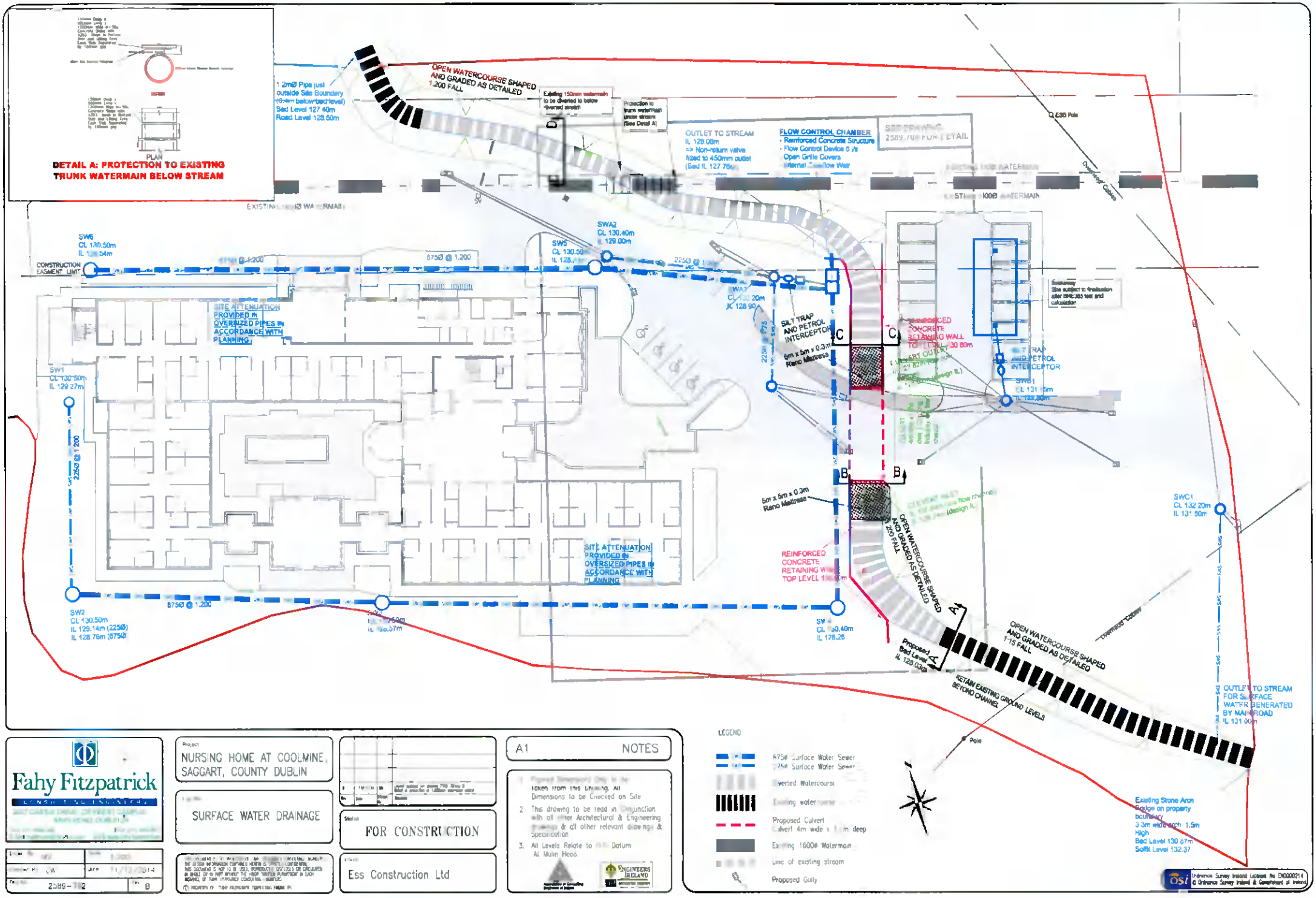
The building is supplied by a metered connection to the existing 150mm diameter watermain north of the site on the Slade Road. A 100mm diameter ring main with fire hydrants is located around the circumference of the existing building

4.2.Proposed Watermain

It is proposed to extend the existing 100mm diameter ring main around the building and retain/relocate existing fire hydrants to comply with Irish Water requirements. Refer to OBA drawing number 38-89A-C03 for the Proposed Watermain Layout Plan.

APPENDIX I

EXISTING SURFACE WATER DRAINAGE LAYOUT PLAN


DETAIL A: PROTECTION TO EXISTING TRUNK WATERMAIN BELOW STREAM
PLAN
1 2mØ Pipe just outside Site Boundary (0.6m below bed level) Bed Level 127.40m Road Level 128.50m
OPEN WATERCOURSE SHAPED AND GRADED AS DETAILED 1:200 FALL
Existing 150mm watermain to be diverted to below diverted stream
Protection to trunk watermain under stream (See Detail A)
OUTLET TO STREAM IL 128.08m => Non-return valve fitted to 450mm outlet (Bed IL 127.76m)
FLOW CONTROL CHAMBER
· Reinforced Concrete Structure
· Flow Control Device 6 l/s
Open Grille Covers
Internal Overflow Weir
SEE DRAWING 2589/700 FOR DETAIL
EXISTING 150Ø WATERMAIN
EXISTING 100Ø WATERMAIN
Overhead Cables
ESB Pole
SW6 CL 130.50m IL 128.54m
CONSTRUCTION EASEMENT LIMIT
675Ø @ 1:200
SW5 CL 130.50m IL 128.
SWA2 CL 130.40m IL 129.00m
2250 @ 1:200
SWA1 CL 130.20m IL 128.90
SITE ATTENUATION PROVIDED IN OVERSIZED PIPES IN ACCORDANCE WITH PLANNING
SILT TRAP AND PETROL INTERCEPTOR
6m x 5m x 0.3m Reno Mattress
REINFORCED CONCRETE RETAINING WALL TOP LEVEL 130.80m
Embankment Slope subject to finalisation after BRE365 test and calculation
SILT TRAP AND PETROL INTERCEPTOR
SW1 CL 130.50m IL 129.27m
2250 @ 1:200
5m x 6m x 0.3m Reno Mattress
SITE ATTENUATION PROVIDED IN OVERSIZED PIPES IN ACCORDANCE WITH PLANNING
REINFORCED CONCRETE RETAINING WALL TOP LEVEL 130.80m
OPEN WATERCOURSE SHAPED AND GRADED AS DETAILED 2:1 FALL
SWC1 CL 132.20m IL 131.50m
675Ø @ 1:200
SW2 CL 130.50m IL 129.14m (225Ø) IL 128.76m (675Ø)
SW4 CL 130.40m IL 128.28
Proposed Bed Level IL 128.63m
OPEN WATERCOURSE SHAPED AND GRADED AS DETAILED 1:15 FALL
RETAIN EXISTING GROUND LEVELS BEYOND CHANNEL
Overhead Cables
Pole
OUTLET TO STREAM FOR SURFACE WATER GENERATED BY MAIN ROAD IL 131.00m
Existing Stone Arch Bridge on property boundary 3.3m wide arch 1.5m High Bed Level 130.67m Soffit Level 132.37
LEGEND
675Ø Surface Water Sewer
225Ø Surface Water Sewer
Diverted Watercourse
Existing watercourse
Proposed Culvert Culvert 4m wide x 1.5m deep
Existing 1600Ø Watermain
Line of existing stream
Proposed Gully
Fahy Fitzpatrick
CONSULTING ENGINEERS
Project
NURSING HOME AT COOLMINE, SAGGART, COUNTY DUBLIN
SURFACE WATER DRAINAGE
Status
FOR CONSTRUCTION
Client
Ess Construction Ltd
A1 NOTES
1. Proposed Setting Out to be taken from this Drawing. All Dimensions to be Checked on Site
2. This drawing to be read in conjunction with all other Architectural & Engineering Drawings & all other relevant drawings & Specification
3. All Levels Relate to Datum At Main Head.
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APPENDIX II

EXISTING SURFACE WATER ATTENUATION CALCULATIONS

Storm Water Attenuation Calculations

Total Site Area = 20388 m^2

Areas contributing to SW Run-off:

Description	Finish	Area (m^2)	Percentage run-off (%)	Equivalent run-off area (m^2)
Roof Areas	conc tile	1900	90	1710
Courtyard	paved	310	70	217
Equivalent impermeable area:				**1710**

Actual hydrobrake outflow = **6.00 l/s**

100 year storm

Permissible Volume (l)= Actual Achievable Outflow (l/s) x time (s)

Actual Volume (l)= (Equivalent Impermeable Area x depth of rainfall)

Storage capacity (l)= Actual - Permissible Volumes

Duration	Rainfall	Permissible	Actual	Store
min	mm	l	l	l
15	33.3	5400.00	56943.00	51543.00
30	41.8	10800.00	71478.00	60678.00
60	52.6	21600.00	89946.00	68346.00
120	66	43200.00	112860.00	69660.00
240	82.9	86400.00	141759.00	55359.00
360	94.8	129600.00	162108.00	32508.00
720	119.1	259200.00	203661.00	-55539.00
1440	149.6	518400.00	255816.00	-262584.00

Rainfall figures are site specific, see Met Eireann rainfall table attached.

From table above, required storage volume is 69.66 m^3
Allow 20% for climate change,
therefore storage required is 83.59 m^3

Attenuation provided in oversized pipes
length = 230.3 m
diameter = 0.675 m

therefore, Attenuation provided = $L\pi r^2$ 82.4 m^3

Type of surface	Runoff coefficient (φ)
Roof without storage	0.9
Concrete or asphalt, rock with large slopes	0.8
Cobbled stone with gravel joints	0.7
Gravel road	0.4
Rock with small slopes	0.3
Gravel paths	0.2
Park	0.1
Lawn, pasture, etc	0-0.1
Forest, no slopes	0-0.1

APPENDIX III

PROPOSED SURFACE WATER ATTENUATION CALCULATIONS

Storm Water Attenuation Calculations

Total Site Area = 20388 m^2

Areas contributing to SW Run-off:

Description	Finish	Area (m^2)	Percentage run-off (%)	Equivalent run-off area (m^2)
Roof Areas	conc tile	2059	90	1853.1
Courtyard	paved	310	70	217
2 new parking bays	macadam	31	80	24.8
Equivalent impermeable area:				**2094.9**

Permissible outflow = **7.90 l/s** Q_{bar}

Note the existing hydrobrake is to be replaced with a new hydrobrake, providing the greenfield discharge rate as calculated - refer to HR Wallingford Greenfield Runoff Rate calculations, attached.

SAAR = 882 mm (Met Eireann)

100 year storm

Permissible Volume (l)= Actual Achievable Outflow (l/s) x time (s)

Actual Volume (l)= (Equivalent Impermeable Area x depth of rainfall)

Storage capacity (l)= Actual - Permissible Volumes

Duration	Rainfall	Permissible	Actual	Store
min	mm	l	l	l
15	33.3	7110.00	69760.17	62650.17
30	41.8	14220.00	87566.82	73346.82
60	52.6	28440.00	110191.74	81751.74
120	66	56880.00	138263.40	81383.40
240	82.9	113760.00	173667.21	59907.21
360	94.8	170640.00	198596.52	27956.52
720	119.1	341280.00	249502.59	-91777.41
1440	149.6	682560.00	313397.04	-369162.96

Rainfall figures are site specific, see Met Eireann rainfall table attached.

From table above, required storage volume is 81.75 m^3

Allow 20% for climate change,

therefore storage required is 98.10 m^3

Existing length of 675mm diameter oversized pipe provided = 230 m

Proposed length of 675mm diameter oversized pipe provided = 50 m

Hydrobrake discharge = 7.90 l/s

Attenuation provided = 100.24 m^3

Type of surface	Runoff coefficient (φ)
Roof without storage	0.9
Concrete or asphalt, rock with large slopes	0.8
Cobbled stone with gravel joints	0.7
Gravel road	0.4
Rock with small slopes	0.3
Gravel paths	0.2
Park	0.1
Lawn, pasture, etc.	0-0.1
Forest, no slopes	0-0.1

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 303300, Northing: 226167,

	Interval		Years												
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.7,	4.1,	4.8,	6.0,	6.8,	7.5,	9.6,	12.1,	13.9,	16.3,	18.6,	20.3,	23.1,	25.3,	27.1,	N/A ,
10 mins	3.8,	5.7,	6.7,	8.4,	9.5,	10.4,	13.4,	16.9,	19.3,	22.7,	25.9,	28.3,	32.2,	35.2,	37.8,	N/A ,
15 mins	4.5,	6.7,	7.9,	9.9,	11.2,	12.2,	15.8,	19.9,	22.7,	26.7,	30.4,	33.3,	37.8,	41.4,	44.4,	N/A ,
30 mins	5.9,	8.7,	10.3,	12.7,	14.4,	15.7,	20.1,	25.3,	28.8,	33.8,	38.3,	41.8,	47.4,	51.8,	55.4,	N/A ,
1 hours	7.7,	11.3,	13.4,	16.4,	18.5,	20.2,	25.7,	32.1,	36.4,	42.6,	48.2,	52.6,	59.4,	64.7,	69.2,	N/A ,
2 hours	10.2,	14.8,	17.3,	21.2,	23.8,	25.9,	32.8,	40.8,	46.2,	53.8,	60.7,	66.0,	74.4,	80.9,	86.4,	N/A ,
3 hours	11.9,	17.2,	20.2,	24.6,	27.6,	30.0,	37.9,	47.0,	53.0,	61.7,	69.4,	75.5,	84.9,	92.2,	98.3,	N/A ,
4 hours	13.3,	19.2,	22.5,	27.3,	30.7,	33.3,	41.9,	51.9,	58.5,	67.9,	76.4,	82.9,	93.2,	101.2,	107.8,	N/A ,
6 hours	15.6,	22.4,	26.1,	31.7,	35.6,	38.6,	48.4,	59.7,	67.2,	77.8,	87.4,	94.8,	106.3,	115.3,	122.8,	N/A ,
9 hours	18.3,	26.2,	30.4,	36.9,	41.2,	44.6,	55.8,	68.7,	77.2,	89.2,	99.9,	108.3,	121.3,	131.4,	139.7,	N/A ,
12 hours	20.5,	29.2,	33.9,	41.0,	45.8,	49.5,	61.8,	75.8,	85.1,	98.2,	110.0,	119.1,	133.1,	144.1,	153.2,	N/A ,
18 hours	24.1,	34.1,	39.5,	47.6,	53.1,	57.3,	71.3,	87.2,	97.8,	112.6,	125.8,	136.1,	151.9,	164.2,	174.4,	N/A ,
24 hours	27.0,	38.0,	44.0,	52.9,	58.9,	63.6,	79.0,	96.3,	107.8,	124.0,	138.4,	149.6,	166.8,	180.2,	191.2,	230.2,
2 days	34.2,	46.7,	53.3,	63.1,	69.7,	74.7,	91.0,	109.1,	120.9,	137.4,	151.8,	163.0,	180.0,	193.1,	203.9,	241.5,
3 days	40.0,	53.8,	60.9,	71.4,	78.4,	83.7,	100.8,	119.7,	131.9,	148.8,	163.5,	174.8,	192.0,	205.2,	216.1,	253.4,
4 days	45.1,	59.9,	67.5,	78.7,	86.0,	91.6,	109.5,	129.0,	141.6,	158.9,	174.0,	185.4,	202.9,	216.2,	227.1,	264.6,
6 days	54.2,	70.7,	79.1,	91.3,	99.2,	105.3,	124.5,	145.2,	158.4,	176.5,	192.2,	204.1,	222.0,	235.6,	246.8,	284.8,
8 days	62.3,	80.3,	89.3,	102.4,	110.9,	117.3,	137.6,	159.3,	173.1,	191.9,	208.1,	220.4,	238.8,	252.7,	264.1,	302.8,
10 days	69.8,	89.0,	98.7,	112.5,	121.4,	128.2,	149.4,	172.1,	186.4,	205.8,	222.5,	235.1,	254.0,	268.2,	279.8,	319.1,
12 days	76.8,	97.2,	107.3,	121.9,	131.2,	138.3,	160.4,	183.9,	198.7,	218.7,	235.8,	248.7,	268.0,	282.5,	294.4,	334.3,
16 days	89.8,	112.3,	123.4,	139.1,	149.2,	156.9,	180.5,	205.5,	221.1,	242.1,	260.0,	273.4,	293.5,	308.6,	320.8,	361.8,
20 days	102.0,	126.3,	138.2,	155.0,	165.8,	173.9,	198.8,	225.0,	241.4,	263.3,	281.9,	295.8,	316.5,	332.1,	344.6,	386.7,
25 days	116.3,	142.6,	155.4,	173.5,	184.9,	193.5,	220.0,	247.6,	264.7,	287.6,	307.0,	321.5,	342.9,	359.0,	372.0,	415.2,

NOTES:
N/A Data not available
These values are derived from a Depth Duration Frequency (DDF) Model
For details refer to:
'Fitzgerald D. L. (2007), Estimates of Point Rainfall Frequencies, Technical Note No. 61, Met Eireann, Dublin',
Available for download at www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies_TN61.pdf

HR Wallingford
Working with water

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by: Alan Manthe

Site name: Millbrook

Site location: Saggart

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	53.27532° N
Longitude:	6.45072° W
Reference:	2010429172
Date:	Oct 28 2021 14:02

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 0.962

Methodology

Q_{BAR} estimation method: Calculate from SPR and SAAR

SPR estimation method: Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	5	5
HOST class:	N/A	N/A
SPR/SPRHOST:	0.53	0.53

Hydrological characteristics	Default	Edited
SAAR (mm):	1017	882
Hydrological region:	12	12
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.13	2.13
Growth curve factor 100 years:	2.61	2.61
Growth curve factor 200 years:	2.86	2.86

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	9.33	7.9
1 in 1 year (l/s):	7.93	6.71
1 in 30 years (l/s):	19.88	16.83
1 in 100 year (l/s):	24.36	20.62
1 in 200 years (l/s):	26.69	22.59

APPENDIX IV

PROPOSED SURFACE WATER SOAKAWAY CALCULATIONS

Soakaway Design DG365-2016

Storm Rainfalls for a range of storm durations

Storm Duration	M_{30}-D min
min	= R mm
10	19 30
15	22 70
30	28 80
60	36 40
120	46 20
240	58 50
360	67 20
720	85 10
1440	107 80
2880	120 90

Assumed values for a rectangular soakaway

length (L) =	**8.5** m
depth (D)=	**0.8** m
width (W) =	**W** m
Roof runoff coefficient =	**0.9**

Calculate the design width of the soakaway (W):

Accumulative impermeable area (A) = **300** m^2
Accumulative impermeable area (A) = **270** m^2

Inflow (I) = The inflow from the impermeable area drained to the soakaway
I = A x R ,where
A = Accumulative impermeable area
R = The total rainfall in a design storm for a specific duration

Outflow (O) = The outflow infiltrating into the soil during rainfall
$O = a_{s50} \times f \times d$,where
a_{s50} = The internal surface area of the Soakaway to 50% effective depth -this excludes the base
f = The soil infiltration rate determined in a trial pit
d = The storm duration

a_{s50} = 2 x (L + W) x (D /2)
= 6.8 + 0.8 W

f = **5.49E-06** m/s as determined on site

Assume Modular units with 95% free volume shall be used to construct the soakaway

Storage (S) = 95% of the effective volume of soakaway, and **0.95**

Storage (S) = The required storage in the soakaway
S = I - O

30 year storm

Duration minutes	Rainfall mm	Inflow m^3	Outflow m^3	Storage m^3	W m
10	19 30	5.211	0.02240 + 0.0026 W	6.46 W	0 8029
15	22 70	6.129	0 03360 + 0.0040 W	6.46 W	0 9430
30	28 80	7.776	0 06720 + 0.0079 W	6.46 W	1.1919
60	36 40	9.828	0.13440 + 0.0158 W	6.46 W	1.4969
120	46 20	12.474	0.26879 + 0.0316 W	6.46 W	1.8801
240	58 50	15.795	0.53758 + 0.0632 W	6.46 W	2.3389
360	67 20	18.144	0.80637 + 0.0949 W	6.46 W	2.6450
720	85 10	22 977	1 61274 0.1897 W	6.46 W	3.2128
1440	107 80	29.106	3 22548 + 0.3795 W	6.46 W	3.7840
2880	120 90	32.643	6.45097 + 0.7589 W	6.46 W	3.6282

Therefore construct a Soakaway:
8.5 m long x **0.8** m deep x **4.0** m wide

Prepared by: A. Manthe

Soakaway Design DG365-2016

Storm Rainfalls for a range of storm durations

Storm Duration	M_{30}-D min
min	= R mm
10	19.30
15	22.70
30	28.80
60	36.40
120	46.20
240	58.50
360	67.20
720	85.10
1440	107.80
2880	120.90

Assumed values for a rectangular soakaway
length (L) = **12** m
depth (D)= **0.8** m
width (W) = **W** m
Road runoff coefficient = **0.9**

Calculate the design width of the soakaway (W):

Accumulative impermeable area = **278** m^2
Effective impermeable area (A) = **250.2** m^2

Inflow (I) = The inflow from the impermeable area drained to the soakaway
I = A x R ,where
A = Effective impermeable area
R = The total rainfall in a design storm for a specific duration

Outflow (O) = The outflow infiltrating into the soil during rainfall
$O = a_{s50} \times f \times d$,where
a_{s50} = The internal surface area of the Soakaway to 50% effective depth :this excludes the base
f = The soil infiltration rate determined in a trial pit
d = The storm duration

a_{s50} = 2 x (L + W) x (D /2)
= 9.6 + 0.8 W

f = **5.49E-06** m/s as determined on site

Assume Modular units with 95% free volume shall be used to construct the soakaway

Storage (S) = 95% of the effective volume of soakaway, and **0.95**

Storage (S) = The required storage in the soakaway
S = I - O

30 year storm

Duration	Rainfall	Inflow	Outflow		Storage	W
minutes	mm	m^3	m^3		m^3	m
10	19.30	4.82886	0.03162 +	0.0026 W	9.12 W	0.5259
15	22.70	5.67954	0.04743 +	0.0040 W	9.12 W	0.6173
30	28.80	7.20576	0.09487 +	0.0079 W	9.12 W	0.7790
60	36.40	9.10728	0.18973 +	0.0158 W	9.12 W	0.9761
120	46.20	11.55924	0.37947 +	0.0316 W	9.12 W	**1.2216**
240	58.50	14.6367	0.75894 +	0.0632 W	9.12 W	1.5112
360	67.20	16.81344	1.13841 +	0.0949 W	9.12 W	1.7011
720	85.10	21.29202	2.27681	0.1897 W	9.12 W	2.0425
1440	107.80	26.97156	4.55363 +	0.3795 W	9.12 W	2.3599
2880	120.90	30.24918	9.10725 +	0.7589 W	9.12 W	2.1401

Therefore construct a Soakaway:
12 m long x **0.8** m deep x **2.5** m wide

Prepared by: A. Manthe

Overview
AquaCell Systems

AquaCell units are a fully tried and tested modular technique for managing excessive rainfall. Units are assembled to create an underground structure as either a temporary storage tank or soakaway.

Continuing urban development, a changing climate and the consequences of intensified rainfall: all are increasingly prominent issues on the political and environmental agenda.

In combination, they represent a complex need for the most intelligent, effective Stormwater Management solutions possible.

There are 4 types of unit:

AquaCell Eco

AquaCell Eco is manufactured from specially reformulated, recycled material and has been designed for shallow, non-trafficked, landscaped applications (see page 6).

AquaCell Prime

AquaCell Prime is manufactured from specially reformulated, recycled material. It is ideal for use in both shallow and deep applications, subject to either regular traffic loading – such as car parks (for vehicles up to 12 tonnes) – or for landscaped areas (see page 7).

AquaCell Core

AquaCell Core has been designed for use in deep applications, subject to both regular and heavy traffic loadings, such as cars and HGV's (for vehicles up to 44 tonnes) – (see page 8).

AquaCell Plus

AquaCell Plus has been designed primarily for use in applications where inspectability is required, and is suitable for use in all applications from landscaped areas to heavily trafficked areas (for vehicles up to 44 tonnes) (see page 9).

For quick, versatile assembly

The lightweight polypropylene, high void units are securely linked together using special clips and shear connectors.

They can be assembled quickly on site into whatever configuration suits each specific location.

AquaCell geocellular systems also allow 'brick-bonding', which can give extra stability, without the need for additional connector pieces. See Installation Guidance page 12.

Wrapped for infiltration or storage

The complete assembly is wrapped in either geotextile sheet or a geomembrane:

For **pervious** soils, the geotextile option allows infiltration of stormwater into the surrounding ground.

For **impervious** ground (e.g. clay) or where infiltration is not desirable, the geomembrane holds stormwater in temporary storage until local drainage flows can accept it for normal disposal.

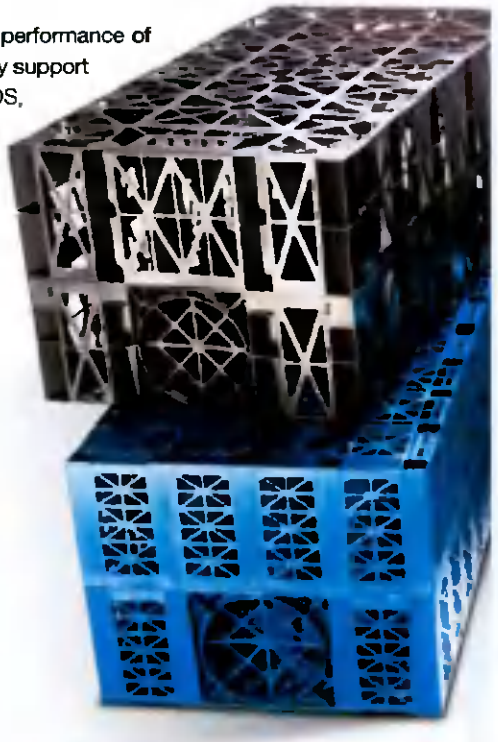
Benefiting community and environment

AquaCell units contribute the following benefits:

- Significantly reduced flooding risk
- Controlled, reduced-volume release of stormwater into existing sewer systems or watercourses
- Recharging of local groundwater (if infiltration/soakaway application)
- Aerobic purification to improve water run-off quality
- Sustainable, cost effective management of the water environment

Helping SUDS and planning approval

The proven qualities and performance of AquaCell systems not only support the achievement of SUDS, they can also help reinforce and enhance planning applications, and enable development to proceed.



CONNECT TO BETTER

Types of connections

There are a number of ways to provide a controlled feed into the AquaCell units to suit the required flow capacity.

These being:

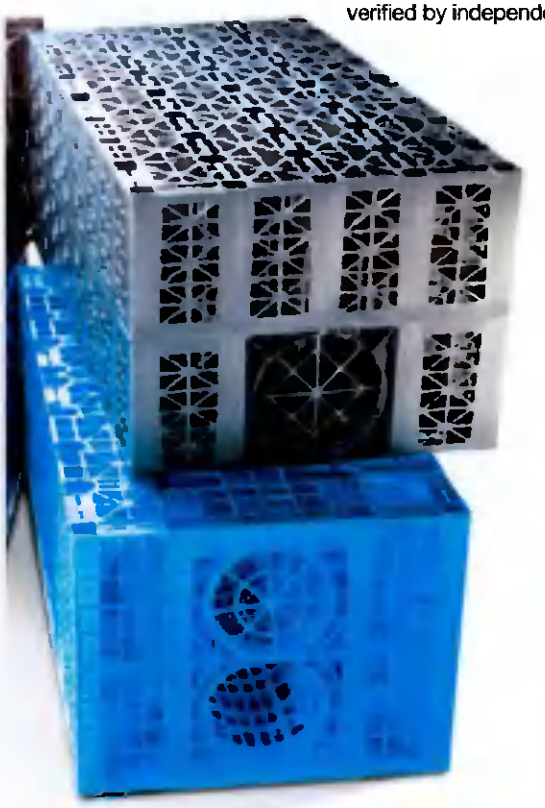
1. Manifold Configuration – this configuration utilizes standard pipe and fittings (see page 20)
2. Box Configuration – this configuration utilizes the AquaCell units (see page 20)
3. Central Pipe Configuration – this configuration utilizes standard perforated TwinWall pipe and fittings (see page 20)

Box systems – select with care

Rising rainfall levels, and increased focus on SUDS compliance, have led to a sharp increase in the use of modular units to create underground structures for infiltration or, temporary storage of stormwater.

However, not all currently available systems have the proven performance characteristics necessary for the wide range of complex underground geocellular applications.

The Wavin range of AquaCell units however provide peace of mind since, all strength and hydraulic capabilities have been verified by independent testing.



Acceptance – British Board of Agrément

The AquaCell Infiltration and Attenuation units; Eco, Prime, Core and Plus have all been awarded British Board of Agrément approval under Certificate No. 03/4018.

The certificate covers the design data, technical specification, installation and maintenance aspects for each unit as follows:

AquaCell Eco

- Approved under BBA Agrément Certificate No. 03/4018, Product Sheet 4

AquaCell Prime

- Approved under BBA Agrément Certificate No. 03/4018, Product Sheet 5

AquaCell Core

- Approved under BBA Agrément Certificate No. 03/4018, Product Sheet 1

AquaCell Plus

- Approved under BBA Agrément Certificate No. 03/4018, Product Sheet 3

AquaCell features

The following AquaCell features are applicable to all units:

- Suitable for use when constructing either a soakaway or storage tank
- Modular, lightweight and versatile
- 95% void: holds 190 litres of water per unit
- Safer option than open or above ground storage structures
- Easy to handle and install
- Proven clip and peg system to secure units
- Allows "brickbonding" assembly for extra stability
- Full range of ancillaries including, silt traps and adaptors
- AquaCell units can be "mixed and matched" together (see pages 11-14 for details)

CONNECT TO BETTER

Design Guidance
AquaCell Units

Hydraulic and structural design

All AquaCell units have identical dimensions: 1m x 0.4m x 0.5m, with a nominal void ratio of 95%. Hydraulic calculations are accordingly the same for AquaCell Eco, Prime, Core and Plus.

Structural design however, requires careful consideration of loading factors specific to each location – see CIRIA C680.

Location type	Minimum cover depth			
	AquaCell Eco	AquaCell Prime	AquaCell Core	AquaCell Plus
Landscaped/non-trafficked areas	0.3m[b]	0.3m[b]	0.3m[b]	0.3m[b]
Car parks, vehicle up to 12000 kg[a] gross mass	n/a	0.71m	0.75m	0.75m
HA/HGV loading [a]	n/a	n/a	1.2m	1.1m
Maximum depth to base of unit (Landscaped)	1.5m	3.7m	4.25m[c]	5.08m
Maximum depth to base of unit (Trafficked)	n/a	3.45m	4.1m	4.78m

(a) For specific advice on cover depths for heavier loadings/HGV applications, contact Wavin Technical Design on 0844 856 5161.

(b) 0.3 is minimum depth for AquaCell Eco, although 0.5m cover is recommended to prevent accidental damage. If construction plant is to be used on site, extra protection may be needed.

(c) Allowable maximum depth to base of bottom layer of units is dependent on soil type, angle of shearing resistance, loadings, and groundwater level. The above depths are based on 38° angle of shearing resistance and no groundwater.

Installation and cover depths

After deciding which AquaCell unit is correct for the project location (using the System Selector on page 5), see Table for the recommended maximum installation depths and minimum cover depths.

The diagram also shows the depth parameters for each unit, and so gives guidance on combining two or more of the AquaCell units.

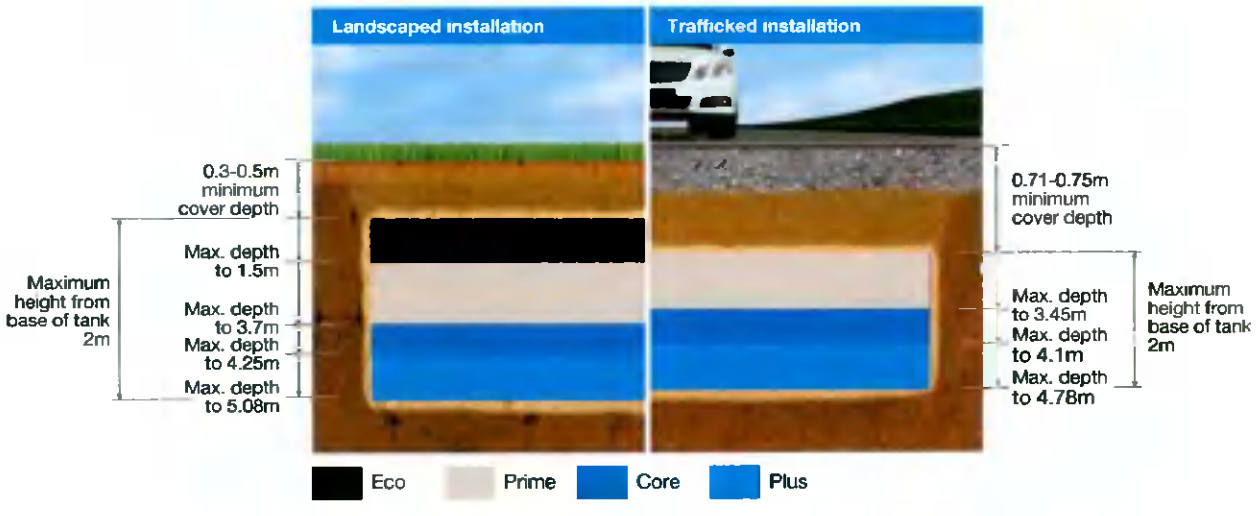
AquaCell systems: Installation depths

Each AquaCell unit has been designed to have specific loading capacities (see pages 6-10) that define the maximum depth parameters for which they are suitable.

Minimum depth of cover varies according to whether or not the installation will be subject to trafficking by cars/HGVs. In each case, the cover depths shown in the diagram include both absolute minimum and recommended minimum cover depths.

However, in some situations, installations may have to be located with greater cover depths. Reasons may include:

- Deep-running drainage network
- Other buried services running above tank location
- Installation into banked/ sloping ground
- Upper layer of clay preventing infiltration



Mixing AquaCell units together

Bypass NSB RANGE

APPLICATION

Bypass separators are used when it is considered an acceptable risk not to provide full treatment, for very high flows, and are used, for example, where the risk of a large spillage and heavy rainfall occurring at the same time is small, e.g.

- Surface car parks.
- Roadways.
- Lightly contaminated commercial areas.

PERFORMANCE

Klargester were one of the first UK manufacturers to have separators tested to EN 858-1. Klargester have now added the NSB bypass range to their portfolio of certified and tested models. The NSB number denotes the maximum flow at which the separator treats liquids. The British Standards Institute (BSI) tested the required range of Kingspan Klargester Bypass separators and certified their performance in relation to their flow and process performance assessing the effluent qualities to the requirements of EN 858-1. Klargester bypass separator designs follow the parameters determined during the testing of the required range of bypass separators.

Each bypass separator design includes the necessary volume requirements for:

- Oil separation capacity.
- Oil storage volume.
- Silt storage capacity.
- Coalescer.

The unit is designed to treat 10% of peak flow. The calculated drainage areas served by each separator are indicated according to the formula given by PPG3 NSB = 0.0018A(m2). Flows generated by higher rainfall rates will pass through part of the separator and bypass the main separation chamber.

Class I separators are designed to achieve a concentration of 5mg/litre of oil under standard test conditions.

FEATURES

- Light and easy to install.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.
- Vent points within necks.
- Oil alarm system available (required by EN 858-1 and PPG3).
- Extension access shafts for deep inverts.
- Maintenance from ground level.
- GRP or rotomoulded construction (subject to model).

To specify a nominal size bypass separator, the following information is needed:-

- The calculated flow rate for the drainage area served. Our designs are based on the assumption that any interconnecting pipework fitted elsewhere on site does not impede flow into or out of the separator and that the flow is not pumped.
- The drain invert inlet depth.
- Pipework type, size and orientation.

SIZES AND SPECIFICATIONS

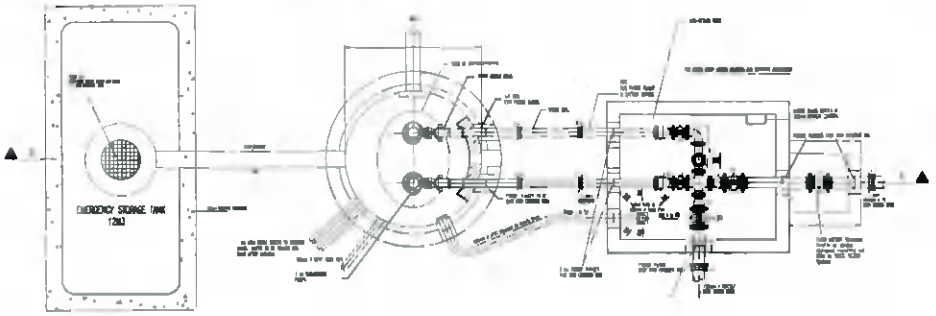
UNIT NOMINAL SIZE	FLOW (l/s)	PEAK FLOW RATE (l/s)	DRAINAGE AREA (m²)	STORAGE CAPACITY (litres) SILT	STORAGE CAPACITY (litres) OIL	UNIT LENGTH (mm)	UNIT DIA. (mm)	ACCESS SHAFT DIA. (mm)	BASE TO INLET INVERT (mm)	BASE TO OUTLET INVERT	STANDARD FALL ACROSS (mm)	MIN. INLET INVERT (mm)	STANDARD PIPEWORK DIA.
NSBP003	3	30	1670	300	45	1700	1350	600	1420	1320	100	500	160
NSBP004	4.5	45	2500	450	60	1700	1350	600	1420	1320	100	500	160
NSBP006	6	60	3335	600	90	1700	1350	600	1420	1320	100	500	160
NSBE010	10	100	5560	1000	150	2069	1220	750	1450	1350	100	700	315
NSBE015	15	150	8335	1500	225	2947	1220	750	1450	1350	100	700	315
NSBE020	20	200	11111	2000	300	3893	1220	750	1450	1350	100	700	375
NSBE025	25	250	13890	2500	375	3575	1420	750	1680	1580	100	700	375
NSBE030	30	300	16670	3000	450	4265	1420	750	1680	1580	100	700	450
NSBE040	40	400	22222	4000	600	3230	1920	600	2185	2035	150	1000	500
NSBE050	50	500	27778	5000	750	3960	1920	600	2185	2035	150	1000	600
NSBE075	75	750	41667	7500	1125	5841	1920	600	2235	2035	200	950	675
NSBE100	100	1000	55556	10000	1500	7661	1920	600	2235	2035	200	950	750
NSBE125	125	1250	69444	12500	1875	9548	1920	600	2235	2035	200	950	750

☐ Rotomoulded chamber construction GRP chamber construction * Some units have more than one access shaft – diameter of largest shown.

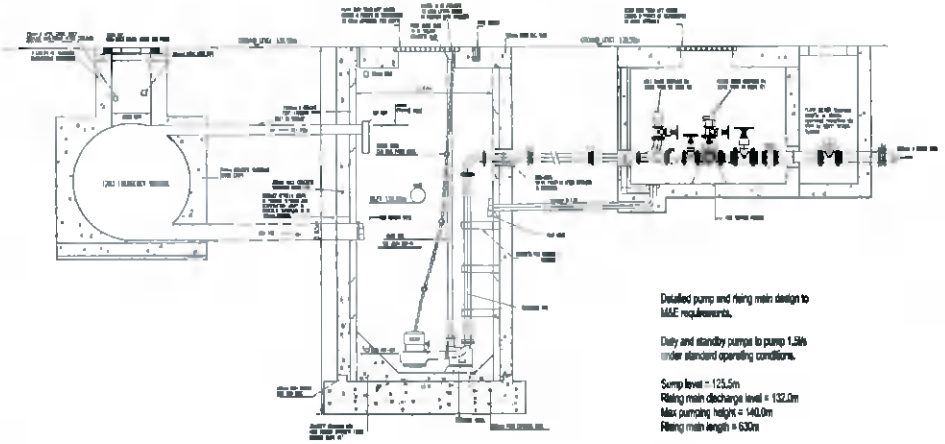
APPENDIX V

EXISTING FOUL PUMP RELATED DRAWINGS & PUMP RELATED EVALUATION CALCULATIONS

PUMP STATION DETAILS



PLAN



Detailed pump and rising main design to MAE requirements.

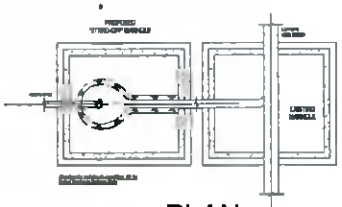
Duty and standby pumps to pump 1.5l/s under standard operating conditions.

Sump level = 125.5m
Rising main discharge level = 132.0m
Max pumping height = 140.0m
Rising main length = 630m

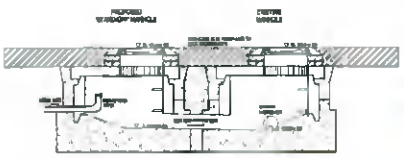
Audible and Visible Alarm for high level, pump failure etc. with GSM dial out to maintenance company and / or building caretaker

SECTION

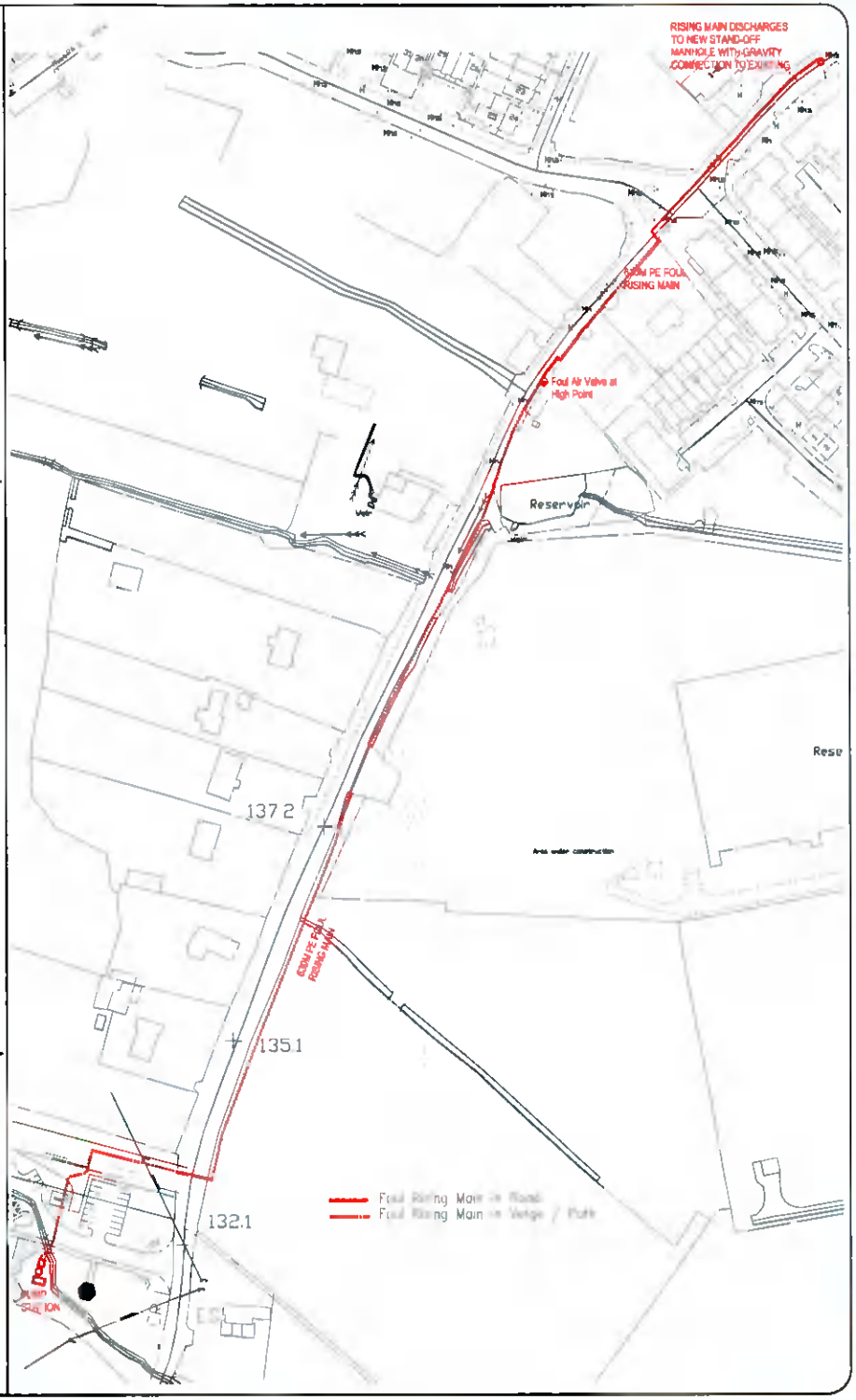
STAND-OFF MANHOLE DETAILS



PLAN



SECTION A-A



NOTES A1

Figured Dimensions Only to be Taken from this Drawing. All Dimensions to be Checked on Site.

This drawing to be read in Conjunction with all other Architectural & Engineering drawings & all other relevant drawings & Specification

A	13/11/14	GTB	Layout Updated Approved detail of Stand-off manhole added
Issue	Date	By	Revision

FOR CONSTRUCTION

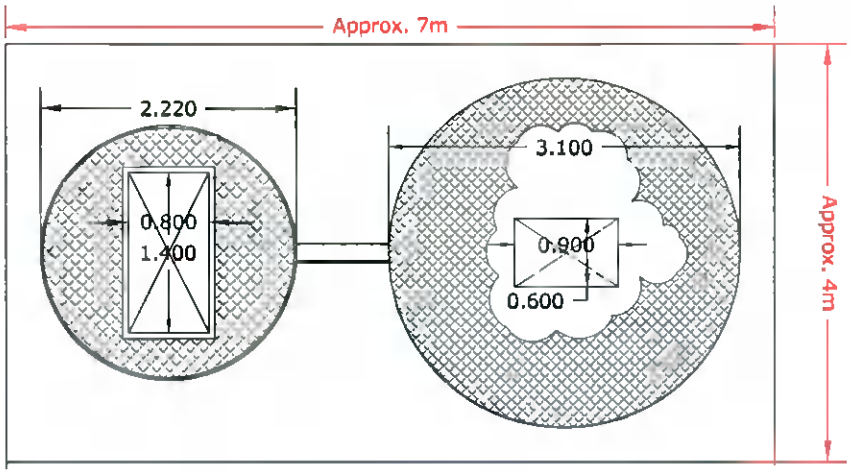
Client
Ess Construction Ltd

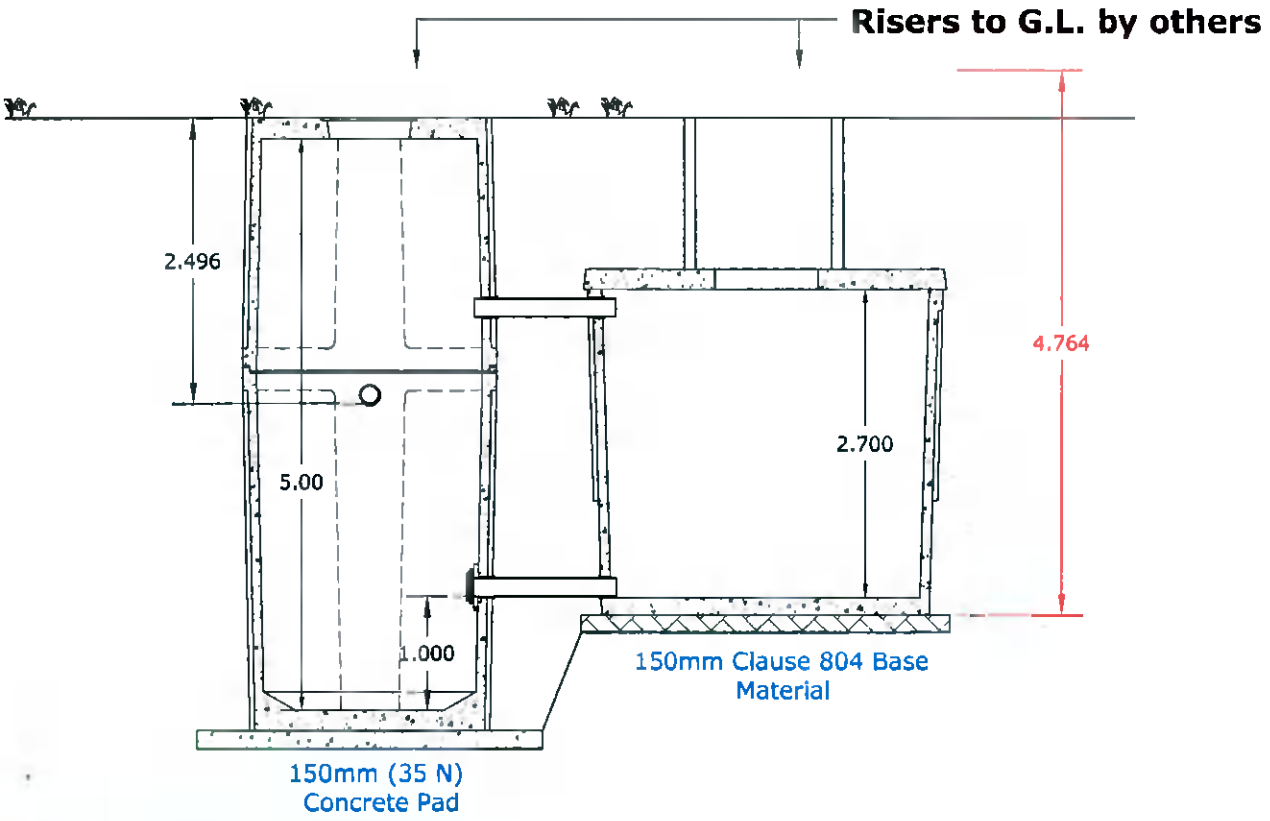
Project
NURSING HOME AT COOLMINE, SAGGART, COUNTY DUBLIN

Drawing Title
PUMP STATION DETAILS & RISING MAIN OUTFALL

Fahy Fitzpatrick
2017 CASTLE DRIVE, CITYWEST CAMPUS, NAAS ROAD, DUBLIN 24

Drawn By	LP	Scale	1:40/1:1000
Checked By	-	Date	20/11/2014
Dwg No	2589-706		A





NOTES

+Overflow opening 600mmx 900mm

+Opening on pump chamber 1400mm x 800mm

+Other sizes and configurations of opening on request.

+Heavy or medium-duty access covers available on request

+All Pipework shown to be 6" class C Watermain fitted with Flap-valve, flex-seal couplings & elastomeric wall-seals.

+Please Verify the suitability of the orientation of this tank prior to ordering

+Minimum base preparation 100mm cl804 / crushed stone well compacted & level

+Please ensure adequate anti trench collapse measures are in place prior to installation.

+Please advise CPT Ltd if a high water table is present.

+Individual tank dimensions available on request

Capacity below invert:

Overflow tank: 14.78m3

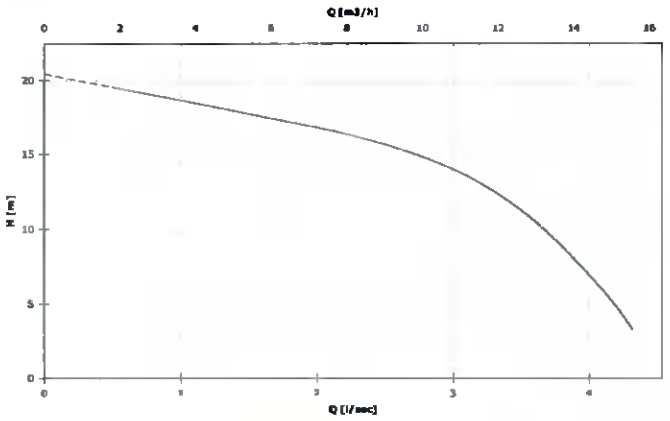
P.O. #:	
Sts:	Standard Dwg.
Drn:	J.Whelan
Ckd:	M.J.L.
Date:	2 May 2006

_____ Ltd.
1.9 x 5m pump chamber, &
3,500 gal overflow (25m3)
2m Invert

Revisions	
1	A
2	
3	

CARLOW CONCRETE TANKS

GRS 100/2/G40H A0CT/50



Impeller with grinder system

Rated power output (P2)	0.9 kW
Free passage	0 mm

Technical data	
Number of poles	2
Rated power output (P2)	0.9 kW
Input power (P1)	1.3 kW
Nominal absorbed current (In)	2.3 A
rated power factor (cos phi)	0.80
Nominal power frequency (f)	50 Hz
Rated nominal voltage(Vn)	400 V
N° phases	3
IPMotor	68
ATEX thermal class	not applicable
insulation class	F

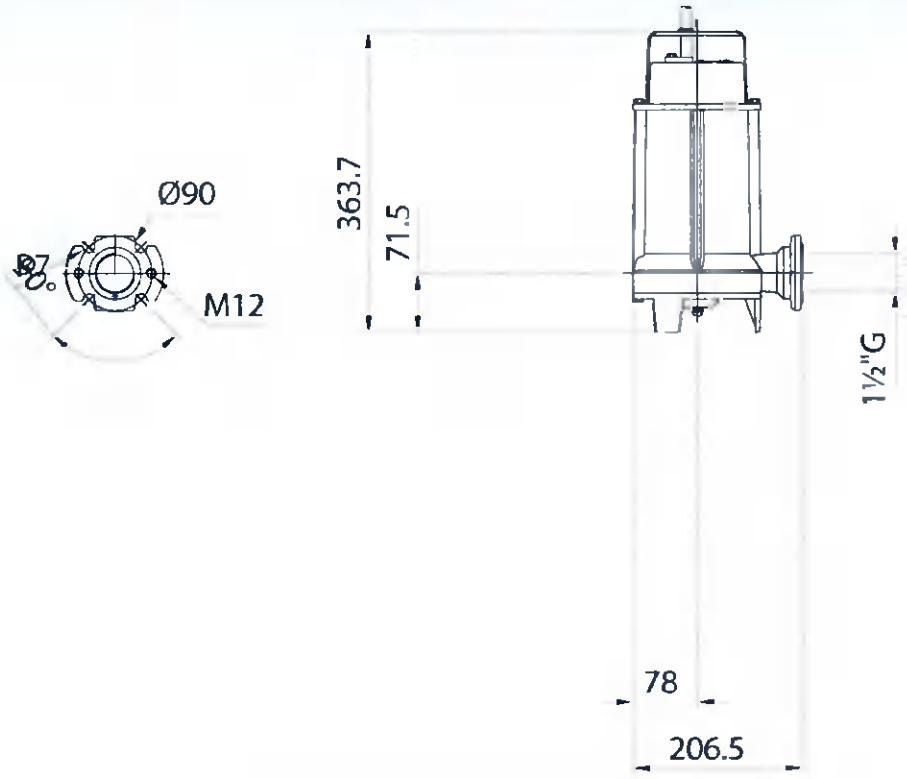
Constructive characteristics	
Outlet	G1"½ DN32 PN6
Outlet orientation	H (horizontal)
Type of starting	D
Weight	21 kg
Standard cable type	H07RN-F 4G1
EX cable type	N.A.
Standard paint type	Bicomponent epoxy paint
Maximum acoustic pressure	70 dB
Set of standard mechanical seals	One Silicon carbide mechanical seal (SiC)
Probe for water presence	

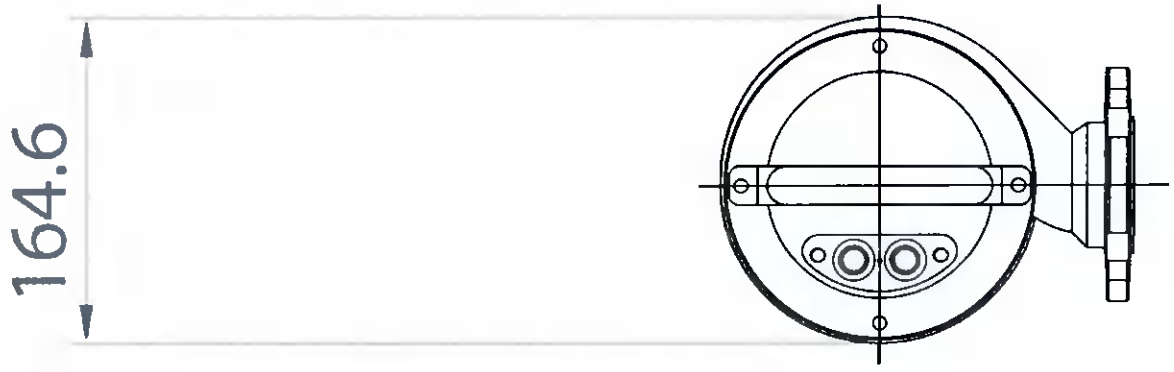
Use limits	
Maximum operating temperature	40 °C
Maximum immersion depth	20 m
PH of treated fluid	6 to 14 pH
max starts per hour	30

Test limits	
Density of treated fluid	1 Kg/dm³
Viscosity of treated fluid	1 mm²/s

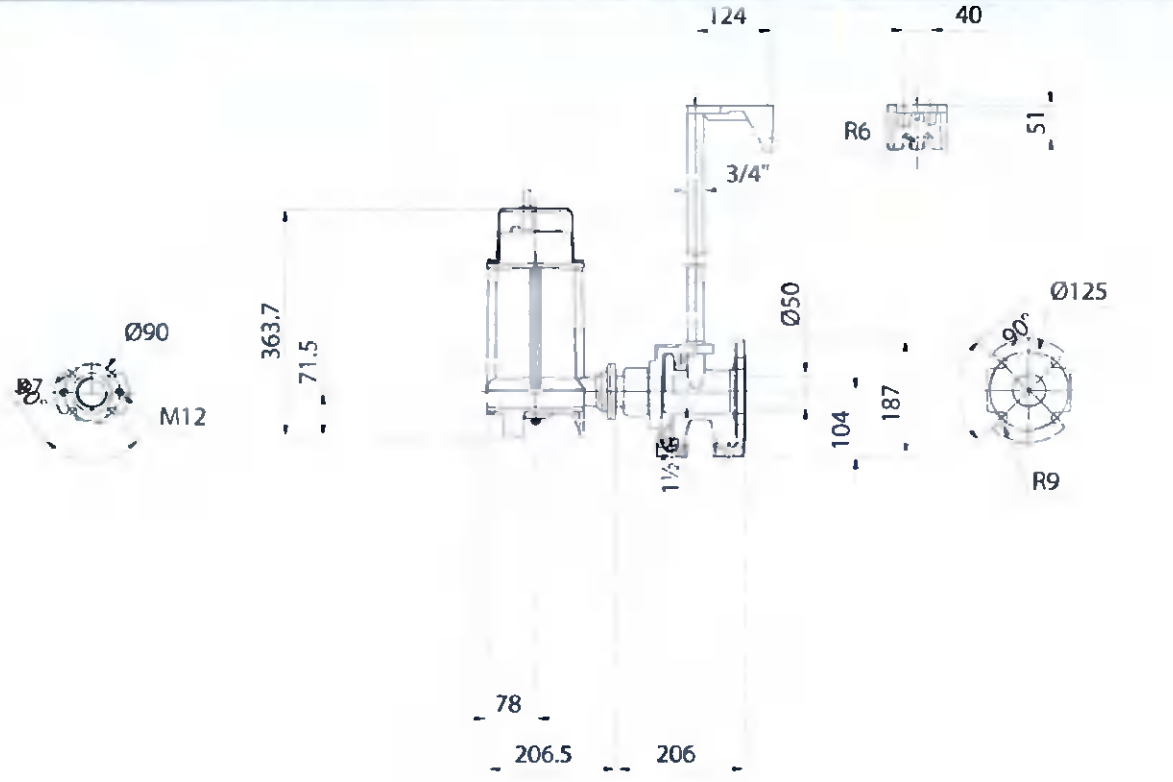
Materials	
Case	Grey Cast Iron - EN-GJL 250 (02)
Shaft	Stainless Steel - AISI 420 (23)
Cooling jacket	Not applicable (00)
Standard gasket	Rubber - NBR (77)
EX gasket	Not applicable (00)
Nuts and bolts	Stainless Steel - Class A2-70 (42)
Hydraulic	Grey Cast Iron - EN-GJL 250 (02)
Impeller	Grey Cast Iron - EN-GJL 250 (02)
Cutting disk	Tool Stainless Steel - X102 CrMo17 KU (16)
Cutter	Tool Stainless Steel - X102 CrMo17 KU (16)
Grid	Not applicable (00)

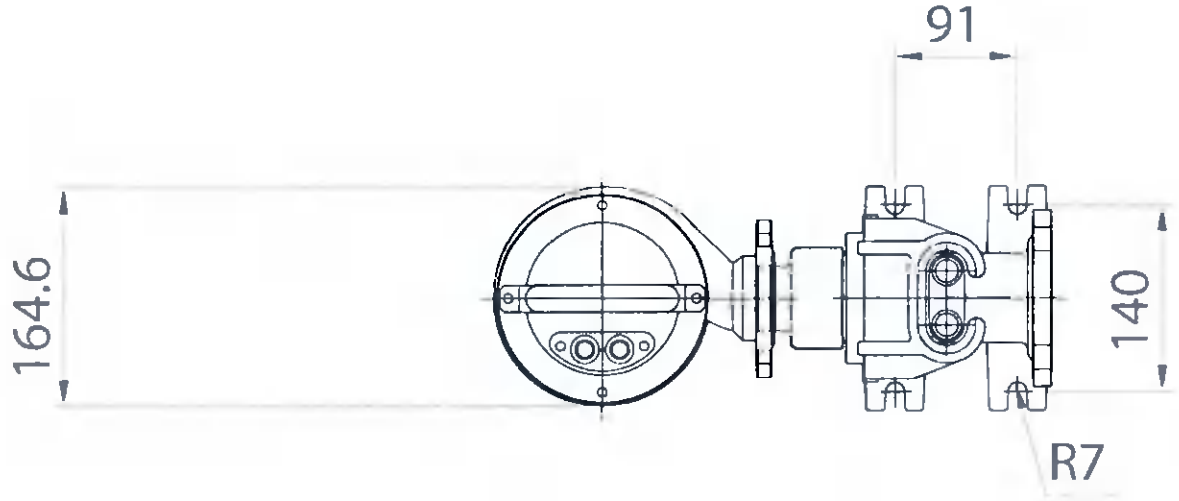
Pump

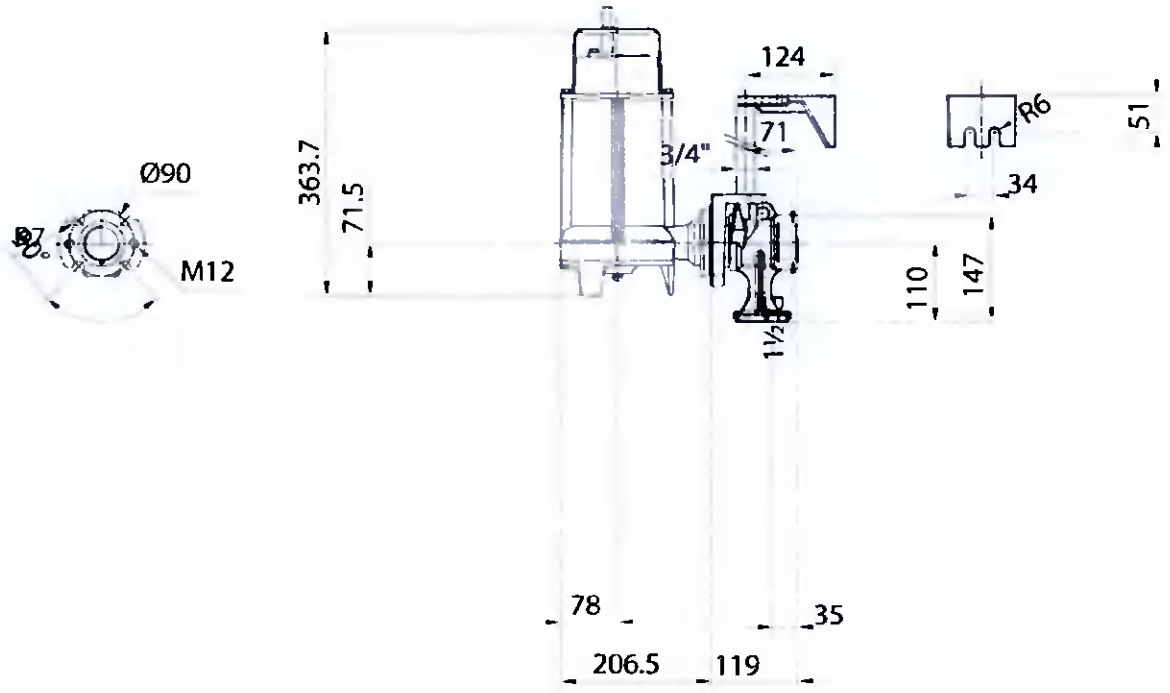


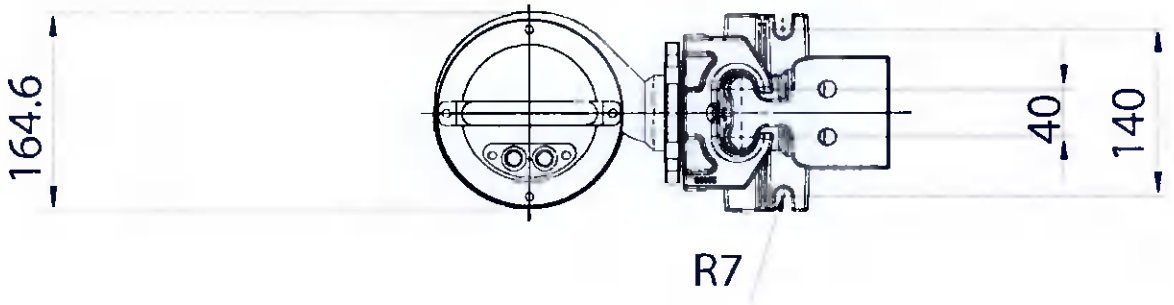


Bottom coupling devices with horizontal outlet

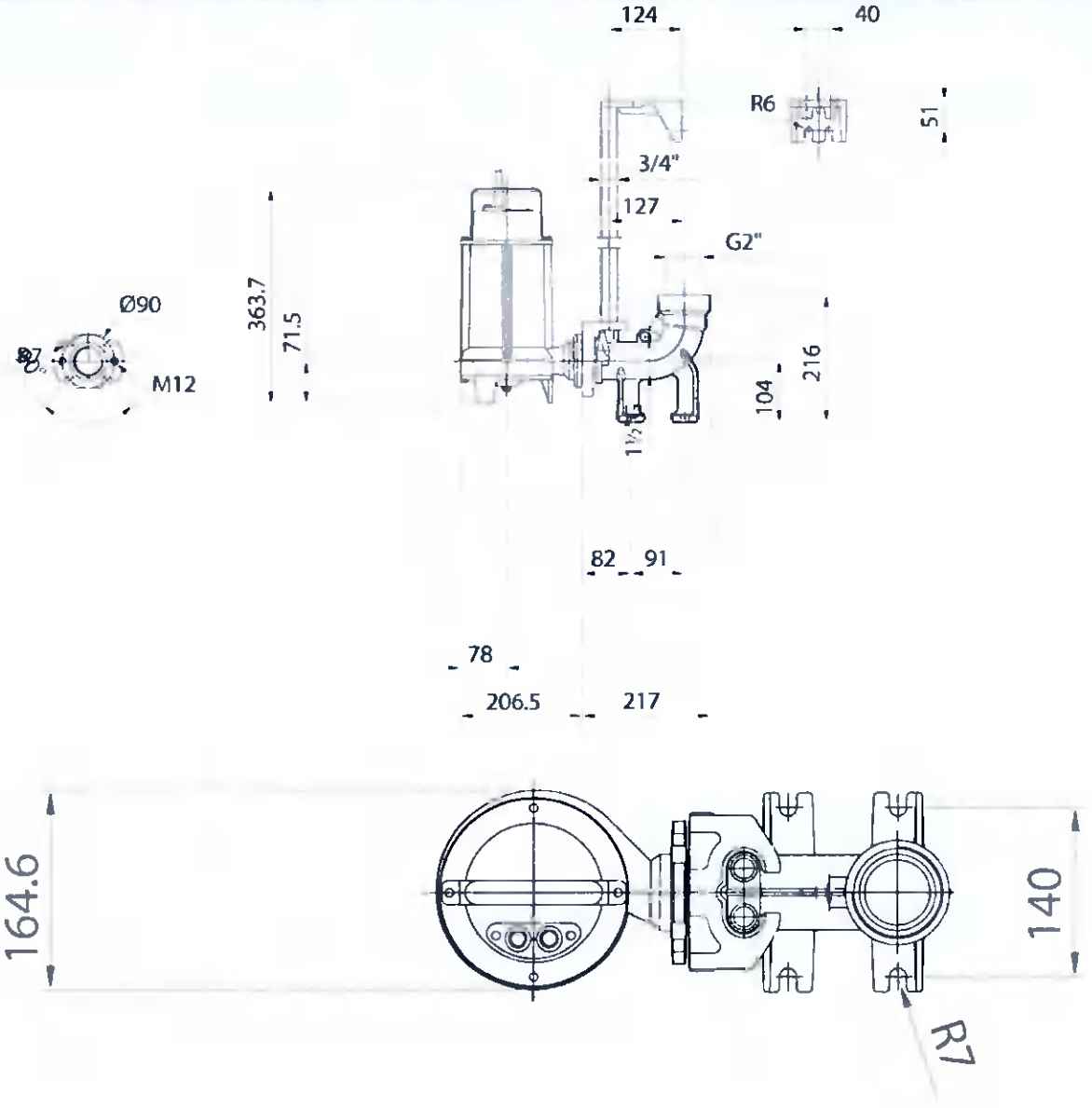


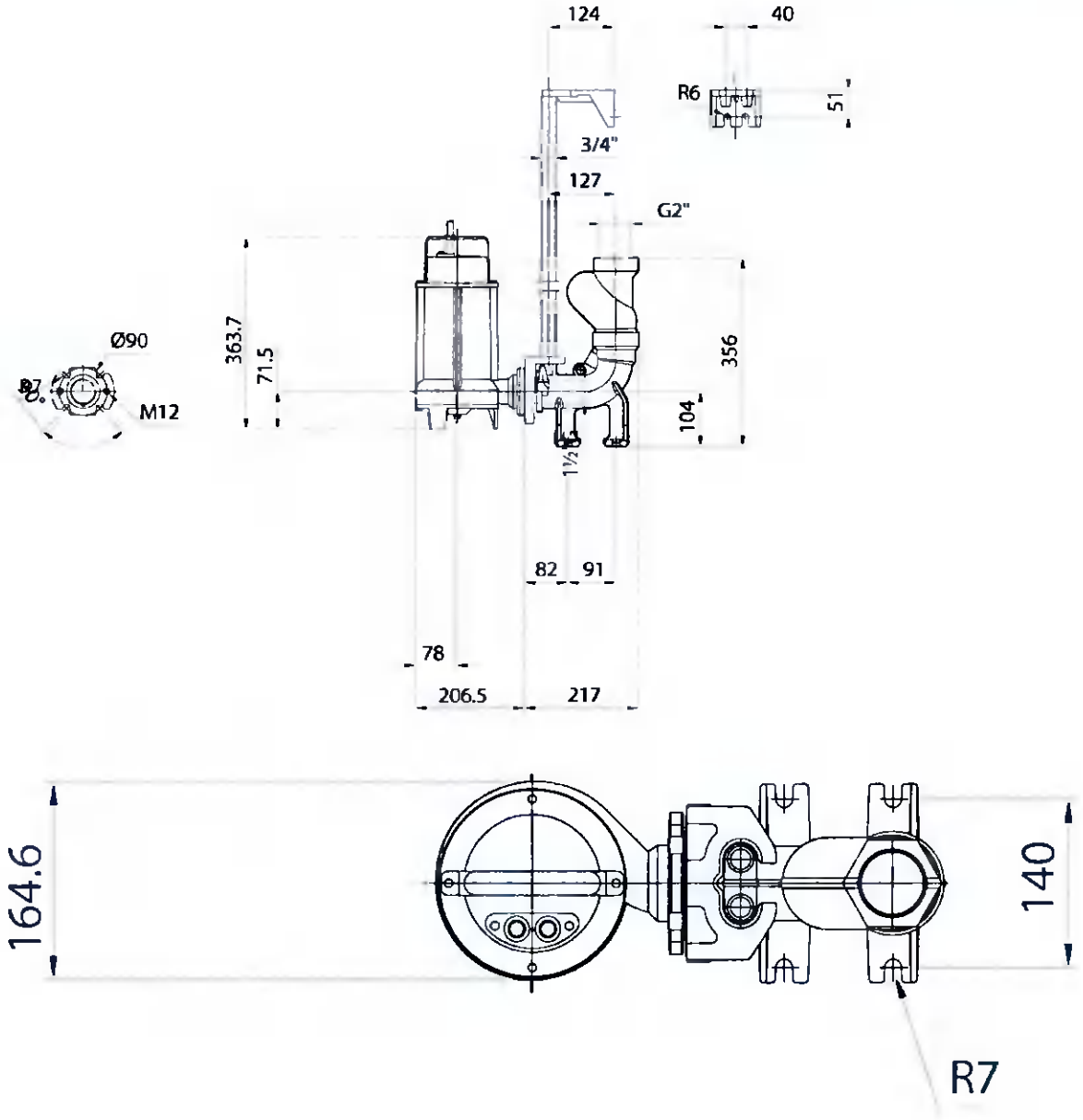


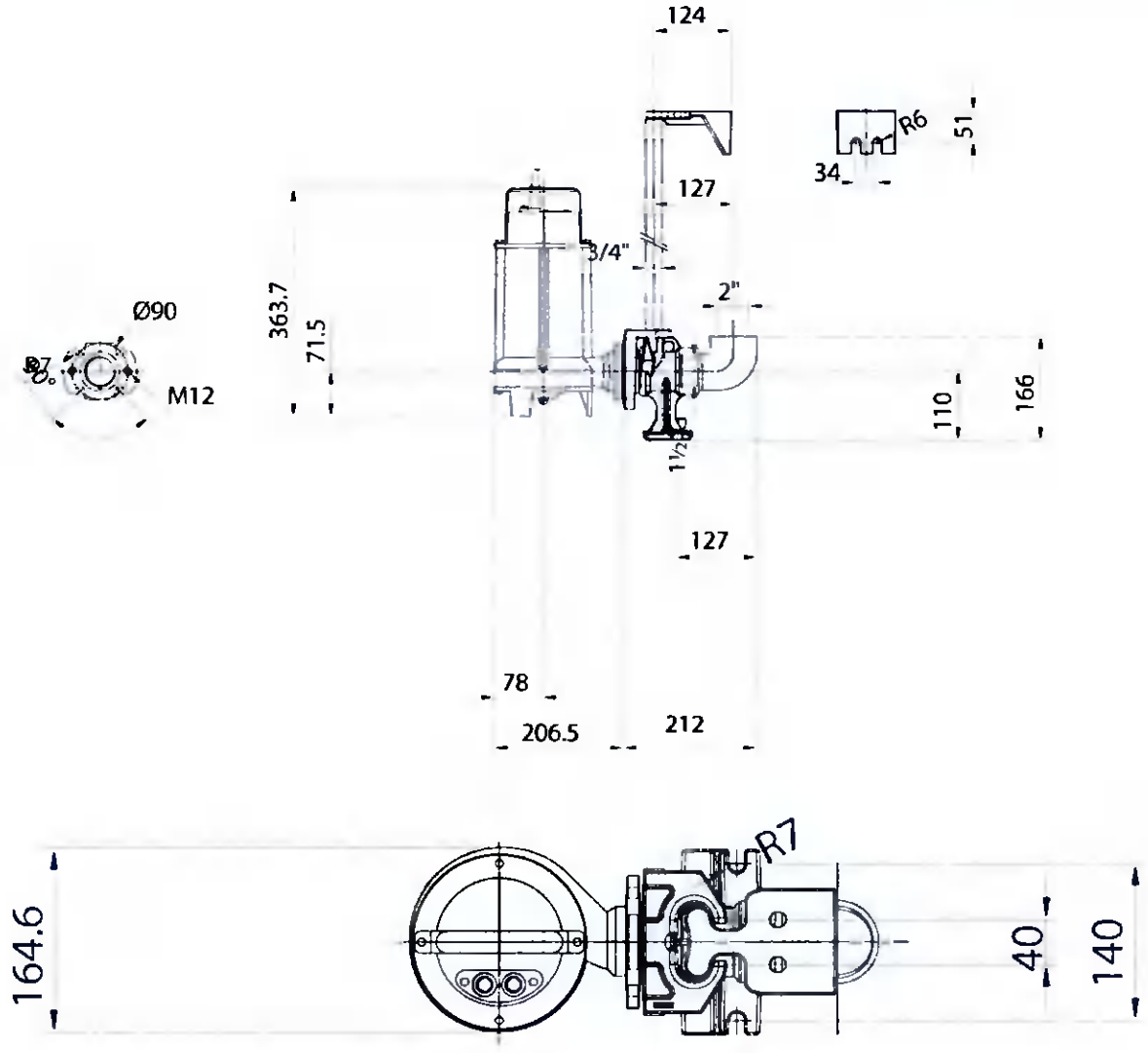


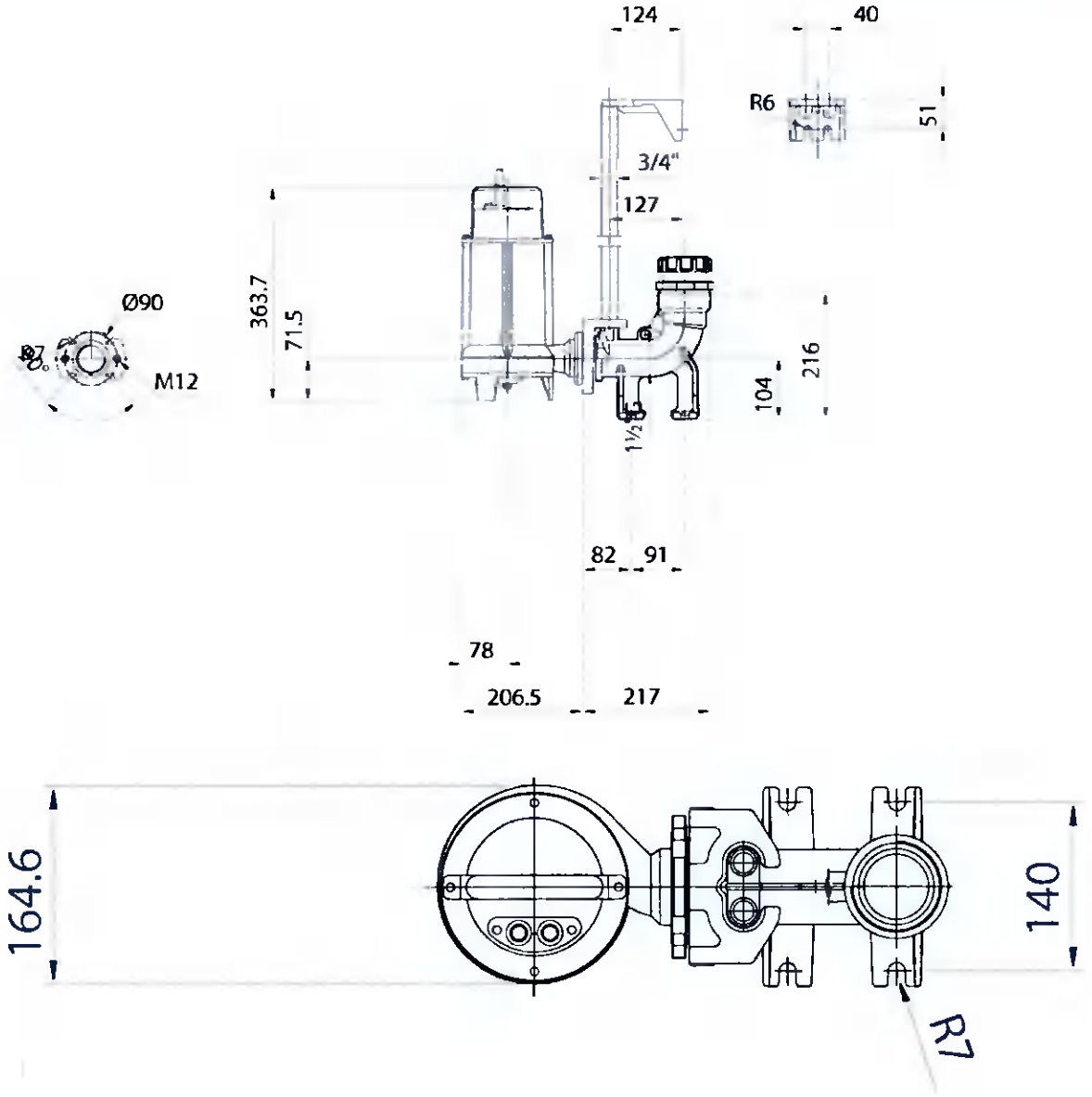


Bottom coupling devices with vertical outlet









OBA		Project No.		Sheet No.	Rev.
		38-89		1 of 4	0
Project: Millbrook Manor Nursing Home, Saggart					
		By	**Date**	**Rev**	**Ckd.**
Element: Foul Pumping Station and Rising Main Sizing		AM	8/11/2020	0	COB

Design Flows

Foul Flows

No. of Nursing Home Residents	83	
Flow (Wastwater Code of Practice, Appendix C, Wastewater Flow Rates for Design, Irish Water)	350	l/person/day
No. of Nursing Home day staff (full time)	30	
Flow (Wastwater Code of Practice, Appendix C, Wastewater Flow Rates for Design, Irish Water)	90	l/person/day
Average daily flow (DWF)	31,750	l/day

TOTAL FLOWS

TOTAL ESTIMATED FLOW	31,750	l/day
Increase by 10% additional contingency	34,925	l/day
Average flow (DWF)	**0.4**	**l/s**
Peak flow (6DWF)	**2.4**	**l/s**

OBA		Project No.		Sheet No.	Rev.
		38-89		2 of 4	0
Project: Millbrook Manor Nursing Home, Saggart					
		By	Date	Rev	Ckd.
Element: Foul Pumping Station and Rising Main Sizing		AM	8/11/2020	0	COB

Sizing the Wet Well

Design Information:

Average flow (dwf)	0.4	l/s
Peak flow (6dwf)	2.4	l/s

Choose fixed speed pump:

Choose a Pump Rate	5	l/s	0.300	m^3/min
to ensure V>0.75m/s			18	m^3/hr

Size Wet Well:

Note: fixed speed pumps

T = V/q + V/(Q-q) max for q=0.5Q mins between starts
or V=0.9*Q/S where Q is in l/s and S=starts/hr

Q = Pumping Rate	5.00	l/s	0.3	m^3/m
q = flow in (max)	2.43	l/s	0.14552	m^3/m
q = flow in (avg)	0.40	l/s	0.02425	m^3/m

Provide sump with PS:

Let Depth =	0.60	(depth between cut-in and cut-out)
Diameter =	1.90	

Therefore, Pumped Volume = 6.8 m^3

No of Starts:

Actual time , T, between starts at peak times (6DWF)	91	min
No.of Pump Starts/ hour at peak times =	1	starts/hr
Actual time , T, between starts at average flows (DWF)	305	min
No.of Pump Starts/ hour during average day =	0.2	starts/hr
Average no. of starts per day =	5	starts/day

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Initial Sizing of Rising Main:

Formula: $Q = vA$ $\quad A = \frac{3.14d^2}{4}$

Flow in rising main, Q =	0.005	m^3/sec	(Pumping rate)
v =	0.75	m/s	(Required self cleansing velocity)
Therefore, diameter, d =	92	mm	(Guide)

Calculating Velocity and Headloss in rising main:

PARAMETER	UNIT	DATA	NOTES	
Flow	m^3/s	0.005	18	m^3/h
Pipe Diameter	m	0.09	**90mm ID**	
Fluid Kinematic Viscosity	kg/m s	0.00000114		
Fluid Density	kg/m^3	1000		
Pipe Roughness	m	0.00003		
Pipe Length	m	650		

CALCULATED RESULTS

PARAMETER	UNIT	CALC. RESULT		
Velocity	m/s	0.786	**OK**	(>.75m/s)
Velocity Head	m	0.031	$v^2/2g$	
Reynolds Number		62049	Re = velocity*dia/kinematic viscosity	
Friction Factor		0.0212	Equation	
Headloss	m	4.823	Equation	

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Design Information:

Enter Approx. Low Water Cut-In Level 125.50 **mAOD** aprx

Enter Approx. Height to which liquid being pumped 127.97 **mAOD** aprx

Formula:

Power (W) = Q*p*g*Ht/n

Total Head = Static Lift + Dynamic Head

Static Lift = Difference in height between Low W.L. in sump and level to which liquid being pumped

Dynamic Head = headloss due to friction in pipe

Q = Flow	(m^3/s)	Q =	0.005	
p = Density (kg/m^3)		p =	1000	
g = Acceleration due to Gravity (m/s^2)		g =	9.81	
Hs = Static Head (see above)		Hs =	2.5	
Hd = Dynamic Head (m)		Hd =	4.8	
Hp = Intake, Pump and Manifold Losses		Hp =	1.00	(guide only)
Ht = Total Manometric Head (m)		Ht =	8.29	
n = Pump Efficiency		n =	0.35	(guide only)

1162 W

Therefore, Pump Power Required = 1 kW (APPROX)

INITIAL GUIDE ONLY - PLEASE REFER TO M&E SPECIFICATION

Include for emergency storage:

Average Flow into PS per day= 35 m^3/day

Min. of 24 hr storage provided = 35 m^3 as per Building Regs