



DRAINAGE & FLOOD RISK STATEMENT

Wentworth Park Estate Tankersley

Reference

AMF/DFS/4776.v2

Date

February 2016

Version

2

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CONFIDENTIALITY STATEMENT

This report is addressed to and may be relied upon by the following:

Wilton Developments Limited
4th Floor
10 South Parade
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West Yorkshire
LS1 5QS

This report has been prepared for the sole use and reliance of the above named party. This report shall not be relied upon or transferred to any other parties without the express written authorisation of JPG (Leeds) Limited. No responsibility will be accepted where this report is used, either in its entirety or in part, by any other party.

DOCUMENT HISTORY

VERSION	PURPOSE/DESCRIPTION	DATE
1	Final – For issue to Client	December 2015
2	Final – Latest Site Plan Added	February 2016



1.0 INTRODUCTION

JPG (Leeds) Limited has been instructed by Wilton Developments Limited to carry out a Drainage and Flood Risk Statement for a proposed commercial development at Wentworth Park Estate, Tankersley.

The report will review the drainage and flood risk issues associated with the proposed development and recommend any mitigation which should take place as part of the development.

This document is prepared in accordance with the requirements of and in response to the Planning Practice Guidance & National Planning Policy Framework (NPPF) which states that those proposing particular developments are responsible for:

- Providing an assessment of whether any proposed development is likely to be affected by flooding and whether it will increase the flood risk elsewhere and of the measures proposed to deal with these effects and risks, and
- Satisfying the local planning authority that any flood risk to the development or additional risk arising from the proposal will be successfully managed with the minimum environmental effect, to ensure that the site can be developed and occupied safely.

NPPF defines flood zones as follows:

- Zone 1 – Low Probability – less than 1 in 1000 annual probability (< 0.1%) of river or sea flooding in any year.
- Zone 2 – Medium Probability – between a 1 in 100 and 1 in 1000 annual probability (1% - 0.1%) of river flooding or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year.
- Zone 3a – High Probability – 1 in 100 or greater annual probability (> 1%) of river flooding or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.
- Zone 3b – Functional Floodplain – 1 in 20 or greater annual probability (5%) of river flooding in any year. This is land on which water has to flow or be stored in times of flood.

A Flood Risk Assessment is required for all sites in excess of 1ha within Zone 1 and all sites within Zones 2 and 3.



2.0 THE SITE

The site is located approximately 7.0 km to the south of Barnsley town centre, adjacent to Carr Lane in Tankersley, with the approximate centre of the site being at NGR 433303, 399790. A site location plan and aerial photograph are provided in Appendix A.

The site has a roughly rectangular shape and covers an area of approximately 9.6ha.

The site was subject site infrastructure works during 2007, this involved an earthworks exercise to provide level development plateaus, a new site access road with foul and surface water sewers to serve the development plots.

A copy of the as-built site topographic survey following the infrastructure works is provided in Appendix B.

3.0 EXISTING DRAINAGE AND SEWER NETWORK

The proposed development plots are served by foul and surface water sewers constructed within the 2007 site infrastructure works, with foul and surface water tails provided to each development plot.

An attenuation pond constructed with the site infrastructure works is located to the east of the site. Surface water run-off from the infrastructure drainage serving the site is attenuated in this facility prior to discharging at a restricted rate of 57.9 litres/second to the public sewer in Stone Leigh.

The sites foul infrastructure sewers discharge to the foul public sewer in Wentworth Way.

A copy of the site infrastructure drainage layout and pond plan prepared by WYG are provided in Appendix C.

4.0 DEVELOPMENT PROPOSALS

It is proposed to develop the site with four large commercial units.

A proposed site layout plan has been provided. This is referenced below and a copy is presented in Appendix D:

- Kilmartin Plowman and Partners. Site Plan. 1979-201 P6



5.0 FLOOD RISK ASSESSMENT

Publicly available information on flooding obtained from the Environment Agency (EA) website database is provided in Appendix E.

The site is indicated to fall within Flood Zone 1 which comprises land assessed as at a low risk of flooding from watercourse and/or sea with less than a 1:1000 annual probability of river or sea flooding.

6.0 SURFACE AND FOUL WATER DRAINAGE

The proposed site drainage will comprise of a separate surface and foul water drainage system.

The following summarises the requirements for the discharge of surface and foul water from the site.

6.1 Surface Water Drainage

Surface water from the development plots shall discharge to the surface water infrastructure sewers within the site access road, utilising the tails provided to each plot, ultimately outfalling to the existing attenuation pond adjacent the sites eastern boundary.

Surface water run-off from the infrastructure drainage is attenuated in the pond prior to discharging at a restricted rate of 57.9 litres/second to the public sewer in Stone Leigh. The pond was designed by WYG to allow an unrestricted discharge from the development plots.

JPG have undertaken design calculations on Windes Microdrainage software to check the existing attenuation pond has capacity to accept the development proposals. The following provides a summary of the design check:

Attenuation Pond Design Check

Storage Design Parameters

- Restricted discharge rate 57.8 litres/second.
- Proposed Impermeable area = 4.97ha.
- M5-60 = 18.8
- Ratio R = 0.36
- Pond Base level = 153.650m AOD.
- Pond top level = 156.500m AOD.



Storage Design Calculations Summary

- 1:30 Year Return Period Water Level = 155.431 AOD (1.069m freeboard).
- 1:100 Year Return Period (+20% cc) Water Level = 156.086m AOD (0.414m freeboard).

The design check confirms the existing attenuation pond has the capacity to accept an unrestricted discharge from the proposed development site.

A copy of the Windes Microdrainage are provided in Appendix F.

The proposed on site drainage system shall be designed in accordance with the requirements of Sewers for Adoption and shall demonstrate that:

- No surface flooding occurs in 1 in 30 year rainfall event.
- No flooding to buildings and adjacent properties occurs in 1 in 100 year rainfall event (including an allowance of 20% for the effects of future climate change), as defined in NPPF Technical Guidance.

Surface water discharge from new car parking/service areas shall be passed through a suitably designed oil interceptor prior to discharge to sewer.

6.2 Foul Water Drainage

Domestic foul water from the development plots shall discharge to the foul water infrastructure sewers within the site access road, utilising the tails provided to each plot. The foul infrastructure sewers ultimately discharge to the foul public sewer in Wentworth Way.

Drainage from restaurant/cafeteria/kitchen areas shall be passed through a suitable designed grease trap prior to discharge into the foul drainage system.

Any discharge of trade effluent to the sewer network shall be discussed and the relevant consent licences obtained from Yorkshire Water.

7.0 CONCLUSIONS

This assessment has looked at the drainage and flood risk issues to support a planning application for a proposed commercial development at Wentworth Park Estate, Tankersley.

The site lies within Flood Zone 1 and is therefore at low risk of flooding from river or sea. NPPF Technical Guidance states all uses of land are appropriate in Flood Zone 1.

NPPF Technical Guidance states all uses of land are appropriate in Flood Zone 1.



Surface water from the development plots shall discharge to the existing surface water infrastructure sewers within the site access road, outfalling to the attenuation pond adjacent the sites eastern boundary, prior to discharging at a restricted rate of 57.9 litres/second to the public sewer in Stone Leigh.

A design check of the attenuation pond has been undertaken by JPG which confirms it has sufficient capacity to accommodate the development proposals.

Domestic foul water from the development plots shall discharge to the foul water infrastructure sewers with the site access road, utilising the tails provided to each plot. The foul infrastructure sewers ultimately discharge to the foul public sewer in Wentworth Way

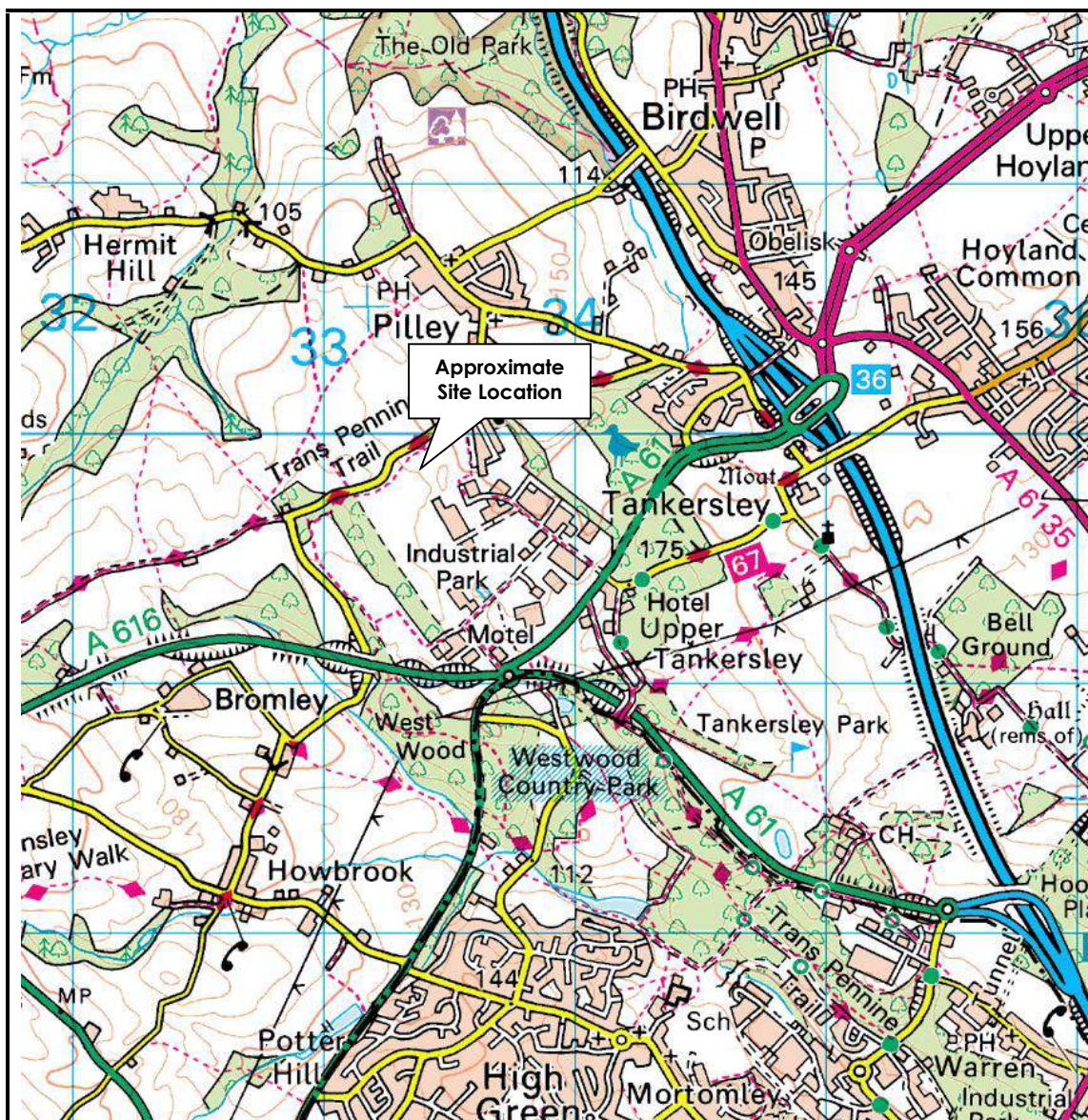
Andrew Fairburn

For and behalf of JPG (Leeds) Limited

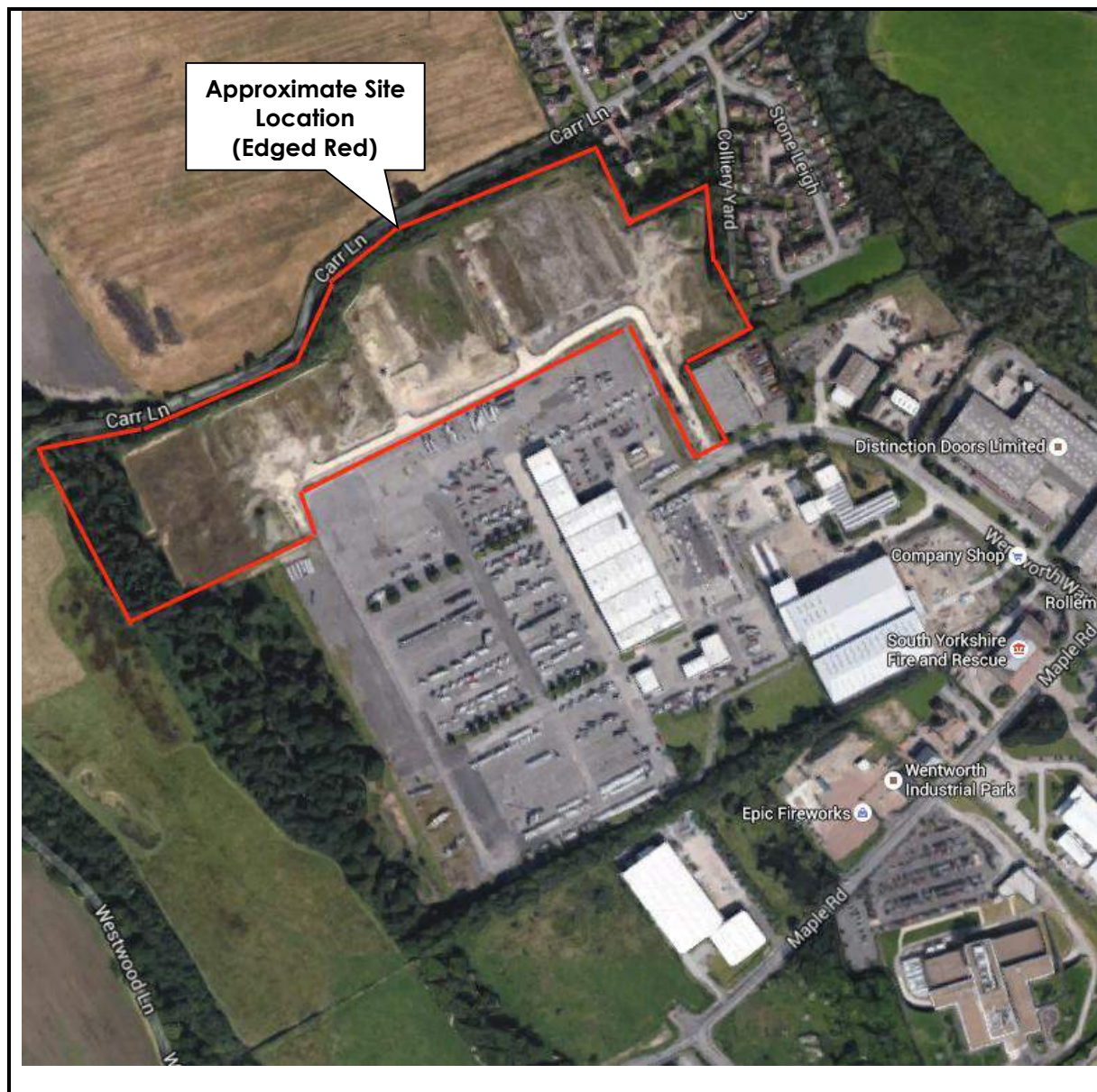
February 2016



Appendix A Site Location Plan and Aerial Photograph



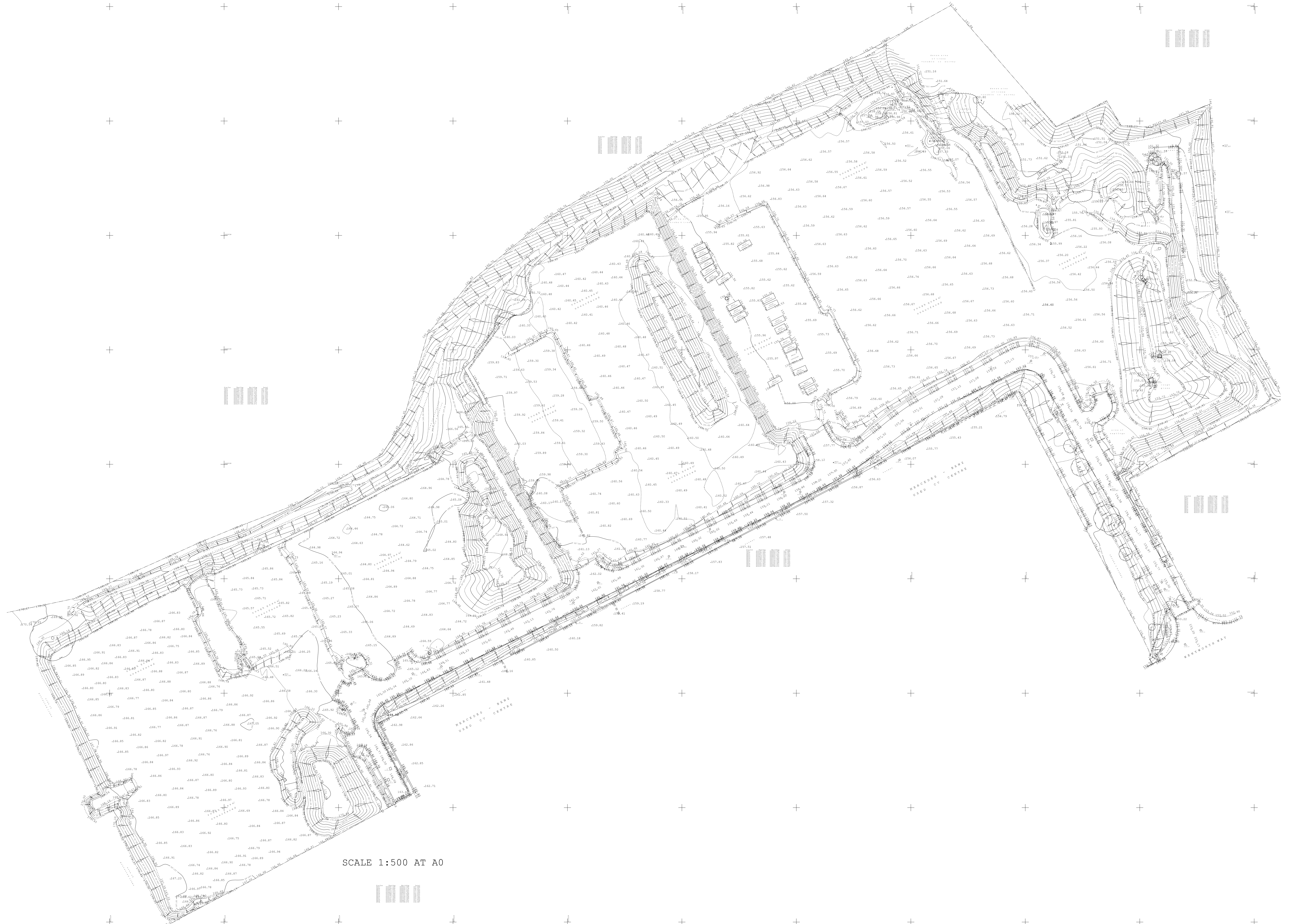
Site Location Plan	
Site	Wentworth Park Estate, Tankersley
Client	Wilton Developments Limited
Job Number	4776
Scale	NTS



Aerial Photograph	
Site	Wentworth Park Estate
Client	Wilton Developments Limited
Job Number	4776
Scale	NTS



Appendix B Topographic Survey



SCALE 1:500 AT A0



Appendix C Existing Site Drainage Drawings

- ## KEY

 Proposed Gully and Connection

Pipe to be plugged and end wrapped with geotextile membrane. End of pipe marked on surface with timber peg or similar approved surrounded in ST4 concrete. Location co-ordinated with topographical survey and provided as part of as built information

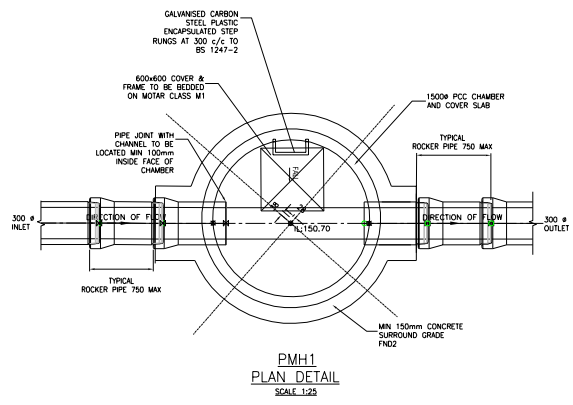
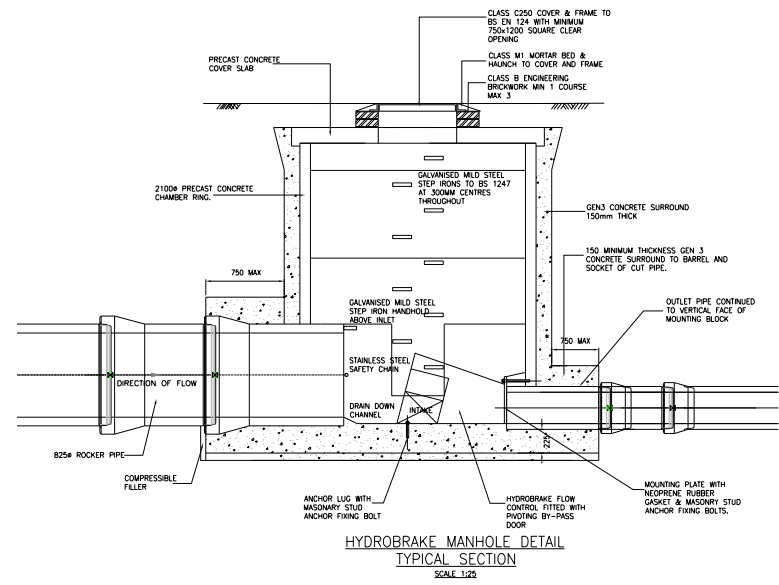
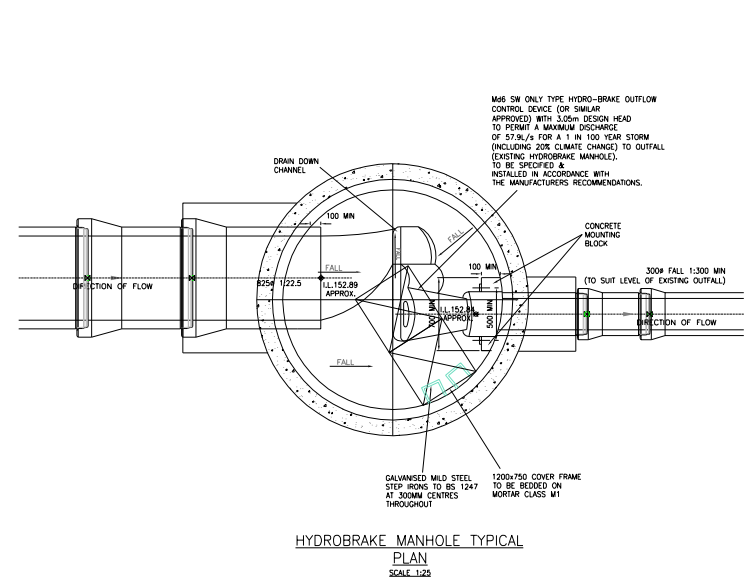
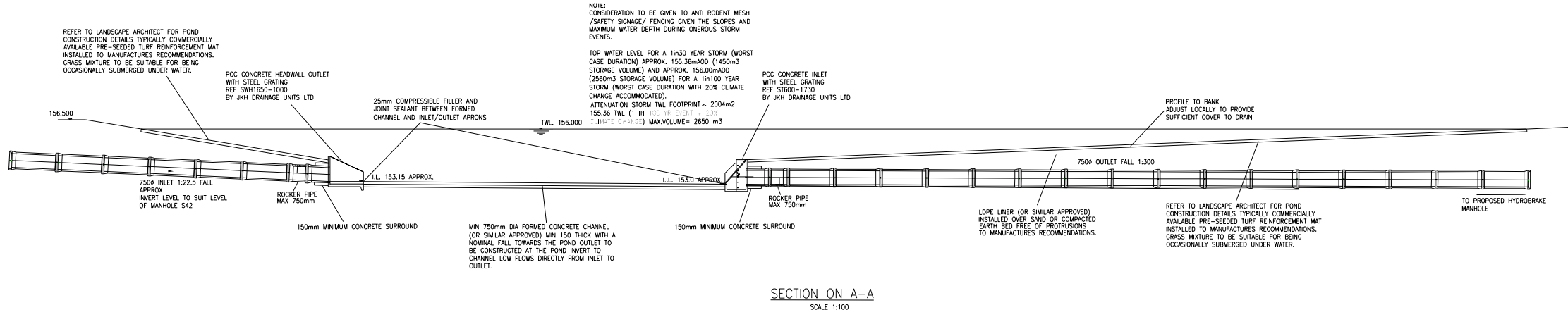
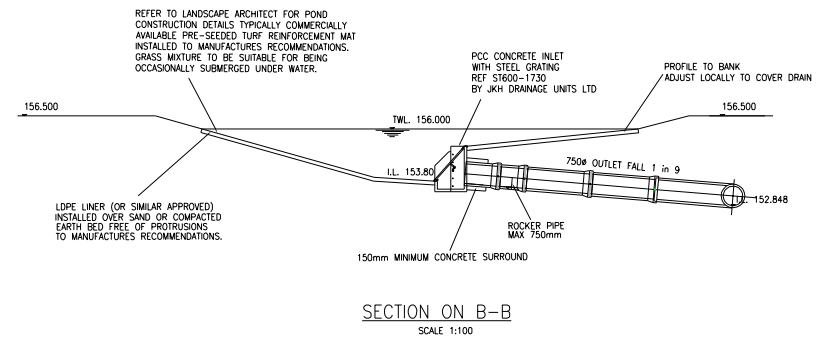
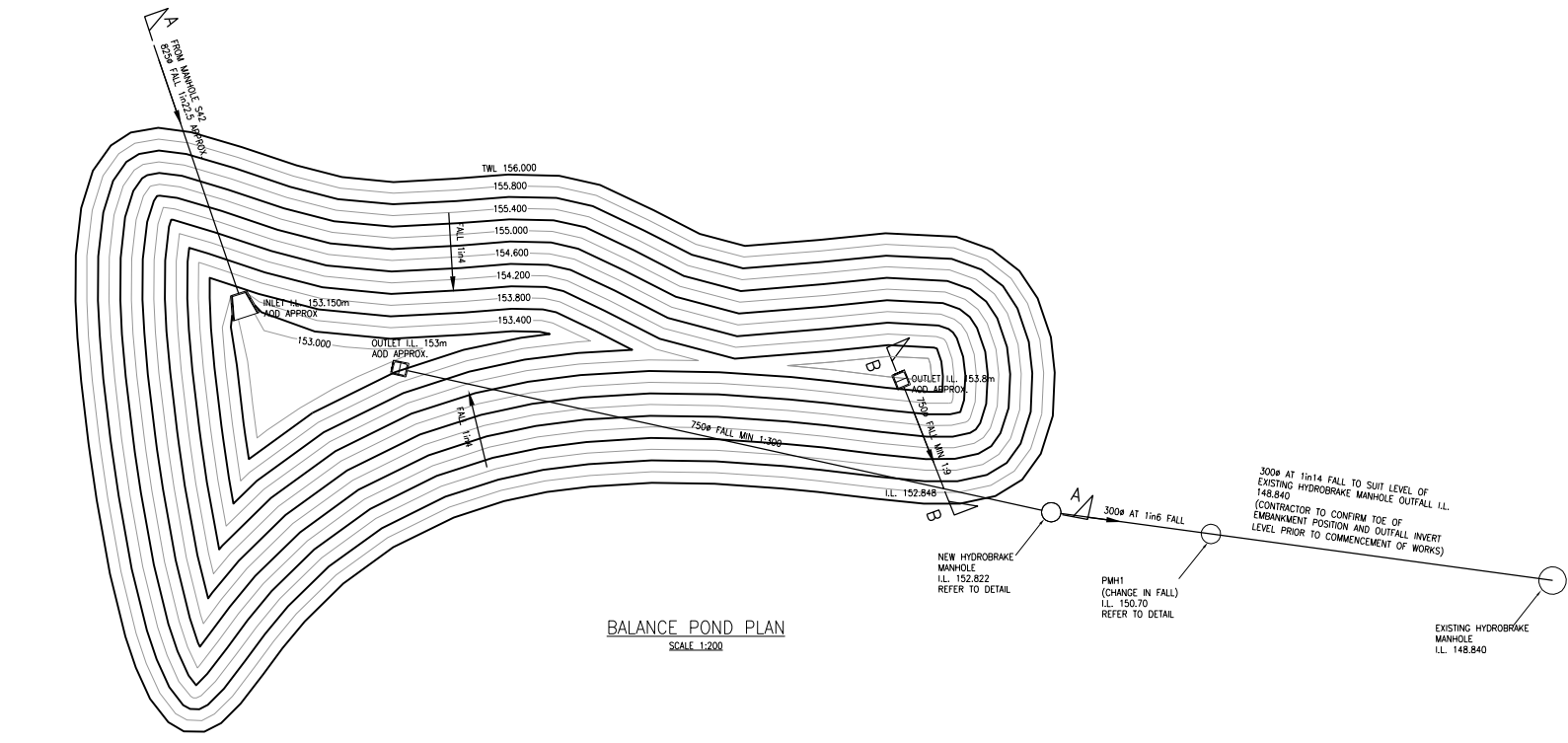


Drawing Title:

PHASE 2 DRAINAGE LAYOUT

© WYG Group Ltd

Manhole Number	Cover Level (m)	MH Depth (m)	Manhole Diam., L* W (mm)	Pipe Out FN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In FN	Pipes In Invert Level (m)	Pipes in Dia (mm)	Pipes in B/Drop (mm)
S10	166.000	2.206	1500	1,005	163.794	525	1,004	164.621	525	827
							5,000	164.094	225	
							7,000	164.005	225	
S15	164.200	1.000	1500	6,003	163.200	300	6,002	163.275	225	
							8,000	163.200	300	
S16	164.160	1.225	1500	1,006	162.935	450	1,005	162.935	525	
							6,003	163.085	300	
S27	161.430	3.181	1500	1,008	158.249	525	1,007	158.324	450	
							9,005	158.324	450	
S29	157.160	1.365	1500	12,001	155.795	375	12,000	155.795	375	
S33	158.040	3.990	1800	1,010	154.050	825	1,009	155.900	525	1550
							12,002	154.425	450	
S34	157.200	3.271	1800	1,011	153.929	825	1,010	153.929	825	
S41	156.570	2.683	1800	1,012	153.887	825	1,011	153.887	825	
							14,003	155.098	450	836
S42	155.900	2.053	1800	1,013	153.847	825	1,012	153.847	825	
S44	163.850	3.500	1500	1,007	160.350	450	1,006	160.350	450	
S45	158.700	1.694	1500	1,009	157.008	525	1,008	157.006	525	
S48	165.020	0.825	1050	5,000	164.195	225				
F2	164.680	0.900	1500	N/A	163.780	150	N/A	165.280	150	1500
F3	165.665	2.133	1500	N/A	163.532	150	N/A	163.532	150	
F4	164.974	1.646	1500	N/A	162.915	150	N/A	162.915	150	
							N/A	163.794	150	879
F7	161.912	1.200	1500	N/A	160.712	150	N/A	160.712	150	
F8	160.170	1.200	1500	N/A	158.970	150	N/A	158.970	150	
F10	158.750	1.200	1500	N/A	157.550	150	N/A	158.270	150	720
F11	157.090	0.940	1500	N/A	156.150	150	N/A	156.150	150	
F12	157.320	1.325	1500	N/A	155.880	150	N/A	155.880	150	
							N/A	155.680	150	
F14	155.795	1.200	1500	N/A	154.595	150	N/A	154.880	150	225



- NOTES
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND SPECIALISTS DETAILS AND SPECIFICATIONS.
 2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED. LEVELS ARE IN METRES A.O.D.
 3. ALL DIMENSIONS ARE TO BE CHECKED ON SITE BY THE CONTRACTOR/FABRICATOR PRIOR TO COMMENCEMENT OF WORK.
 4. ALL WORK TO BE IN ACCORDANCE WITH CIVIL ENGINEERING SPECIFICATION FOR THE WATER INDUSTRY 6th EDITION, PUBLISHED BY THE WATER RESEARCH CENTRE.
 5. ALL SOFT SPOTS TO BE REMOVED FROM BOTTOM OF EXCAVATIONS AND TO BE REFILLED TO FORMATION LEVEL WITH THE SAME MATERIAL AS PERMANENT WORKS WHICH REST IN IT.
 6. CUT ENDS OF REINFORCED CONCRETE PIPES ARE TO BE TREATED WITH EPOXY RESIN PAINT/MORTAR.
 7. CONCRETE BENCHING AND PIPE SURROUND SHALL BE PLACED IN SINGLE CONTINUOUS OPERATION FROM TOP BASE SLAB TO TOP OF BENCHING AND PIPE SURROUND.
 8. LIMESTONE PIPE BEDDING WILL NOT BE PERMITTED IN ACIDIC GROUND WATER CONDITIONS. REFER TO CONTRACT SPECIFICATION FOR SPECIFIC DETAILS.
 9. ALL PIPES WITH MORE THAN 600mm COVER BETWEEN SOFFIT AND FINISHED SURFACE TO BE IN CLASS 'S' (GRANULAR SURROUND) BEDDING.
 10. U.N.D. PIPES MAY BE CONCRETE, CLAYWARE OR PLASTIC SUBJECT TO INSTALLATION, PROTECTION AND BEDDING DETAILS BEING TO MANUFACTURERS RECOMMENDATIONS IF PLASTIC IS USED IN LIEU OF CONCRETE.
 11. ALL COVER LEVELS SHOWN ARE INDICATIVE ONLY. ACCURATE COVER LEVELS SHOULD BE DETERMINED FROM THE EXTERNAL LEVELS DRAWING.
 12. PIPES OF DIFFERENT DIAMETERS ENTERING MANHOLES SHOULD BE INSTALLED WITH SOFFITS AT THE SAME LEVEL.
 13. ALL PONDS ARE TO BE PROVIDED WITH A LOPE WATERTIGHT LINER.
 - a) THE LINER SHALL BE LAID ON A 50MM THICK SAND OR GEOTEXTILE FABRIC PROTECTION LAYER PLACED ON THE TRIMMED FORMATION.
 - b) ALL JOINTS IN THE LINER ARE TO BE WELDED AND TESTED TO CONFIRM EFFECTIVENESS OF SEAL.
 - c) ALL PENETRATIONS BY PIPES OR OTHER DETAILS TO BE SEALED WITH A PROPRIETARY 'TOP HAT' DETAIL MADE OF THE SAME LINER MATERIAL AND SITE WELDED.
 - d) THE LINER SHALL BE ANCHORED AT THE TOP OF THE SLOPE TO A DETAILS APPROVED BY THE MANUFACTURER.
 - e) THE LINER SHALL BE OVERLAP WITH A PROTECTIVE MEMBRANE TO THE MANUFACTURE'S SPECIFICATION PRIOR TO PLACING ANY 'SUB-SOIL' MATERIAL OVER THE LINING MEMBRANE.
 - f) THE LINING INSTALLATION SHALL PROVIDE A 25 YEAR GUARANTEE.
 14. SETTING OUT COORDINATES TO BE CONFIRMED FOLLOWING GROUND MODEL FINALISATION.

HYDROBRAKE MANHOLE
INDICATIVE ARRANGEMENT (FOR ILLUSTRATIVE PURPOSES ONLY – TO BE ALTERED
SUBJECT TO HYDROBRAKE DESIGN AND MANUFACTURERS RECOMMENDATIONS).

A	ISSUED FOR CONSTRUCTION	JR	PS	JS	23.10.08
REV	DESCRIPTION	BY	CHK	APP	DATE

REGATTA HOUSE
CLIPPERS QUAY
SILFORD QUAYS
MANCHESTER
M50 3XP
TEL: +44 (0)161 872 3223
FAX: +44 (0)161 872 3193
e-mail: manchester@wyg.com

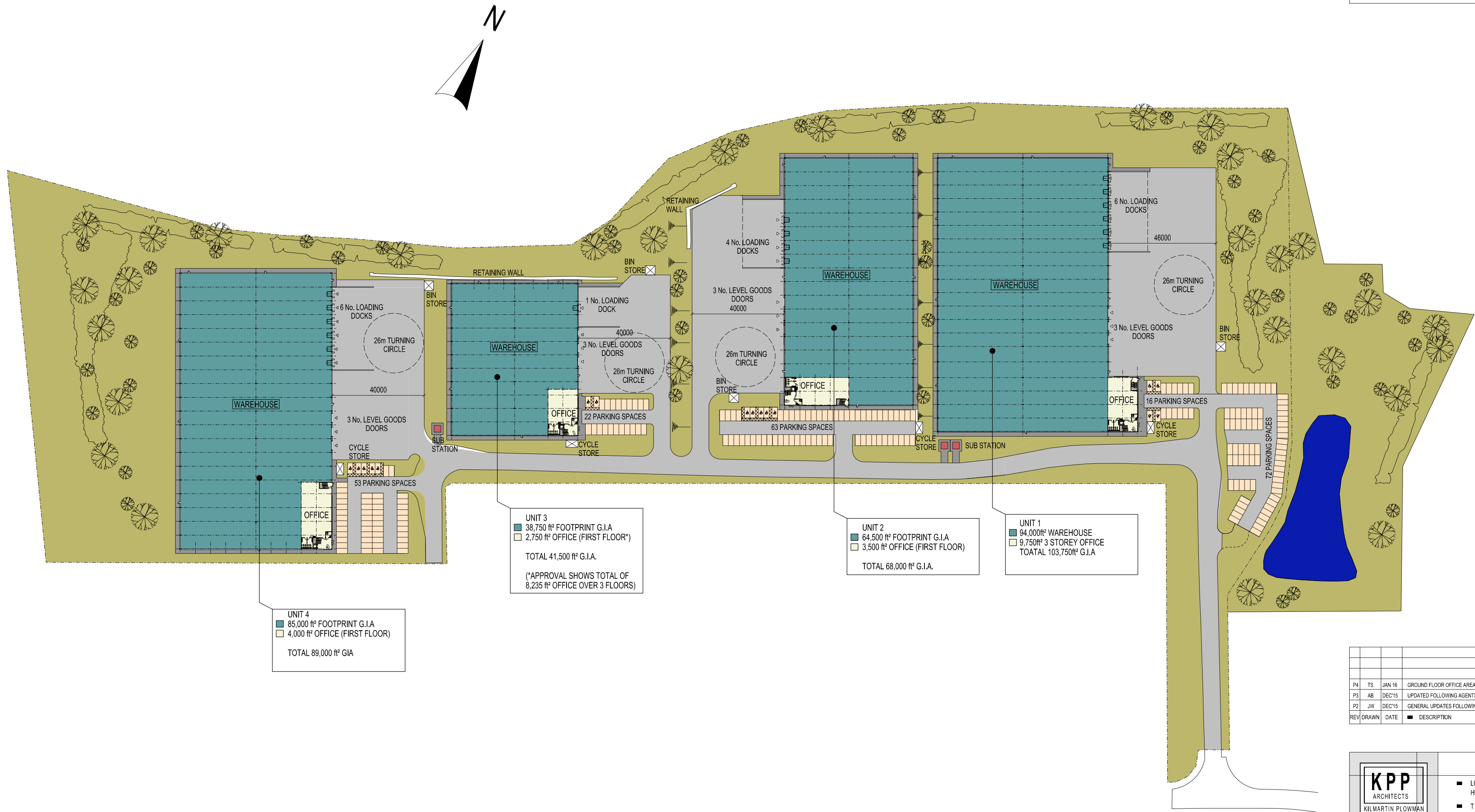
White
Young
Green

Project:
PLOT B
WENTWORTH
TANKERSLEY
Drawing Title:
ATTENUATION POND AND
HYDROBRAKE MANHOLE DETAILS

Scale	Drawn	Date	Checked	Date	Approved	Date
AS SHOWN	JR	11.08.08	PS	23.10.08	JS	23.10.08
Project No.	Office	Type	Drawing No.	Revision		
A046060	018	C	018	A		



Appendix D Proposed Site Layout Plan



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WORK AND MATERIALS MUST COMPLY WITH THE CURRENT BUILDING REGULATIONS AND CODES OF PRACTICE AND BE READ IN CONJUNCTION WITH BUILDING SPECIFICATIONS AND OTHER SUB CONTRACTORS INFORMATION.

KPP
ARCHITECTS
KILMARTIN PLOWMAN
& PARTNERS LIMITED

UNIT 4
■ 85,000 ft² FOOTPRINT G.I.A
□ 4,000 ft² OFFICE (FIRST FLOOR)
TOTAL 89,000 ft² G.I.A

UNIT 3
■ 38,750 ft² FOOTPRINT G.I.A
□ 2,750 ft² OFFICE (FIRST FLOOR*)
TOTAL 41,500 ft² G.I.A.
(*APPROVAL SHOWS TOTAL OF 8,235 ft² OFFICE OVER 3 FLOORS)

UNIT 2
■ 64,500 ft² FOOTPRINT G.I.A
□ 3,500 ft² OFFICE (FIRST FLOOR)
TOTAL 68,000 ft² G.I.A.

UNIT 1
■ 94,000ft² WAREHOUSE
□ 9,750ft² 3 STOREY OFFICE
TOATAL 103,750ft² G.I.A

REV	DRAWN	DATE	DESCRIPTION
P4	TS	JAN 16	GROUND FLOOR OFFICE AREAS REMOVED
P3	AB	DEC'15	UPDATED FOLLOWING AGENTS COMMENTS
P2	JW	DEC'15	GENERAL UPDATES FOLLOWING CLIENT MEETING

KPP
ARCHITECTS
KILMARTIN PLOWMAN
& PARTNERS LIMITED

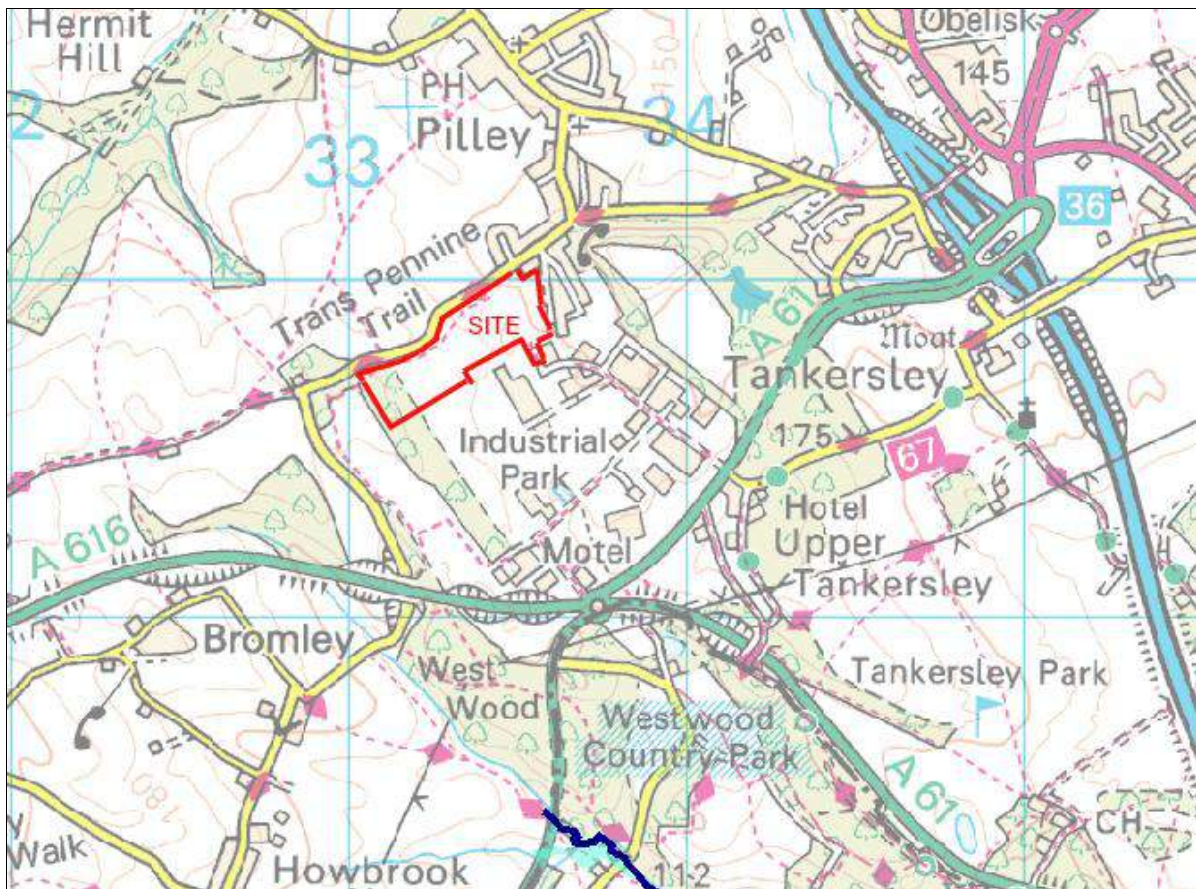
- LODGE HOUSE 12 TOWN STREET
HORSFORTH LEEDS LS18 4RJ
- T : 0113 239 0460 F : 0113 239 0475
- E : architects@kpp-leeds.co.uk
- W : www.kpp-leeds.co.uk

PROJECT TITLE	TANKERSLEY PARK BARNSELEY
TITLE	SITE PLAN

FILE STATUS	PLANNING	SCALE	1:1250 @ A2	DRAWN	AS
PROJECT	1979	DRAWING	201	DATE	NOV'15
REVISION					P6



Appendix E Environment Agency Flood Map



Flood Map obtained from Environment Agency website (December 2015)



Appendix F – Windes Microdrainage Calculations

JPG (Leeds) Limited					Page 1	
5 John Charles Way Leeds LS12 6QA			TANKERSLEY POND DESIGN CHECK			
Date 17.12.15 File 4776.01 - Pond.srcx			Designed by AMF Checked by			
XP Solutions			Source Control 2015.1			
Summary of Results for 30 year Return Period						
Storm Event		Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer		154.833	1.183	57.7	587.2	0 K
30 min Summer		155.030	1.380	57.7	756.8	0 K
60 min Summer		155.182	1.532	57.7	905.1	0 K
120 min Summer		155.268	1.618	57.7	995.3	0 K
180 min Summer		155.269	1.619	57.7	997.0	0 K
240 min Summer		155.252	1.602	57.7	978.7	0 K
360 min Summer		155.205	1.555	57.7	929.2	0 K
480 min Summer		155.155	1.505	57.7	877.6	0 K
600 min Summer		155.102	1.452	57.7	824.8	0 K
720 min Summer		155.046	1.396	57.7	771.7	0 K
960 min Summer		154.930	1.280	57.7	668.0	0 K
1440 min Summer		154.696	1.046	57.7	483.8	0 K
2160 min Summer		154.387	0.737	57.4	287.2	0 K
2880 min Summer		154.165	0.515	54.9	176.2	0 K
4320 min Summer		153.948	0.298	48.0	89.3	0 K
5760 min Summer		153.895	0.245	38.9	70.9	0 K
7200 min Summer		153.866	0.216	32.8	61.2	0 K
8640 min Summer		153.846	0.196	28.5	54.9	0 K
10080 min Summer		153.832	0.182	25.2	50.5	0 K
15 min Winter		154.925	1.275	57.7	663.2	0 K
30 min Winter		155.136	1.486	57.7	858.8	0 K
Storm Event		Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer		68.720	0.0	639.6	21	
30 min Summer		45.545	0.0	848.0	35	
60 min Summer		28.921	0.0	1077.8	64	
120 min Summer		17.839	0.0	1329.7	122	
180 min Summer		13.302	0.0	1487.3	162	
240 min Summer		10.751	0.0	1602.7	194	
360 min Summer		7.934	0.0	1774.1	258	
480 min Summer		6.394	0.0	1906.3	326	
600 min Summer		5.405	0.0	2014.3	392	
720 min Summer		4.710	0.0	2106.2	460	
960 min Summer		3.787	0.0	2258.4	590	
1440 min Summer		2.782	0.0	2488.5	838	
2160 min Summer		2.041	0.0	2739.1	1188	
2880 min Summer		1.637	0.0	2929.1	1528	
4320 min Summer		1.198	0.0	3215.7	2204	
5760 min Summer		0.960	0.0	3434.2	2936	
7200 min Summer		0.807	0.0	3611.8	3672	
8640 min Summer		0.701	0.0	3762.6	4336	
10080 min Summer		0.622	0.0	3896.6	5136	
15 min Winter		68.720	0.0	716.4	21	
30 min Winter		45.545	0.0	949.9	35	
©1982-2015 XP Solutions						

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5 John Charles Way Leeds LS12 6QA		TANKERSLEY POND DESIGN CHECK			
Date 17.12.15 File 4776.01 - Pond.srcx		Designed by AMF Checked by			
XP Solutions		Source Control 2015.1			
Summary of Results for 30 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	155.305	1.655	57.7	1036.3	0 K
120 min Winter	155.414	1.764	57.7	1161.5	0 K
180 min Winter	155.431	1.781	57.7	1182.1	0 K
240 min Winter	155.411	1.761	57.7	1158.2	0 K
360 min Winter	155.347	1.697	57.7	1082.9	0 K
480 min Winter	155.275	1.625	57.7	1003.2	0 K
600 min Winter	155.195	1.545	57.7	918.0	0 K
720 min Winter	155.109	1.459	57.7	831.6	0 K
960 min Winter	154.927	1.277	57.7	665.3	0 K
1440 min Winter	154.558	0.908	57.7	389.7	0 K
2160 min Winter	154.137	0.487	54.3	163.7	0 K
2880 min Winter	153.946	0.296	47.8	88.4	0 K
4320 min Winter	153.876	0.226	35.1	64.7	0 K
5760 min Winter	153.845	0.195	28.1	54.5	0 K
7200 min Winter	153.825	0.175	23.7	48.2	0 K
8640 min Winter	153.811	0.161	20.6	44.0	0 K
10080 min Winter	153.800	0.150	18.3	40.7	0 K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	28.921	0.0	1207.2	64	
120 min Winter	17.839	0.0	1489.2	120	
180 min Winter	13.302	0.0	1665.7	176	
240 min Winter	10.751	0.0	1795.1	228	
360 min Winter	7.934	0.0	1987.0	282	
480 min Winter	6.394	0.0	2135.1	356	
600 min Winter	5.405	0.0	2256.0	430	
720 min Winter	4.710	0.0	2359.0	500	
960 min Winter	3.787	0.0	2529.5	634	
1440 min Winter	2.782	0.0	2787.2	872	
2160 min Winter	2.041	0.0	3067.8	1192	
2880 min Winter	1.637	0.0	3280.7	1472	
4320 min Winter	1.198	0.0	3601.7	2204	
5760 min Winter	0.960	0.0	3846.3	2936	
7200 min Winter	0.807	0.0	4045.2	3584	
8640 min Winter	0.701	0.0	4214.2	4336	
10080 min Winter	0.622	0.0	4364.4	5016	
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5 John Charles Way Leeds LS12 6QA	TANKERSLEY POND DESIGN CHECK	
Date 17.12.15 File 4776.01 - Pond.srcx	Designed by AMF Checked by	
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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.800	Shortest Storm (mins)	15
Ratio R	0.360	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 4.970

Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)
0 4	2.485	4 8	2.485

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Source Control 2015.1		

Model Details

Storage is Online Cover Level (m) 156.500

Tank or Pond Structure

Invert Level (m) 153.650

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	246.0	2.850	2120.0

Hydro-Brake Optimum® Outflow Control

Unit Reference	MD-SHE-0284-5790-3050-5790
Design Head (m)	3.050
Design Flow (l/s)	57.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	284
Invert Level (m)	153.650
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	3.050	57.7
Flush-Flo™	0.883	57.7
Kick-Flo®	1.873	45.6
Mean Flow over Head Range	-	50.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	8.9	1.200	56.7	3.000	57.3	7.000	86.4
0.200	29.3	1.400	55.2	3.500	61.7	7.500	89.3
0.300	48.1	1.600	52.6	4.000	65.8	8.000	92.2
0.400	52.0	1.800	48.1	4.500	69.7	8.500	94.9
0.500	54.6	2.000	47.1	5.000	73.3	9.000	97.6
0.600	56.2	2.200	49.3	5.500	76.8	9.500	100.2
0.800	57.6	2.400	51.4	6.000	80.1		
1.000	57.5	2.600	53.4	6.500	83.3		

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5 John Charles Way Leeds LS12 6QA		TANKERSLEY POND DESIGN CHECK			
Date 17.12.15 File 4776.01 - Pond.srcx		Designed by AMF Checked by			
XP Solutions		Source Control 2015.1			
Summary of Results for 100 year Return Period (+20%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	155.214	1.564	57.7	937.8	0 K
30 min Summer	155.476	1.826	57.7	1236.2	0 K
60 min Summer	155.695	2.045	57.7	1525.2	0 K
120 min Summer	155.851	2.201	57.7	1754.9	0 K
180 min Summer	155.899	2.249	57.7	1828.0	0 K
240 min Summer	155.902	2.252	57.7	1833.9	0 K
360 min Summer	155.865	2.215	57.7	1775.8	0 K
480 min Summer	155.827	2.177	57.7	1717.0	0 K
600 min Summer	155.789	2.139	57.7	1660.4	0 K
720 min Summer	155.751	2.101	57.7	1605.6	0 K
960 min Summer	155.673	2.023	57.7	1495.1	0 K
1440 min Summer	155.491	1.841	57.7	1255.6	0 K
2160 min Summer	155.172	1.522	57.7	895.2	0 K
2880 min Summer	154.868	1.218	57.7	615.7	0 K
4320 min Summer	154.371	0.721	57.3	278.1	0 K
5760 min Summer	154.082	0.432	53.0	140.4	0 K
7200 min Summer	153.947	0.297	47.9	88.7	0 K
8640 min Summer	153.909	0.259	41.5	75.6	0 K
10080 min Summer	153.884	0.234	36.6	67.1	0 K
15 min Winter	155.324	1.674	57.7	1057.2	0 K
30 min Winter	155.602	1.952	57.7	1398.1	0 K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	106.641	0.0	992.9	22	
30 min Summer	71.361	0.0	1329.0	36	
60 min Summer	45.589	0.0	1699.0	66	
120 min Summer	28.149	0.0	2098.2	124	
180 min Summer	20.935	0.0	2340.7	182	
240 min Summer	16.856	0.0	2512.8	242	
360 min Summer	12.354	0.0	2762.6	316	
480 min Summer	9.912	0.0	2955.4	380	
600 min Summer	8.349	0.0	3111.6	444	
720 min Summer	7.253	0.0	3243.6	512	
960 min Summer	5.803	0.0	3460.3	650	
1440 min Summer	4.230	0.0	3783.8	924	
2160 min Summer	3.078	0.0	4129.8	1296	
2880 min Summer	2.453	0.0	4388.4	1644	
4320 min Summer	1.778	0.0	4772.1	2296	
5760 min Summer	1.414	0.0	5059.4	2944	
7200 min Summer	1.183	0.0	5289.9	3672	
8640 min Summer	1.022	0.0	5483.5	4400	
10080 min Summer	0.903	0.0	5657.1	5136	
15 min Winter	106.641	0.0	1112.1	22	
30 min Winter	71.361	0.0	1488.6	36	
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5 John Charles Way Leeds LS12 6QA		TANKERSLEY POND DESIGN CHECK			
Date 17.12.15 File 4776.01 - Pond.srcx		Designed by AMF Checked by			
XP Solutions		Source Control 2015.1			
Summary of Results for 100 year Return Period (+20%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	155.835	2.185	57.7	1729.7	0 K
120 min Winter	156.010	2.360	57.7	2008.9	0 K
180 min Winter	156.071	2.421	57.7	2111.4	0 K
240 min Winter	156.086	2.436	57.7	2137.5	0 K
360 min Winter	156.061	2.411	57.7	2094.2	0 K
480 min Winter	156.010	2.360	57.7	2008.9	0 K
600 min Winter	155.965	2.315	57.7	1934.7	0 K
720 min Winter	155.918	2.268	57.7	1858.0	0 K
960 min Winter	155.812	2.162	57.7	1695.8	0 K
1440 min Winter	155.559	1.909	57.7	1341.4	0 K
2160 min Winter	155.042	1.392	57.7	768.3	0 K
2880 min Winter	154.562	0.912	57.7	391.8	0 K
4320 min Winter	154.014	0.364	50.8	113.6	0 K
5760 min Winter	153.909	0.259	41.5	75.6	0 K
7200 min Winter	153.874	0.224	34.7	64.0	0 K
8640 min Winter	153.853	0.203	30.0	57.2	0 K
10080 min Winter	153.838	0.188	26.6	52.3	0 K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	45.589	0.0	1902.9	64	
120 min Winter	28.149	0.0	2350.0	122	
180 min Winter	20.935	0.0	2621.6	180	
240 min Winter	16.856	0.0	2814.4	236	
360 min Winter	12.354	0.0	3094.1	344	
480 min Winter	9.912	0.0	3310.0	432	
600 min Winter	8.349	0.0	3485.0	472	
720 min Winter	7.253	0.0	3632.8	550	
960 min Winter	5.803	0.0	3875.6	704	
1440 min Winter	4.230	0.0	4237.9	1010	
2160 min Winter	3.078	0.0	4625.4	1364	
2880 min Winter	2.453	0.0	4915.1	1672	
4320 min Winter	1.778	0.0	5344.9	2252	
5760 min Winter	1.414	0.0	5666.5	2936	
7200 min Winter	1.183	0.0	5924.6	3672	
8640 min Winter	1.022	0.0	6141.6	4328	
10080 min Winter	0.903	0.0	6336.1	5112	
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Model Details

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Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
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Hydro-Brake Optimum® Outflow Control

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0.300	48.1	1.600	52.6	4.000	65.8	8.000	92.2
0.400	52.0	1.800	48.1	4.500	69.7	8.500	94.9
0.500	54.6	2.000	47.1	5.000	73.3	9.000	97.6
0.600	56.2	2.200	49.3	5.500	76.8	9.500	100.2
0.800	57.6	2.400	51.4	6.000	80.1		
1.000	57.5	2.600	53.4	6.500	83.3		

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