Report Title	# Detailed Drainage Report
Property Address	Partfield Park Drigg Holmrook Whitehaven
Client	Mr & Mrs Usher
Our Reference	24-429r001C
Date	October 2024
Prepared by	Josh Gemmell BEng Hons
Checked by	Colin Aimers BEng Hons CEng MICE CEnv Director colin.aimers@kingmoorconsulting.co.uk

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CONTENTS

INTRODUCTION

The purpose of this report is to provide technical design for the drainage at the proposed development of holiday lodges at Partfield Park, Drigg, Holmrook, Whitehaven, thereafter known as the site. This follows the detailed site review by Kingmoor Consulting Ltd.

Research has been undertaken on the site and observations made regarding the existing site and the drainage servicing the site.

Calculations associated with the drainage have been performed by software packages from a recognised resource. Where appropriate copies of calculations are provided in the Appendices of this report.

PROPOSED DEVELOPMENT

It is proposed to develop 8 no. leisure lodges and 8 no. touring pitches to facilitate campervans for short term occupation at the site, in addition to a shop/office and toilet/shower block. New drainage shall be installed to service the development alongside the replacement of existing drainage presently servicing the wider site.

This site has obtained planning permission under consent ref 4/21/2411 by Cumberland Council.

THE SITE

EXISTING DRAINAGE

The existing site drainage has been investigated where it is possible and we have identified the key surface and foul drainage serving the site.

All Surface water currently goes to ground, a ditch is present on the eastern edge of the site, before draining to the south via a culvert under the adjacent B5344. A field drain from the adjacent field to the north also flows into the eastern boundary but is currently blocked and requires work done to repair the pipework underground.

An existing pond that is built in the neighbouring garden has an overflow pipe installed which also flows into this ditch. It appears this overflow pipe is rarely in use as the pond water level is a distance below the inlet of the overflow pipe.

There is a band of wet ground stretching across an area of the site, however, surface water appears to drain sufficiently elsewhere on the site, and does not appear to flood the site.

There is no existing foul drainage serving the site.

GEOLOGY

SUPERFICIAL DEPOSITS

The published superficial geology by The British Geological Survey shows the site is overlain by Diamicton Till present comprising Clays and Silts.

SOLID GEOLOGY

The solid geology as published by the British Geological Survey shows the site to be underlain with sandstones.

Copies of all BGS information are appended to this report.

DRAINAGE STRATEGY

FOUL DRAINAGE

It is proposed that the proposed development shall be serviced by a suitably sized foul storage tank. [Cess Pit]. This will be placed to service the whole site with one large tank. It will provide storage for all of the proposed lodges and the toilet/shower block.

The tank shall meet the requirements of BS 6297:2007+A1:2008, which provides guidance and recommendations for the design and installation of cesspools and drainage fields for wastewater treatment. In addition, a Elsan tank shall be provided for the discharge of chemical toilet waste on site. No waste will be treated on site, it will be removed by routine monitoring.

SURFACE WATER DRAINAGE

It is proposed to discharge the surface water from the development to a new attenuation pond located at the south of the site. The proposed french drain crossing the site shall discharge into the existing ditch.

This follows the Hierarchy of Drainage, as stated in the National Planning Practice Guidance, the aim should be to discharge surface water run-off as high up the drainage hierarchy, as reasonably practicable:

- Into the ground (infiltration) - ***Available***
- To a surface water body - ***Available***
- To a surface water sewer, highway drain, or another drainage system - ***Not available***
- To a combined sewer - ***Not available***

DETAILED DESIGN

FOUL DRAINAGE

For the purposes of capacity, the following loads shall be adopted for foul drainage.

Property	Nature of Property	Equivalent Population [People]
Proposed		
Lodges 1-8	Residential	24
Toilet/Shower Block	Communal	20
	TOTAL	**48**

To allow us to calculate the required size of the foul storage tank, we have based this on the requirements stated in British Water document Loads and Flows 4, with the tank size being calculated based on the site's requirements.

The following assumptions have been made :

- 8 Serviced Lodges - 120L per person, per day
  Type 1 - 2 bedrooms (4 population equivalent)
  Type 2 - 1 bedroom (2 population equivalent)

- 8 Non-Serviced Pitches
  2 Berth - 2 population equivalent
  4 Berth - 4 population equivalent
  - 20 litres per person (Toilets), load - 2 flushes per person
  - 40 litres per person (Shower), load - 1 per person, per day

Below is a summary table from the calculations of the foul storage tank which will indicate how these values/sizes have been calculated.

LOAD	POPULATION (person)	TOTAL/ per day [Litres]	TOTAL/ per month [35% occupancy]	TOTALS [Litres]
120L per person	16 pop (TYPE 1) 8 pop (TYPE 2)	1920L 960L TOTAL - 2880L	2880L @ 10.5 days = 30240L per month	30240L
20L per person (Toilets), load - 2 flushes per person, per day. 40L per person (Shower), load - 1 per person, per day.	2 Berth - 12 people	720L	720L @ 10.5 days = 7560L per month	37800L
-	4 Berth - 8 people	480L	480L @ 10.5 days = 5040L per month	**42840L**

The proposed cesspool tank will be manufactured by SPEL. It is proposed to use a tank which will be sized at 55,000L capacity. This shall also contain a high level alarm to trigger at 80% capacity.

SURFACE WATER DRAINAGE

Principally the surface water drainage shall be calculated on the impermeable areas of the development, and shall discharge to the proposed attenuation pond on the site. Access roads, paths etc to be constructed on the site shall percolate naturally to the ground.

It is proposed that the new surface water system shall be installed to drain the impermeable surface areas and the new shop/office block. This is proposed to drain into a new attenuation pond located at the southern side of the site. This will provide adequate storage capacity and allow water to discharge at the permissible rate of flow (QBar) with the installation of a hydrobrake.

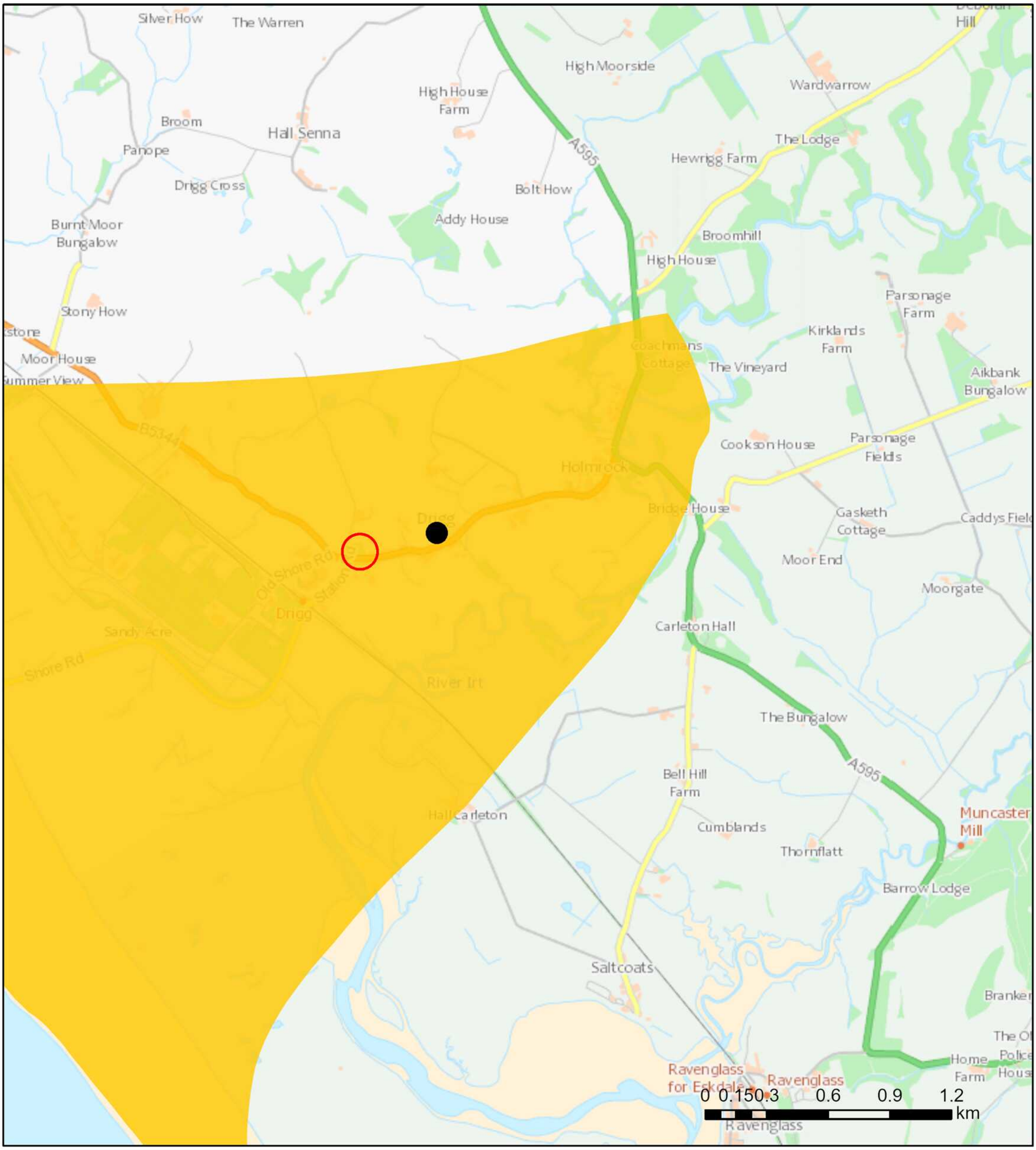
All roof area surface water from the lodges is proposed to drain to ground.

A new french drain system is proposed to be installed across the length of the site to deal with the current wet ground, it is proposed that this will discharge into the existing ditch. This will allow the removal of water from the waterlogged area.

APPENDICES

APPENDIX A - BGS GEOLOGICAL RECORDS

Solid Geology



GeoIndex Onshore Data Sources: NERC, Natural England, English Heritage and Ordnance Survey

Map Key

Bedrock geology 1:50,000 scale

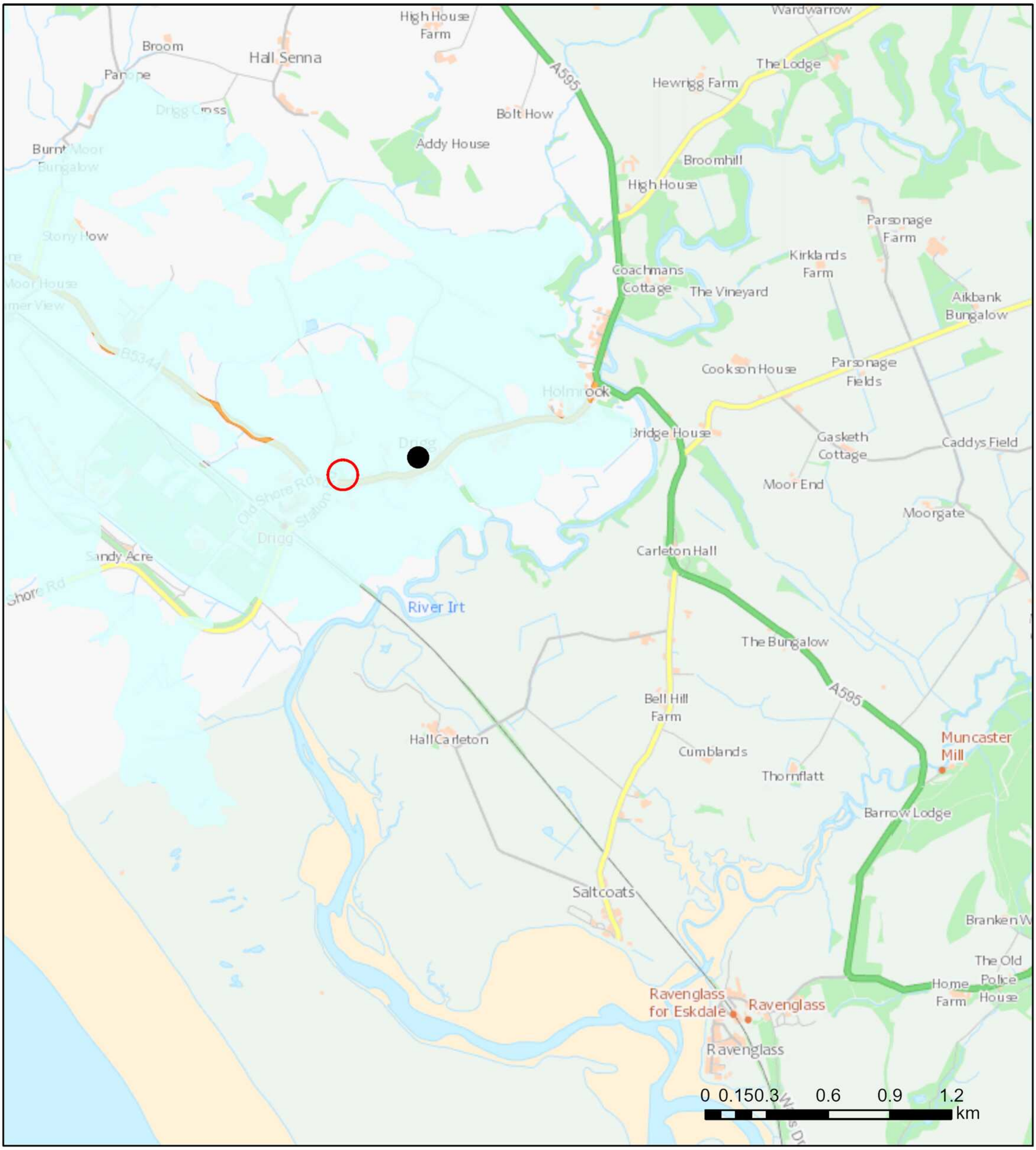
- WILMSLOW SANDSTONE FORMATION - SANDSTONE
- ESKDALE INTRUSIONS - GRANITE
- BIRKER FELL ANDESITE FORMATION - BASALTIC-ANDESITE
- BIRKER FELL ANDESITE FORMATION - ANDESITE
- BIRKER FELL ANDESITE FORMATION - LAVA, ANDESITIC
- DEVOKE WATER TUFF MEMBER - PYROCLASTIC-ROCK, BASALTIC
- SKIDDAW GROUP - MUDSTONE
- SKIDDAW GROUP - SILTSTONE AND SANDSTONE
- ST BEES SANDSTONE MEMBER - SANDSTONE
- FLEMING HALL TUFF FORMATION - TUFF, ANDESITIC
- SELLAFIELD MEMBER - SANDSTONE
- ESKDALE INTRUSIONS - MICROGRANITE
- BIRKER FELL ANDESITE FORMATION - VOLCANICLASTIC-SANDSTONE

Selection Results

Bedrock geology 1:50,000 scale

Description	Details
SELLAFIELD MEMBER - SANDSTONE	More Information

Superficial Deposits



GeoIndex Onshore Data Sources: NERC, Natural England, English Heritage and Ordnance Survey

Map Key

Superficial deposits 1:50,000 scale

- GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL
- GLACIOFLUVIAL ICE CONTACT DEPOSITS, DEVENSIAN - SAND, GRAVEL AND BOULDERS
- GLACIOFLUVIAL DELTAIC (AND/OR SUBAQUEOUS FAN) DEPOSITS - SAND
- TILL, DEVENSIAN - DIAMICTON
- GLACIOLACUSTRINE DEPOSITS, DEVENSIAN - CLAY AND SILT
- TALUS - ROCK FRAGMENTS, ANGULAR, UNDIFFERENTIATED SOURCE ROCK
- ALLUVIUM - CLAY, SILT, SAND AND GRAVEL
- TIDAL RIVER OR CREEK DEPOSITS - CLAY, SILT AND SAND
- RAISED MARINE DEPOSITS - CLAY AND SAND
- BLOWN SAND - SAND
- RAISED MARINE DEPOSITS - SAND, GRAVEL AND BOULDERS
- HEAD - CLAY, SILT, SAND AND GRAVEL
- RIVER TERRACE DEPOSITS (UNDIFFERENTIATED) - SAND AND GRAVEL
- RIVER TERRACE DEPOSITS (UNDIFFERENTIATED) - GRAVEL, SAND AND SILT
- ALLUVIAL FAN DEPOSITS - GRAVEL
- ALLUVIAL FAN DEPOSITS - SAND AND GRAVEL
- LACUSTRINE DEPOSITS - CLAY AND SILT
- MARINE BEACH DEPOSITS - SAND AND GRAVEL
- TIDAL FLAT DEPOSITS - CLAY AND SILT
- PEAT - PEAT

Selection Results

Superficial deposits 1:50,000 scale

Description	Details
TILL, DEVENSIAN - DIAMICTON	More Information

APPENDIX B - CESSPOOL INFORMATION

SPEL Tankstor®

Below Ground Tanks

Overview

SPEL Tankstor® tanks are manufactured for many applications and in a wide range of specifications to handle such substances as water, sewage, farm effluent, petroleum products and chemicals.

Our modern plant, equipment and quality assurance procedures ensure market-leading quality.

Being manufactured in glass reinforced plastics, SPEL tanks are lightweight, easy to handle and install. They are not susceptible to rust, exhibit excellent corrosion resistant properties and have a life expectancy in excess of 50 years.

Product Range

H Series | Horizontal Tanks

200 Series
(1.2m inside diameter):
1,000 – 10,000L capacity

300 Series
(1.8m inside diameter):
4,000 – 40,000L capacity

400 Series
(2.6m inside diameter):
13,650 – 100,000L capacity

500 Series
(3.5m inside diameter):
60,000 – 200,000L capacity

600 Series
(4.0m inside diameter):
100,000 – 300,000L capacity

V Series | Vertical Tanks

200 Series
(1.2m inside diameter):
1,700 - 5,000L capacity

300 Series
(1.8m inside diameter):
5,000 – 15000L capacity

400 Series
(2.6m inside diameter):
10,000 – 36,500L capacity

500 Series
(3.5m inside diameter):
50,400 – 90,100L capacity

600 Series
(4m inside diameter):
65,668 – 115,930L capacity

Applications

Stormwater attenuation

Fire fighting sprinkler reservoirs

Potable water storage

Septic/settlement tanks

Cesspools

Silage effluent holding tanks

SPEL RainSave rainwater reservoirs

Accidental spillage containment

Transformer oil dump tanks

Packaged pumping chambers

Chemical spill tanks

Shell Design

Designed with reference to BS EN 13121. All tank shells carry the SPEL 25 Year Warranty and life expectancy in excess of 50 years.

Shell Specifications

Different tank shell specifications are available dependent upon tank invert levels, ground conditions and ground water levels.

Inlet/Outlet Connections

Pipe connections available to accommodate most standard sizes.

Horizontal Tank Dimensions

Tank capacity litres	200 Series 1.2m inside diameter length mm	300 Series 1.8m inside diameter length mm	400 Series 2.6m inside diameter length mm	500 Series 3.5m inside diameter length mm	600 Series 4.0m inside diameter length mm
1,000	**1,160**				
2,000	**2,040**				
3,000	**2,930**				
4,000	**3,810**	**1,950**			
5,000	**4,700**				
6,000	**5,578**	**2,755**			
7,000	**6,470**				
7,300		**3,200**			
8,000	**7,346**	**3,535**			
9,000	**8,236**				
9,270		**4,015**			
10,000	**9,120**	**4,285**			
12,000	**10,888**	**5,070**			
13,650	**12,347**	**5,755**			
16,000		**6,700**			
17,000		**7,060**			
18,200		**7,615**	**4,000**		
20,000		**8,255**	**4,400**		
25,000		**10,215**	**5,250**		
27,300			**5,700**		
30,000		**12,175**	**6,170**		
35,000		**14,155**			
36,400			**7,400**		
40,000		**16,120**			
40,600			**8,200**		
45,000				**5,390**	
45,500			**9,050**		
50,000			**9,950**		
60,000			**11,830**	**6,960**	
70,000			**13,710**	**8,520**	
75,000			**14,700**	**9,040**	
80,000			**15,600**	**10,040**	
90,000					
90,400			**17,560**		
100,000				**11,140**	**8,710**
120,000					**10,310**
125,000				**13,840**	
140,000					**11,891**
150,000				**16,340**	**12,690**
160,000				**17,540**	**13,485**
170,000					**14,320**
175,000				**18,940**	
180,000				**19,440**	**15,079**
190,000					**15,871**
200,000				**21,540**	**16,635**
220,000					**18,259**
240,000					**19,899**
250,000					**20,651**
260,000					**21,450**
270,000					**22,250**
280,000					**23,020**
290,000					**23,850**
300,000					**24,650**

Note: Intermediate sizes are available.

Below Ground Vertical Tank Dimensions

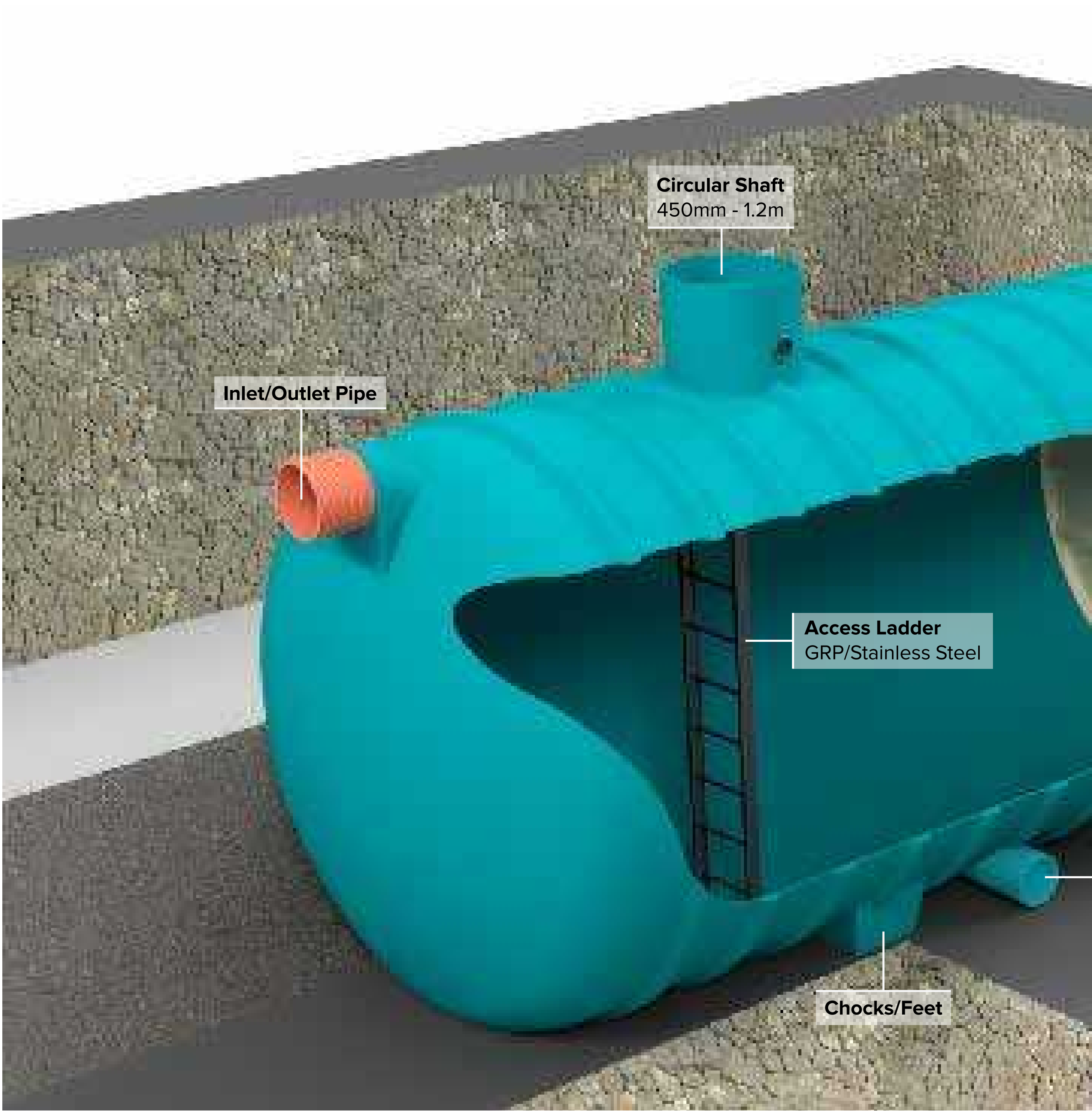
o/a Depth mm	200 Series 1.2m inside diameter Tank Capacity L	300 Series 1.8m inside diameter Tank Capacity L	400 Series 2.6m inside diameter Tank Capacity L	500 Series 3.5m inside diameter Tank Capacity L	600 Series 4.0m inside diameter Tank Capacity L
	VT200	VT300	VT400	VT500	VT600
2,000	**2,100**				
2,500	**2,600**	**5,500**			
3,000	**3,200**	**6,700**	**11,400**		
3,500	**3,800**	**8,000**	**14,000**	**23,200**	
4,000	**4,300**	**9,300**	**16,700**	**28,000**	**36,000**
4,500	**4,900**	**10,500**	**19,300**	**32,800**	**42,200**
5,000	**5,500**	**11,800**	**22,000**	**37,600**	**48,500**
5,500	**6,000**	**13,100**	**24,600**	**42,400**	**54,800**
6,000	**6,600**	**14,400**	**27,300**	**47,200**	**61,100**
6,500	**7,200**	**15,600**	**29,900**	**52,100**	**67,400**
7,000	**7,700**	**16,900**	**32,600**	**56,900**	**73,700**
7,500	**8,300**	**18,200**	**35,200**	**61,700**	**79,900**
8,000	**8,800**	**19,500**	**37,900**	**66,500**	**86,200**

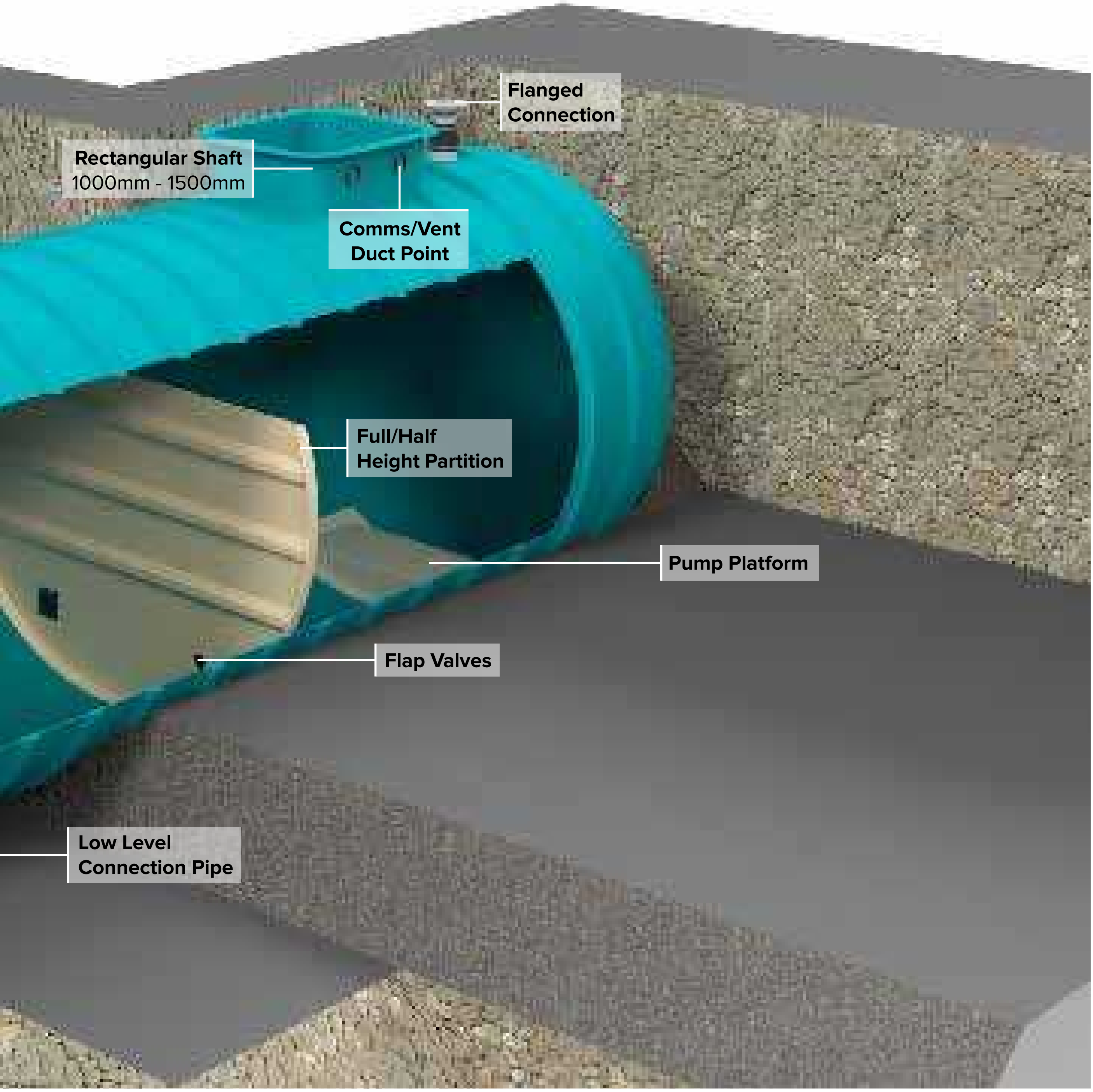
Note: Intermediate sizes are available.

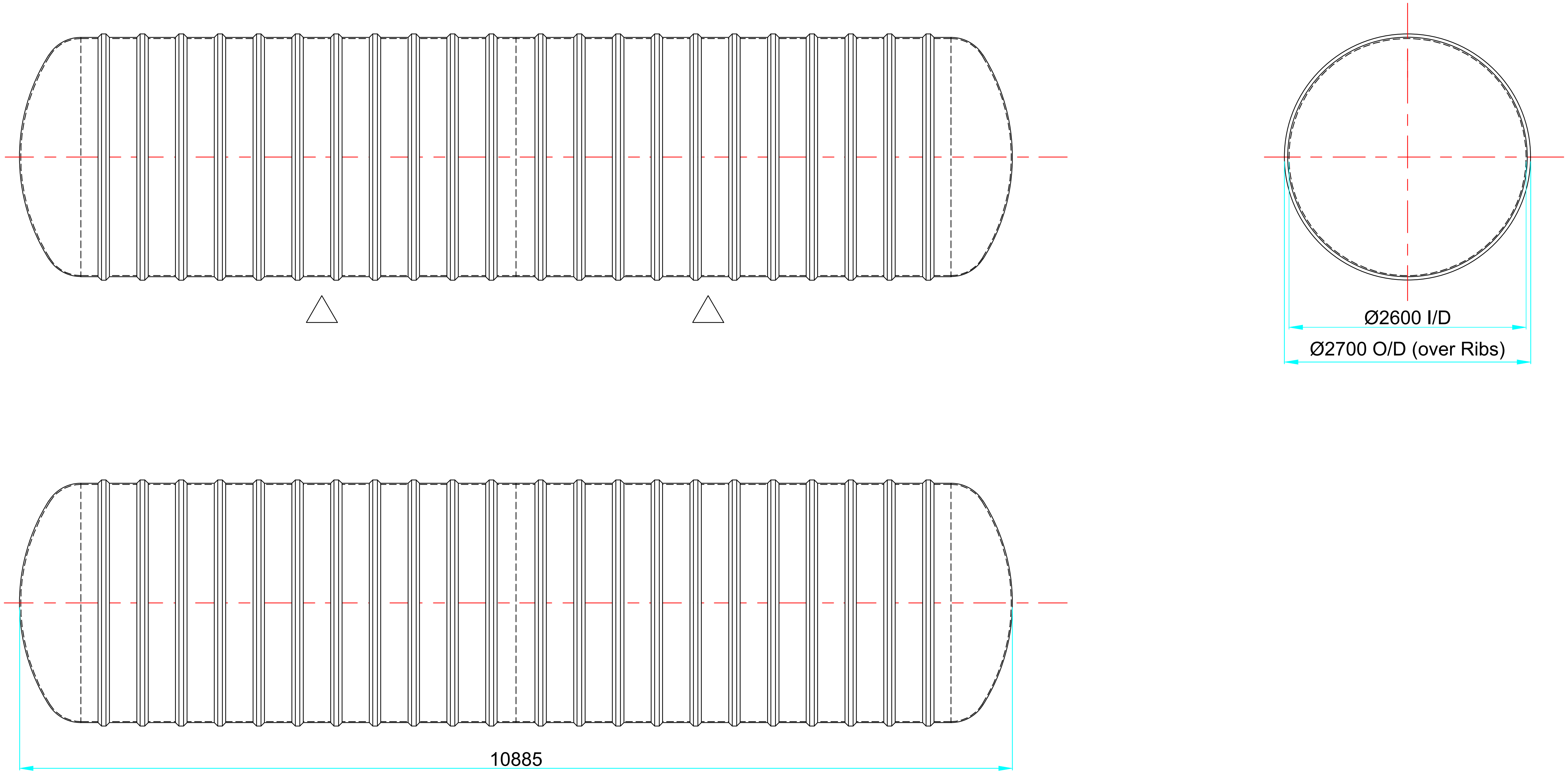
SPEL Tankstor® Tank

Example Installation

For a full list of additional accessories, see page 2.14




Flanged Connection
Rectangular Shaft 1000mm - 1500mm
Comms/Vent Duct Point
Full/Half Height Partition
Pump Platform
Flap Valves
Low Level Connection Pipe



Key to Symbols: Lifting Point | Hold- down strap rib locations where mechanical anchoring is required | Manufacturing Joint | BoQ's reference no.

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SPEL PRODUCTS

DIMENSIONS ARE SUBJECT TO DIMENSIONAL TOLERANCES. If critical, check physically prior to installation

Water table & Burial Depth:
The customer must check tank specification is compatible with ground water table level (in winter) and burial depth. If in doubt refer to SPEL Data Manual Section 7 or contact SPEL Products Sales or Technical Department

Title: SPEL 400 Series Tankstor Underground Storage Tank

Contract:

Capacity
55,000 Ltrs

Tank Specification

Laminate Specification

All sizes in mm
If in doubt ASK!

SPEL Life in Water
Lancaster Road, Shrewsbury
Shropshire, SY1 3NQ, England
Telephone: +44 (0)1743 445200
www.spelproducts.co.uk

Drawn

Checked

Date

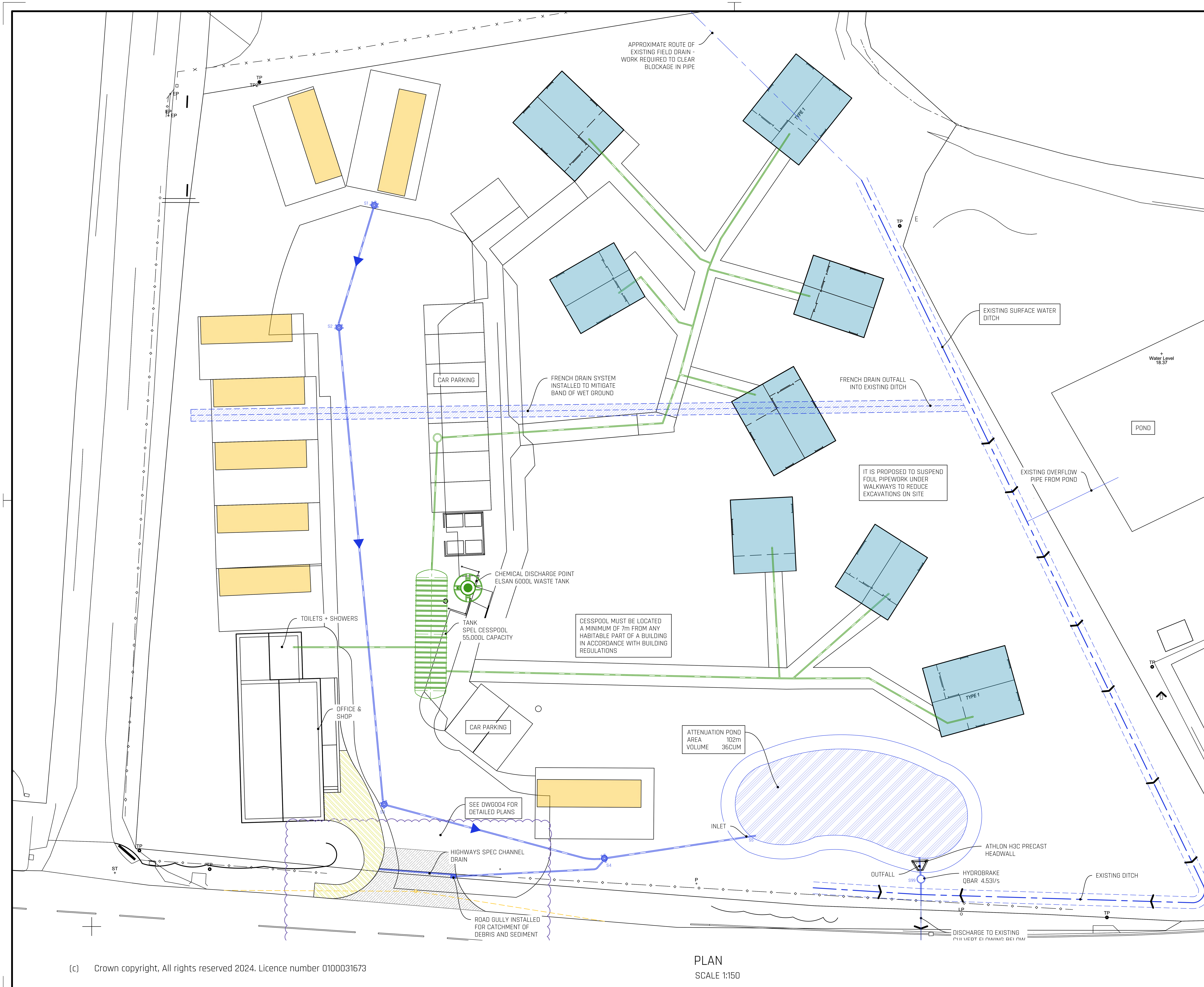
Scale 1:50 Sheet A3

TANK SERIAL No.

INTERNAL ORDER No.

Revision

APPENDIX C - DRAWINGS



PLAN

SCALE 1:150

KEY

- LODGES
- PITCHES
- TOILETS/SHOWER AND SHOP

GENERAL NOTES

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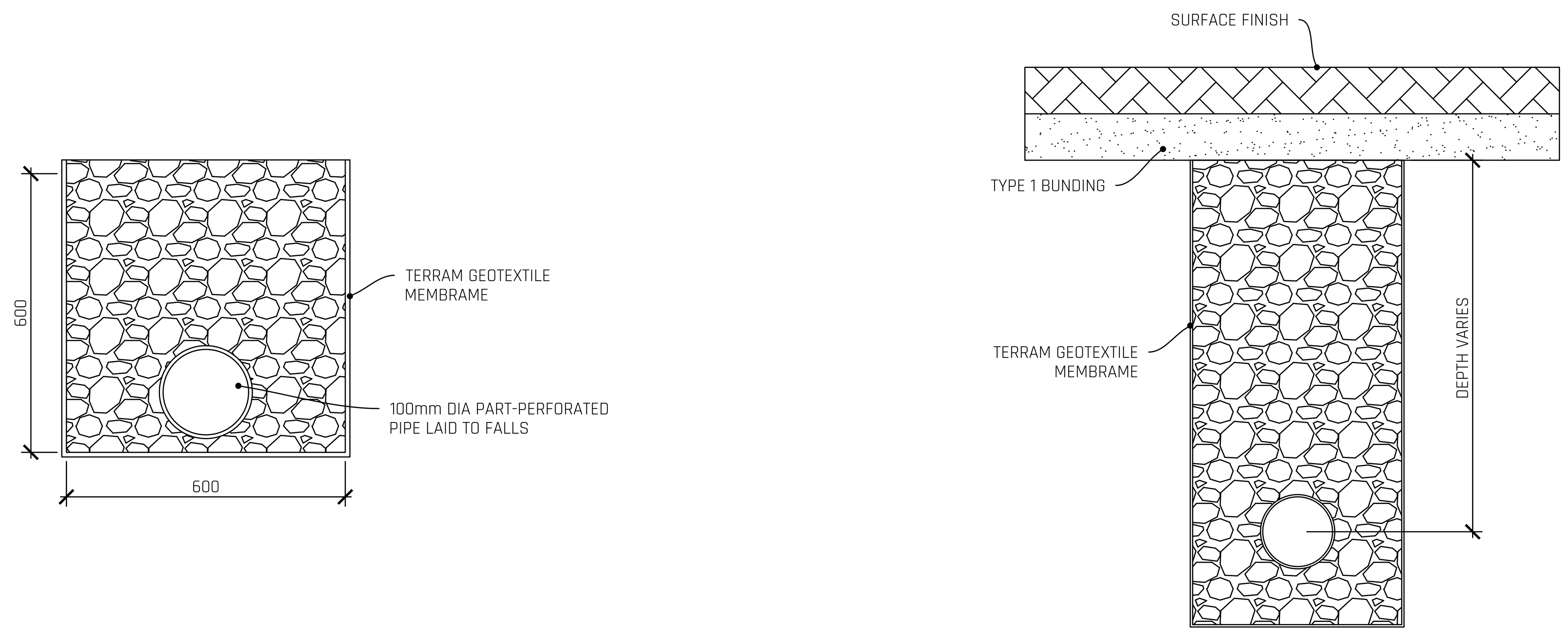
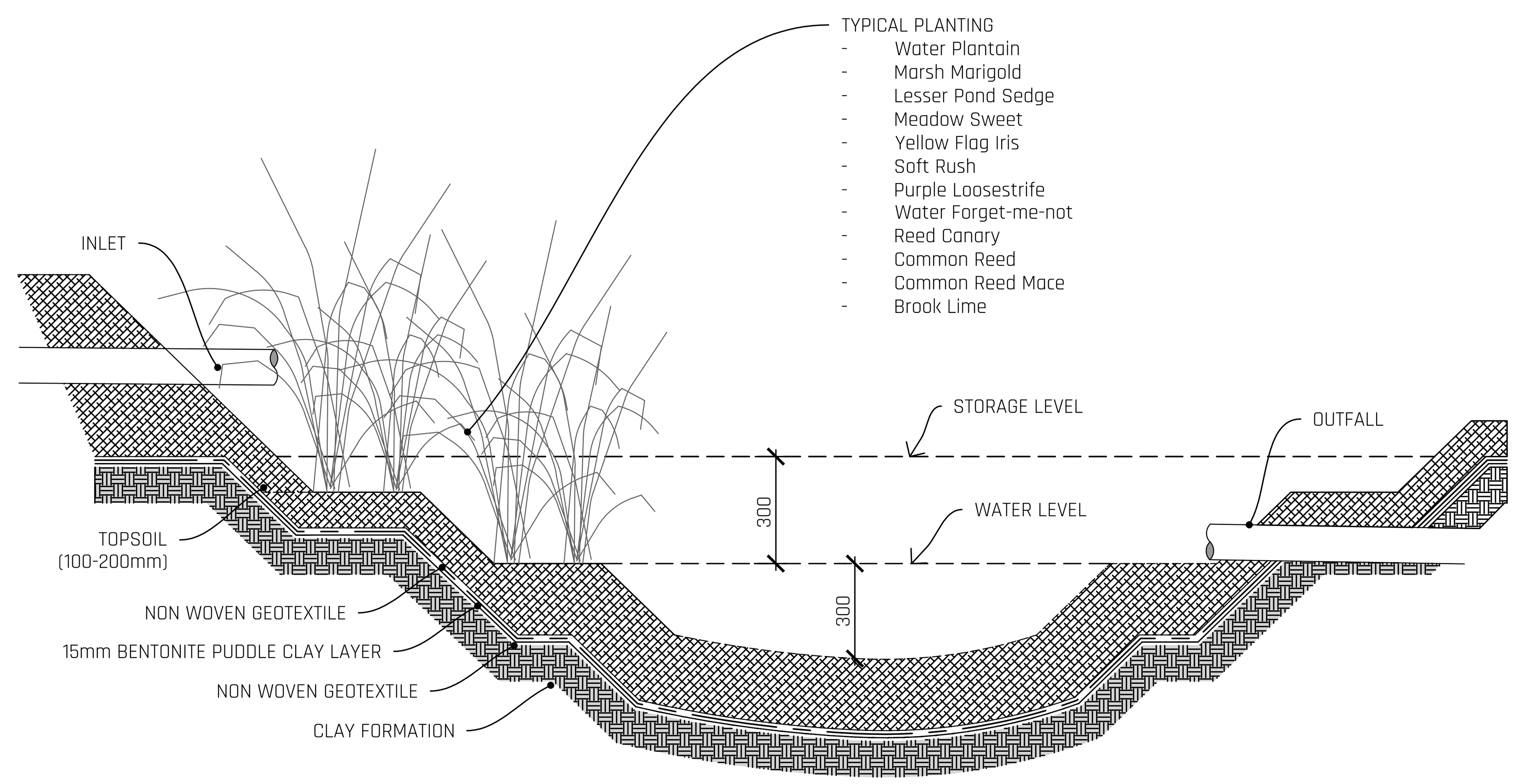
CLIENT

PROJECT: PARTFIELD PARK, DRIGG, HOLMROOK, WHITEHAVEN		
TITLE: PROPOSED DRAINAGE LAYOUT		
SCALE: AS NOTED	STATUS: FOR PLANNING CONSENT	
PAPER SIZE: A1	DRAWN BY: J GEMMELL	CHECKED AND APPROVED: C AIMERS
PROJECT PHASE: BUILD	DATE: OCTOBER 2024	DATE: OCTOBER 2024
DRAWING NUMBER: 24-429-DWG001		REVISION: B



TYPICAL FRENCH DRAIN

SCALE 1:10



POND DETAIL

SCALE 1:15

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CLIENT

PROJECT
PARTFIELD PARK, DRIGG, HOLMROOK, WHITEHAVEN

TITLE
DRAINAGE DETAILS

SCALE: AS NOTED	STATUS: FOR PLANNING CONSENT	
PAPER SIZE: A1	DRAWN BY: J GEMMELL	CHECKED AND APPROVED: C AIMERS
PROJECT PHASE: BUILD	DATE: OCTOBER 2024	DATE: OCTOBER 2024
DRAWING NUMBER: 24-429-DWG002		REVISION: B

Manhole Number / Coordinates	Cover Level / Depth To Soffit	Connections	Pipe	Code	Inverts	Diams	Manhole Size	Types: Manhole	Types: Cover
S1 E. 307401.271 N. 500184.384	19.450 0.750		0	1.000	18.550	150	600	4	Unspec
S2 E. 307398.297 N. 500174.076	19.000 0.750		1	1.000	18.416	150	600	4	Unspec
			0	1.001	18.100	150			
S3 E. 307400.133 N. 500134.446	18.100 0.750		1	1.001	17.604	150	600	4	Unspec
			0	1.002	17.200	150			
S4 E. 307420.671 N. 500129.315	17.600 0.750		1	1.002	16.935	150	600	4	Unspec
			0	1.003	16.700	150			
S5 E. 307440.659 N. 500132.411	17.460 0.863		1	1.003	16.447	150	600	4	Unspec
			0	1.004	16.447	150			
S99 E. 307440.765 N. 500129.035	17.460 0.897		1	1.004	16.413	150	1200	4	Unspec

STORM Network 1

Pipe Code	Diameter (mm)	Gradient (1:)	Pipe Length	Upstream Manhole Number	Upstream Invert	Upstream Cover	Downstream Manhole Number	Downstream Invert	Downstream Cover
1.000	150	80	10.728	S1	18.55	19.45	S2	18.42	19.00
1.001	150	80	39.673	S2	18.10	19.00	S3	17.60	18.10
1.002	150	80	21.169	S3	17.20	18.10	S4	16.94	17.60
1.003	150	80	20.226	S4	16.70	17.60	S5	16.45	17.46
1.004	150	99	3.378	S5	16.45	17.46	S99	16.41	17.46

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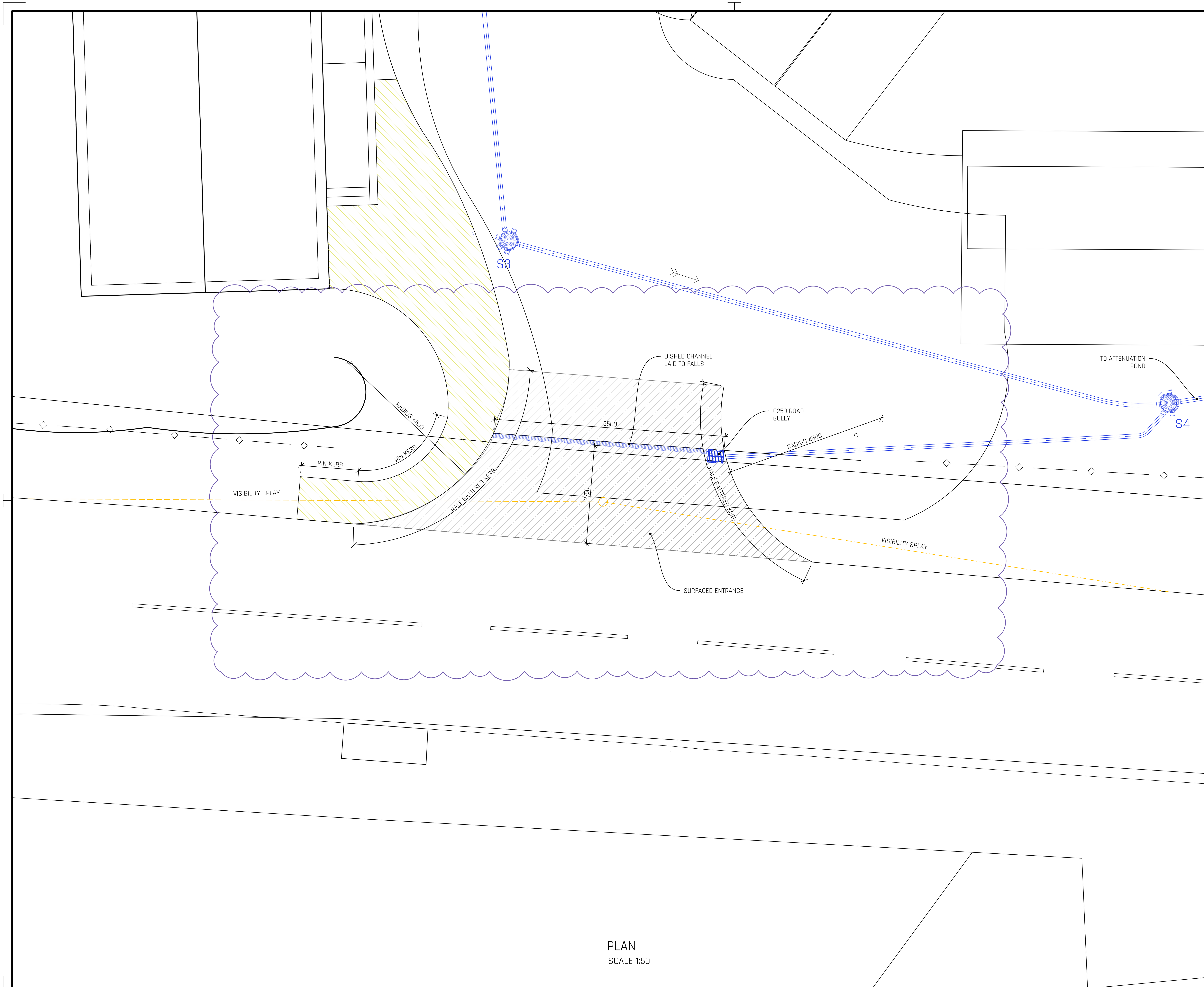
CLIENT

PROJECT
PARTFIELD PARK, DRIGG, HOLMROOK, WHITEHAVEN

TITLE
MANHOLE AND PIPE SCHEDULES

SCALE	STATUS	
AS NOTED	FOR PLANNING CONSENT	
PAPER SIZE: A1	DRAWN BY: J GEMMELL	CHECKED AND APPROVED: C AIMERS
PROJECT PHASE: BUILD	DATE: OCTOBER 2024	DATE: OCTOBER 2024
DRAWING NUMBER: 24-429-DWG003		REVISION: B



PLAN
SCALE 1:50

KEY

- SURFACED AREA
- FOOTPATH

GENERAL NOTES

1. ALL DIMENSIONS IN MILLIMETERS UNLESS NOTED AND NOT TO BE SCALED FROM DRAWINGS. USE WRITTEN DIMENSIONS ONLY AND CHECK ON SITE BEFORE ORDERING MATERIALS OR STEELWORK.
2. ALL DRAWINGS TO BE READ IN CONJUNCTION WITH DRAWINGS PRODUCED BY OTHERS AND ANY ERRORS TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER PRIOR TO COMMENCEMENT OR INSTALLATION OF THE WORKS.
3. ALL MATERIALS AND WORKMANSHIP TO BE UNDERTAKEN IN ACCORDANCE WITH BEST PRACTICE AND THE RELEVANT CODES INCLUDING BRITISH STANDARDS AND BUILDING REGULATIONS.
4. THIS WORK MAY BE REQUIRED TO COMPLY WITH THE BUILDING SAFETY ACT 2023. IF WORK REQUIRES MORE THAN ONE CONTRACTOR TO UNDERTAKE THE WORKS, THE CLIENT IS REQUIRED TO APPOINT A PRINCIPAL DESIGNER TO COORDINATE DESIGN WORKS, AND ENSURE THAT ALL DESIGN AND WORKS ARE CONSTRUCTED IN ACCORDANCE WITH THE BUILDING REGULATIONS. IT CANNOT BE ASSUMED THAT KINGMOOR CONSULTING LTD ARE BY DEFAULT THE PRINCIPAL DESIGNER UNLESS APPOINTED SPECIFICALLY FOR THIS ROLE.

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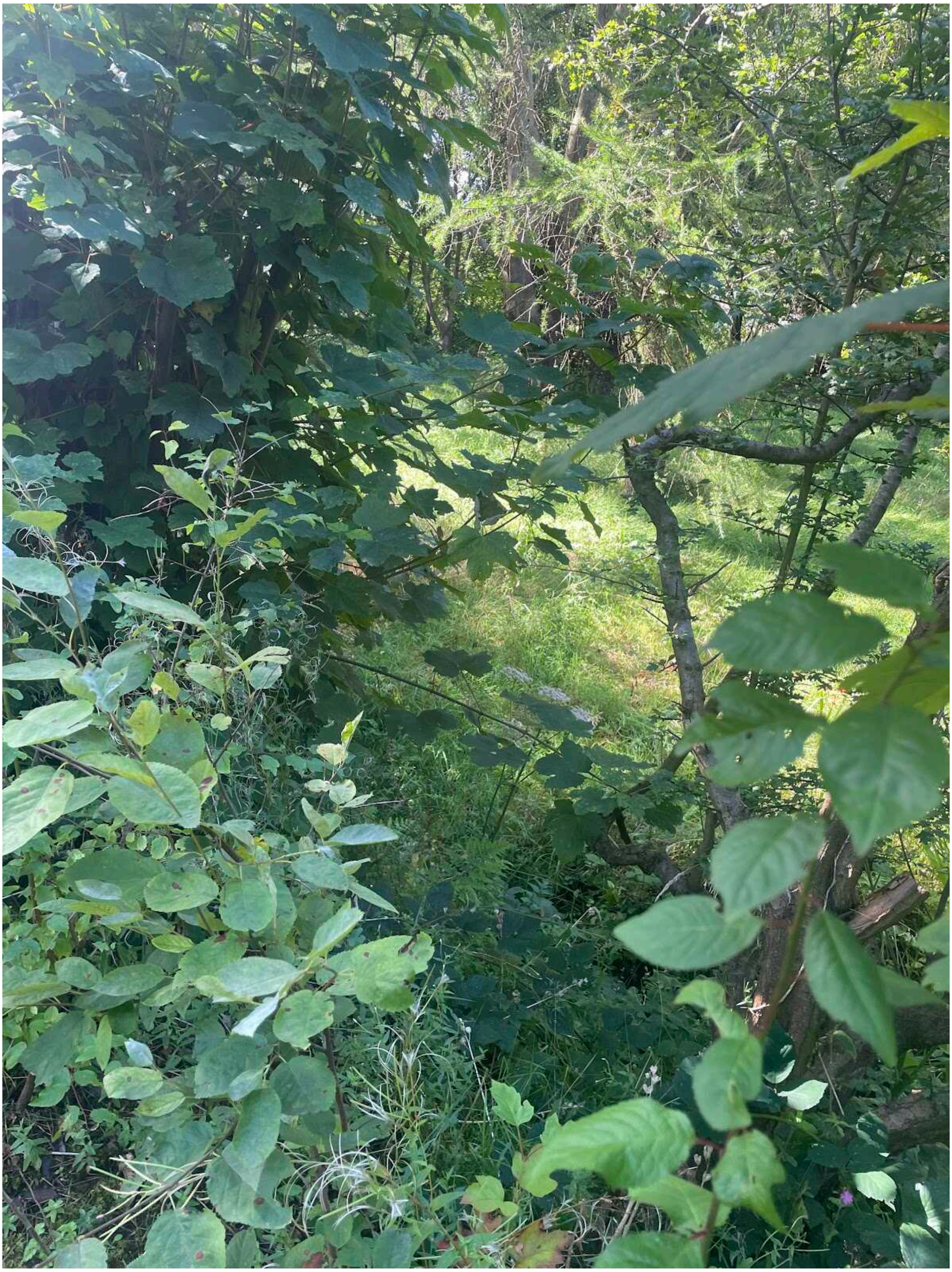
CLIENT

PROJECT	PARTFIELD PARK, DRIGG, HOLMROOK, WHITEHAVEN
TITLE	SITE ENTRANCE
SCALE	AS NOTED
STATUS	FOR PLANNING CONSENT
PAPER SIZE	A1
DRAWN BY	J GEMMELL
CHECKED AND APPROVED	C AIMERS
PROJECT PHASE	BUILD
DATE	OCTOBER 2024
DATE	OCTOBER 2024
DRAWING NUMBER	24-429-DWG004
REVISION	B

APPENDIX D - PHOTOGRAPHS



APPENDIX E - CALCULATIONS

See separate documents

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Josh Gemmell
Site name:	Partfield Park
Site location:	Drigg

Site Details

Latitude:	54.37907° N
Longitude:	3.43973° W
Reference:	2722025021
Date:	Aug 27 2024 08:59

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.

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 0.568

Methodology

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

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	1075	1075
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

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):	4.53	4.53
1 in 1 year (l/s):	3.94	3.94
1 in 30 years (l/s):	7.7	7.7
1 in 100 year (l/s):	9.42	9.42
1 in 200 years (l/s):	10.74	10.74

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	40	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	0.750
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.011	4.00	19.450	600	307401.271	500184.384	0.900
2	0.017	4.00	19.000	600	307398.297	500174.076	0.900
3	0.011	4.00	18.100	600	307400.133	500134.446	0.900
4	0.007	4.00	17.600	600	307420.671	500129.315	0.900
5			17.460	600	307440.659	500132.411	1.013
99			17.460	1200	307440.765	500129.035	1.047

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	10.728	80.0	150	Circular	19.450	18.550	0.750	19.000	18.416	0.434
1.001	39.673	80.0	150	Circular	19.000	18.100	0.750	18.100	17.604	0.346
1.002	21.169	80.0	150	Circular	18.100	17.200	0.750	17.600	16.935	0.515
1.003	20.226	80.0	150	Circular	17.600	16.700	0.750	17.460	16.447	0.863
1.004	3.378	99.3	150	Circular	17.460	16.447	0.863	17.460	16.413	0.897

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	600	Manhole	Adoptable	2	600	Manhole	Adoptable
1.001	2	600	Manhole	Adoptable	3	600	Manhole	Adoptable
1.002	3	600	Manhole	Adoptable	4	600	Manhole	Adoptable
1.003	4	600	Manhole	Adoptable	5	600	Manhole	Adoptable
1.004	5	600	Manhole	Adoptable	99	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	307401.271	500184.384	19.450	0.900	600	0	1.000	18.550	150
2	307398.297	500174.076	19.000	0.900	600	1	1.000	18.416	150
						0	1.001	18.100	150
3	307400.133	500134.446	18.100	0.900	600	1	1.001	17.604	150
						0	1.002	17.200	150
4	307420.671	500129.315	17.600	0.900	600	1	1.002	16.935	150
						0	1.003	16.700	150
5	307440.659	500132.411	17.460	1.013	600	1	1.003	16.447	150
						0	1.004	16.447	150
99	307440.765	500129.035	17.460	1.047	1200	1	1.004	16.413	150

Simulation Settings

Rainfall Methodology	FSR	Winter CV	0.840	Check Discharge Rate(s)	✓
FSR Region	England and Wales	Analysis Speed	Normal	100 year (l/s)	9.4
M5-60 (mm)	20.000	Skip Steady State	x	Check Discharge Volume	✓
Ratio-R	0.400	Drain Down Time (mins)	240	100 year 360 minute (m³)	181
Summer CV	0.750	Additional Storage (m³/ha)	0.0		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
10	0	0	0	100	50	0	0
30	0	0	0				

Pre-development Discharge Rate

Site Makeup	Greenfield	SAAR (mm)	1075	Region	10	QBar	4.5
Greenfield Method	IH124	Soil Index	4	Growth Factor 100 year	2.08	Q 100 year (l/s)	9.4
Positively Drained Area (ha)	0.568	SPR	0.47	Betterment (%)	0		

Pre-development Discharge Volume

Site Makeup	Greenfield	Soil Index	4	Return Period (years)	100	Betterment (%)	0
Greenfield Method	FSR/FEH	SPR	0.47	Climate Change (%)	0	PR	0.510
Positively Drained Area (ha)	0.568	CWI	125.188	Storm Duration (mins)	360	Runoff Volume (m³)	181

Node 99 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	16.413	Product Number	CTL-SHE-0104-4500-0750-4500
Design Depth (m)	0.750	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	4.5	Min Node Diameter (mm)	1200

Node 5 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Pit Width (m)	3.500	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	16.447	Pit Length (m)	6.500	Number Required	1
Safety Factor	1.0	Time to half empty (mins)	19	Depth (m)	1.500		

Approval Settings

Node Size	✓	Maximum Cover Depth (m)	3.000	Surcharged Depth	✓
Node Losses	✓	Backdrops	✓	Return Period (years)	
Link Size	✓	Minimum Backdrop Height (m)		Maximum Surcharged Depth (m)	0.100
Minimum Diameter (mm)	150	Maximum Backdrop Height (m)	1.500	Flooding	✓
Link Length	✓	Full Bore Velocity	✓	Return Period (years)	30
Maximum Length (m)	100.000	Minimum Full Bore Velocity (m/s)		Time to Half Empty	x
Coordinates	✓	Maximum Full Bore Velocity (m/s)	3.000	Discharge Rates	✓
Accuracy (m)	1.000	Proportional Velocity	✓	Discharge Volume	✓
Crossings	✓	Return Period (years)		100 year 360 minute (m³)	
Cover Depth	✓	Minimum Proportional Velocity (m/s)	0.750		
Minimum Cover Depth (m)		Maximum Proportional Velocity (m/s)	3.000		

Results for 10 year Critical Storm Duration. Lowest mass balance: 99.30%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	18.592	0.042	3.2	0.0119	0.0000	OK
15 minute winter	2	10	18.167	0.067	8.1	0.0191	0.0000	OK
15 minute winter	3	10	17.283	0.083	11.2	0.0236	0.0000	OK
15 minute summer	4	10	16.795	0.095	12.9	0.0270	0.0000	OK
30 minute winter	5	24	16.579	0.132	9.8	3.0471	0.0000	OK
30 minute winter	99	24	16.576	0.163	4.6	0.1846	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	3.2	0.810	0.161	0.0424	
15 minute winter	2	1.001	3	8.0	1.056	0.401	0.2998	
15 minute winter	3	1.002	4	11.0	1.129	0.554	0.2065	
15 minute summer	4	1.003	5	12.9	1.403	0.648	0.2217	
30 minute winter	5	1.004	99	4.6	0.424	0.256	0.0575	
30 minute winter	99	Hydro-Brake®		4.4				7.4

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.30%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	18.598	0.048	4.0	0.0134	0.0000	OK
15 minute winter	2	10	18.177	0.077	10.2	0.0219	0.0000	OK
15 minute winter	3	10	17.297	0.097	14.1	0.0275	0.0000	OK
15 minute summer	4	10	16.812	0.112	16.4	0.0317	0.0000	OK
30 minute winter	5	25	16.637	0.190	12.5	4.3800	0.0000	SURCHARGED
30 minute winter	99	25	16.633	0.220	4.8	0.2491	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	4.0	0.860	0.201	0.0499	
15 minute winter	2	1.001	3	10.1	1.119	0.507	0.3572	
15 minute winter	3	1.002	4	13.9	1.187	0.699	0.2477	
15 minute summer	4	1.003	5	16.3	1.425	0.820	0.2783	
30 minute winter	5	1.004	99	4.8	0.441	0.267	0.0595	
30 minute winter	99	Hydro-Brake®		4.5				9.6

Results for 100 year +50% CC Critical Storm Duration. Lowest mass balance: 99.30%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	18.619	0.069	7.8	0.0196	0.0000	OK
15 minute winter	2	10	18.227	0.127	19.9	0.0359	0.0000	OK
15 minute winter	3	11	17.752	0.552	27.4	0.1564	0.0000	SURCHARGED
15 minute winter	4	12	17.290	0.590	28.9	0.1671	0.0000	SURCHARGED
30 minute winter	5	30	16.954	0.507	22.3	11.6796	0.0000	SURCHARGED
30 minute winter	99	30	16.951	0.538	5.3	0.6086	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	7.8	1.022	0.392	0.0819	
15 minute winter	2	1.001	3	19.6	1.245	0.987	0.6328	
15 minute winter	3	1.002	4	24.3	1.379	1.221	0.3727	
15 minute winter	4	1.003	5	27.7	1.574	1.394	0.3561	
30 minute winter	5	1.004	99	5.3	0.514	0.299	0.0595	
30 minute winter	99	Hydro-Brake®		4.5				18.9

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