
**VALLEY ROAD / STATION ROAD,
WOMBWELL, BARNSELY**

FLOOD RISK ASSESSMENT AND DRAINAGE STATEMENT

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VALLEY ROAD OFF STATION ROAD WOMBWELL, BARNSELEY

2. INTRODUCTION

3. It is proposed to redevelop land at Valley Road, off Station Road in Wombwell and this report has been commissioned to determine whether the site will be affected by flooding or cause others to flood.
4. This report should be read in conjunction with the architect's (Chris Carr Associates) Layout '21.75 P1' and the topographical survey: drawing 'BHL_010_Wombwell' prepared by Holden Surveys Ltd.

5. LOCATION AND SITE DESCRIPTION

6. Valley Road is an industrial estate served from Station Road, a few hundred metres northeast of Wombwell town centre. Station Road is classified as the B6096 and runs between Wombwell and Darfield through an area known as Low Valley – all part of the larger (river) Dearne Valley.
7. The site is currently being used for light industrial use, fabricating windows in a factory unit covering a large portion of the site.
8. Adjacent to this site there are other industrial units to the north and east, residential properties on the south and a sports ground to the west.

9. EXISTING TOPOGRAPHY

10. The site, in general, is regular in shape measuring approximately 165m by 180 metres and covers an overall area of around 3.16 hectares.
11. The site is situated on high ground with ground levels around the factory at 27.8m [*all levels relate to OS Orthometric Hts*]. The boundary along the northern side is around the highest (un-mounded) ground level on the industrial estate at around 29.1 metres. Beyond this to the north the land falls away.

12. The levels along the boundary with the sports ground at the rear lie typically between 26.5m and 27metres. There is however a two metre high mounded bund along the inside of the boundary fence (top: 28.9m nom.), which correlates to a 'flood defence line' shown on the Environment Agency's "Flood Zone Maps". This bund wraps around the southwest corner to form a physical barrier between the industrial unit and some of the residential properties (35 to 59 Station Road).
13. Elsewhere along the southern side of the site levels fall from the factory level of 27.8m to the boundary that is around 25.7 metres in the area of the remaining properties and 26.3m in the area fronting Station Road.
14. To the east, the land falls away towards Bulling Dike, which is just outside the industrial estate's boundary. Levels along the boundary in this location are around 25.4m and the bed of the watercourse is 1.8 metres lower at 23.6m. Bulling Dike flows southeast passing beneath Station Road in a culverted section. Station Road in this location is also at a level of around 25.4m.

15. EXISTING DRAINAGE

16. The existing site drains to separate foul and surface water public sewers in Valley Road. Foul sewers join combined sewers in Station Road and beyond. The surface water sewer outfalls to Bulling Dike.
17. The building on site covers an area of 6,449 square metres and the yard around it a further 8,032 square metres, a total of 14,481 square metres. Calculation show that during a 1 in 2-year storm flows of around 240 litres per second would be produced (61.3mm/hr) and around 185 l/s during a 1-year storm. Calculation also shows that this part of the industrial estate draining to Bulling Dike via a 675mm diameter public surface water sewer would produce a flow of 437 litres per second and would appear not to surcharge during larger 1 in 30-year storms. Adequate pipe sizes indicate there is no flow attenuation on the existing sewer network.

18. ADDITIONAL CONSIDERATIONS

19. The Environment Agency's Indicative Flood Zone Map shows the proposed development site along with other large areas in this region to be affected by flooding. And whilst large areas do flood the map is somewhat in accurate in this precise area; for example the site is shown to flood whereas the lower land between the site and Bulling Dike does not.

20. During 1 in 100-year storms (1% likely annual occurrence) Bulling Dike does surcharge and flood waters pass over Station Road affecting the public house and low-lying properties (126-132 Station Road) if not protected. It is suggested that during such storms flood levels reach a level of around 25.3m to 25.4 metres. *[Note levels related to OS Orthometric Hts appear to be around 400mm lower than levels relating to OS Benchmarks, which due to subsidence are thought to be no longer accurate in this particular area]*

21. In June 2007 the area was severely affected by large storms. The Environment Agency quotes:

15/6/2007

Cannon Hall 61mm of rain in 24 hours

Harley (M1 Junction 35A) 115mm of rain in 48 hours

25/6/2007

Cannon Hall 80mm of rain in 24 hours

Harley (M1 Junction 35A) 84mm of rain in 24 hours

Both storms were typically less than 1% likely annual occurrence (1 in 100-years) but within the space of 10 days.

22. Local enquiries following the June storms identified flood levels extending to the Station Road / Valley Road junction to a level of around 26.25m – flood water 850 to 900mm deep on Station Road in the location of the dike. (For reference, this flood level is shown on the architect's Layout drawing.)

23. The flood also extended to the north of the industrial estate and into the sports ground on the west of the development site but not quite reaching the site boundary.

24. PROPOSALS

25. The development proposed is for 130 new dwellings located in the central (2.44 Ha) part of the site screened all around by a 10m landscaping belt. It is proposed to serve the dwellings with new estate roads and courtyards.

26. Requirement H3 of the Building Regulations 2000 specifies a hierarchy for the disposal of surface water. In brief, this states that consideration should first be given to soakaways, infiltration systems and other Sustainable Drainage Systems (SUDS).

27. The site consists of made-ground over some gravel and mudstone beneath. With this in mind and with the level of the site being higher than adjacent properties it is felt that if large amounts of rainwater is put directly to ground, it could create problems for others. It is therefore considered that only small areas such as individual drives and footpaths are

allowed to run off and drain into garden areas via 'French drain' or infiltration trenches and that all roofs and roads should be drained to sewers.

28. The total roof and road area amounts to 12,440 square metres (39.4% of development site) and is substantially less than the existing factory and yard (14,481 m²). Calculation shows that this area would create flows of around 161 litres per second during a 1-year storm (47.7 mm/hr) compared to around 185 l/s for the existing use and would more than satisfy a like-for-like condition
29. However, it is recognised that the valley is severely affected by flooding causing problems for others and although measures taken on this site can not alleviate them altogether some improvements can be made.
30. It is proposed to drain the site to Bulling Dike via a Hydro-brake flow control and through a balancing pond. The pond to be positioned in an area of 'Public Open Space' will be flat bottomed with gentle side slopes, not exceeding 1 in 7 and not deeper than 1m. For lighter storms, water will flow through the pond as a stream in an open channel. Draft proposals indicate that the pond will have a volume of around 1,850 cubic metres.
31. Using a 375mm type MD4 Hydro-brake flow control calculation shows that during a 1 in 100-year storm 368 cubic metres of water will need to be stored during the critical 180 minute winter storm. Rainfall during this storm is shown to be 17.56mm/hr.
32. For comparison purposes a 1 in 225-year storm has a rainfall intensity of 21.08mm/hr for the same storm and is seen to be around 20% greater than the 1 in 100-year and could be used as indicator of climate change. Calculation show that for this storm the required storage increases from 368 to 430 cubic metres.
33. During this larger storm, the calculation shows a maximum water depth of 300mm in the pond and a peak outflow to Bulling Dike at around 57 litres per second.
34. The proposed pond will be as much of a landscape feature as a balancing pond explaining the great oversize but nonetheless a usable feature in extreme conditions such as the storm-on-storm situation experienced in June 2007 or when the downstream watercourses are in flood. With a drained area of 12,440 square metres from the development, 100mm of rainfall would produce 1,244 cubic metres of water – approximately two thirds of the pond's volume.
35. The extreme floods of June 2007 saw flood water extend across the Station Road / Valley Road junction with water around 350mm deep (at the centre line of Valley Road - level 25.9m). With this in mind, it is proposed to create a footpath link / emergency access from the new development to Station Road by the side of 79 Station Road.

36. It is a recommended good practise to construct ground floor levels of new properties at least 600mm above any known flood levels. Although the combined flood from the two storms in June 08 was an extreme situation – far less than a 1% annual chance, the water level in this location is probably the highest on record and should therefore be the datum. With a flood level of 26.25m it is suggested that any new properties should be constructed with a floor level not less than 26.85 metres (OS Orthometric Hts). Levels in the area of the existing factory are typically 27.6m to 27.8 metres and it is in this area that most of the new properties will be built and will be seen to be far above the recommended minimum levels.

37. SUMMARY AND CONCLUSIONS

38. It is proposed to redevelop land at Valley Road, off Station Road in Wombwell by demolishing an existing factory and constructing new residential housing

39. The site covers an overall area of around 3.16 hectares with the existing factory and yards covering approximately 14,481 square metres. It is proposed to create an extensive landscape area around the perimeter of the site and develop a central area of around 2.44Ha which will provide total roof and road area of 12,440 square metres (39.4% of development site).

40. . The site falls within the Dearne Valley, which has recently seen extensive flooding albeit the proposed development site lies above this level.

41. To site is currently drained unrestricted to Bulling Dike, which is just outside the industrial estate's boundary and typically, at least once a year, will discharge water directly to the dike at a rate exceeding 200 litres per second; and twice this during larger less frequent storms.

42. It is proposed, also, to drain the new development to Bulling Dike but via a flow control and through a feature balancing pond – purposefully larger than required for aesthetic reasons. The results of which is that water during the largest of storms (1 in 100-years plus 20% for the unknowns of climate change) will discharge to Bulling Dike at a maximum rate of 57 litres per second.

43. The size of the pond is such that in time of severe flood downstream, it will store all the water from a typically storm of greater magnitude than 1 in 100-years (less than 1% chance of occurrence per year).

44. Proposed properties will have floor levels more than 600mm above any known flood level – typically 1.5 metres above the extreme flood level of 26.25 metres.

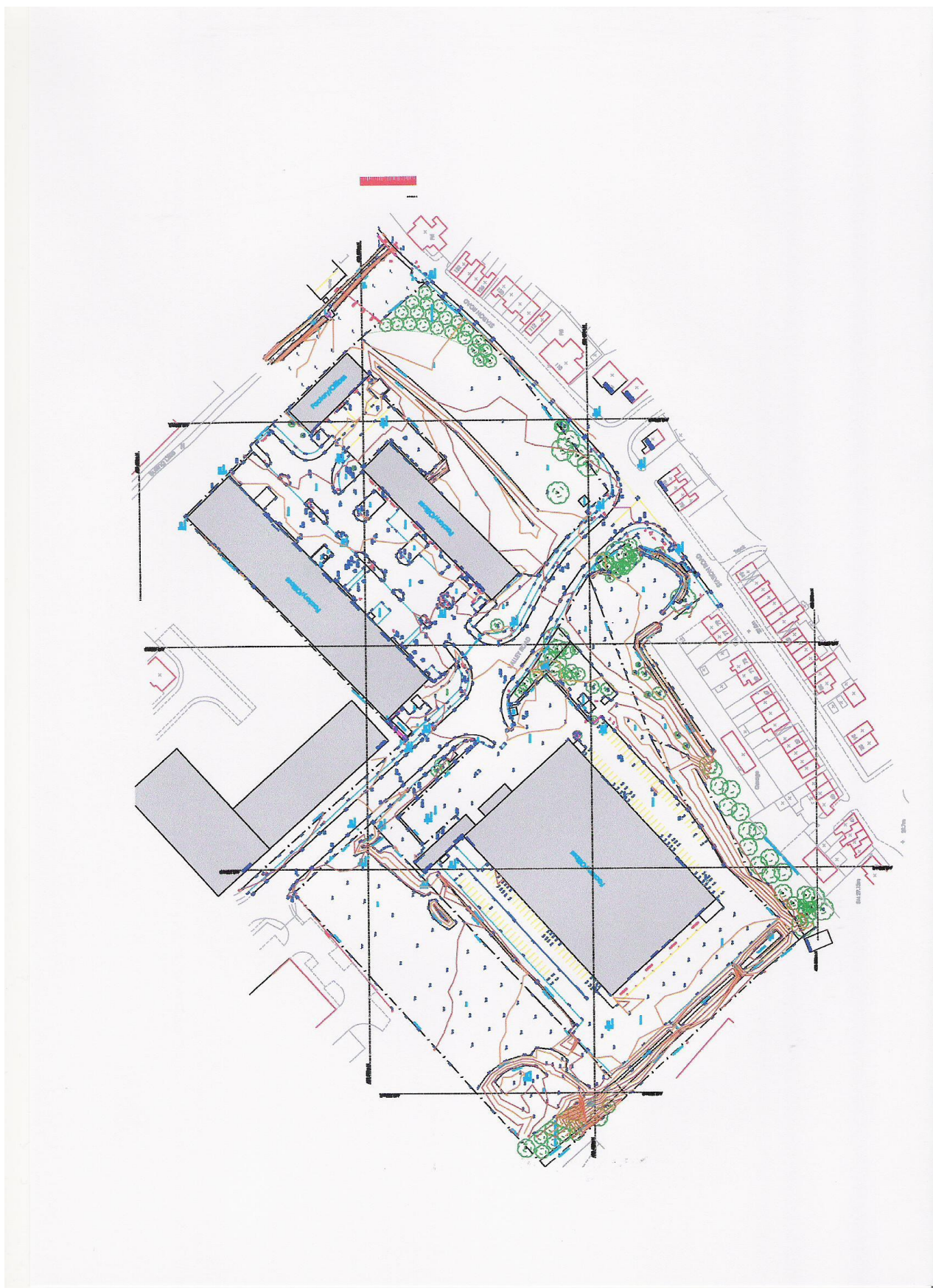
45. If these measures are taken, the properties will be protected from flooding and the development will not cause other surrounding properties to flood. Moreover the proposals are an improvement on existing drainage for the site will provide some minor flood alleviation to other properties in the area.

Michael Stevenson

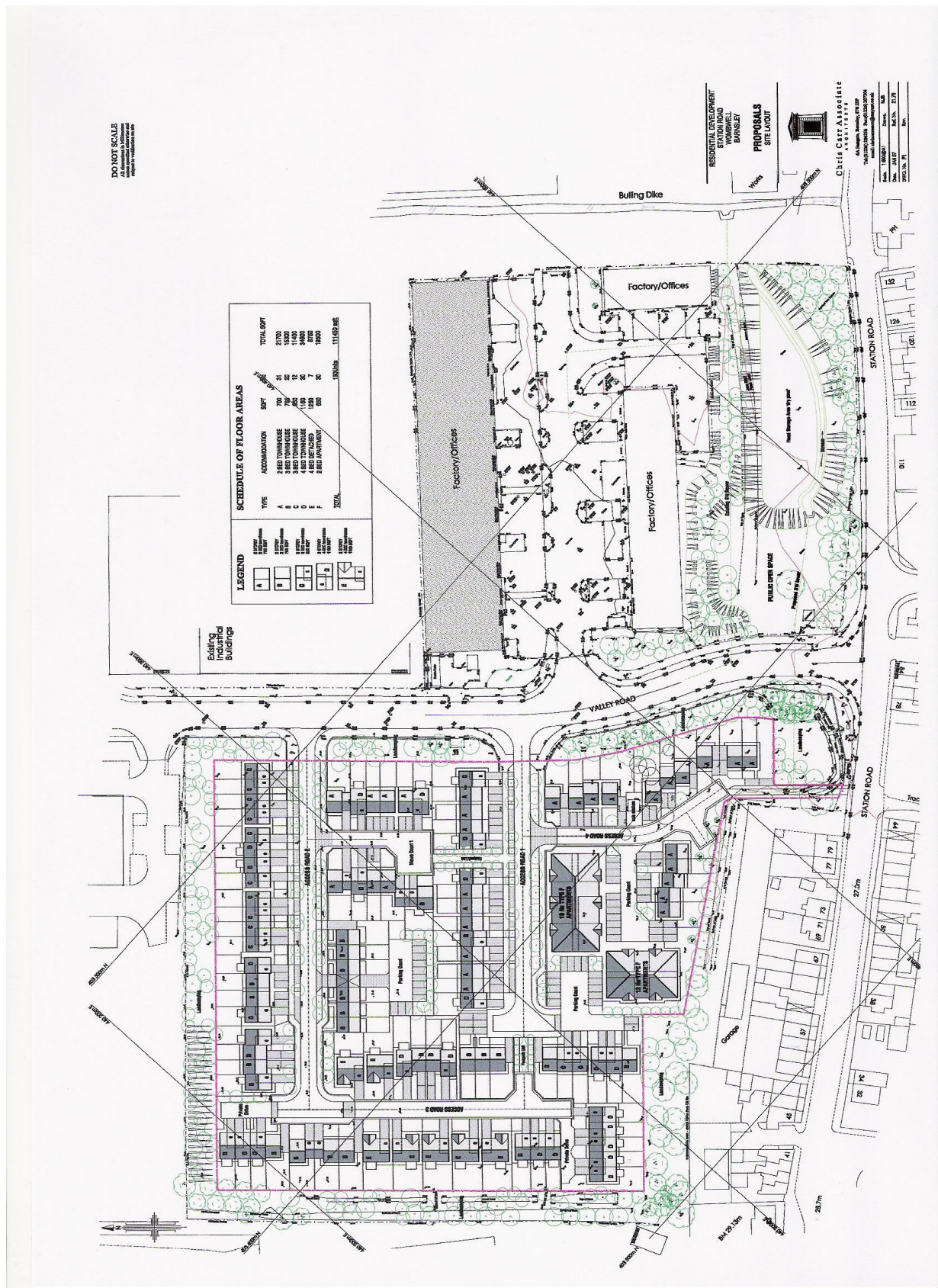
19th December 2007

(The following Appendices are condensed. If full documents or hard copy drawings are required please contact the author)

APPENDIX 1 – SURVEY / LOCATION



APPENDIX 2 – PROPOSED LAYOUT



APPENDIX 3 – PUBLIC SEWER RECORDS



APPENDIX 4 – EXISTING SITE DRAINAGE CALCULATION

Stevenson Associates		Page 1
PO Box 58 Monk Fryston Leeds LS25 5WZ	Valley Road Wombwell Barnsley Existing Sewers (nom)	
Date February 2008 File WOMBWELL EXISTING...	Designed By Stevenson Checked By	
Micro Drainage		System1 W.10.4

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Pipe Size File c:\WinDes\STANDARD.PIP
Manhole Size File c:\WinDes\STANDARD.MHS

Location - England & Wales

Return Period (years)	2
MS-60 (mm)	19.000
Ratio R	0.400
Maximum Rainfall (mm/hr)	200
Foul Sewage (l/s/ha)	0.00
O'flow Setting (*Foul only)	0
Volumetric Runoff Coeff.	0.75
Infiltration #	0
Minimum Backdrop Height (m)	0.200
Depth from Soffit to G.L. (m)	1.200
Min Vel. (m/s - Auto Design Only)	1.00
Min Slope (1:X - Optimisation)	500
Minimum Outfall Invert (m)	24.170
Ground Level at Outfall (m)	25.440
Outfall Manhole Name	Headwall
Outfall Manhole Dia/Length (mm)	0
Outfall Manhole Width (mm)	0

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	126.60	1.200	105.5	1.448	5.00	0.0	0.600	o	450
1.001	58.10	0.400	145.2	0.364	0.00	0.0	0.600	o	525
1.002	110.00	0.725	151.7	0.010	0.00	0.0	0.600	o	675

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	B.Area (ha)	B.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	61.3	6.1	27.000	1.448	0	0	0	1.98	315	240
1.001	59.0	6.6	25.725	1.812	0	0	0	1.86	402	289
1.002	55.6	7.5	25.175	1.822	0	0	0	2.13	761	289

(c) 1982-2006 Micro Drainage

APPENDIX 5 – PROPOSED 100-YEAR STORAGE CALCULATION

Stevenson Associates			Page 1			
PO Box 58		Station Road Wombwell				
Monk Fryston		100 Year				
Leeds LS25 5WZ		Without Climate Change				
Date February 2008		Designed By Stevenson				
File Valley road 100 storage.src		Checked By				
Micro Drainage		Storage Design W.10.4				
<u>Summary of Results for 100 year Return Period</u>						
Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
15 Summer	17.4	17.4	24.5648	0.1647	214.1	O K
30 Summer	25.2	25.2	24.6038	0.2037	270.4	O K
60 Summer	33.5	33.5	24.6308	0.2307	310.8	O K
120 Summer	37.7	37.7	24.6448	0.2447	332.0	O K
180 Summer	39.0	39.0	24.6488	0.2487	338.3	O K
240 Summer	39.0	39.0	24.6488	0.2487	337.9	O K
360 Summer	37.4	37.4	24.6438	0.2437	330.1	O K
480 Summer	35.4	35.4	24.6373	0.2372	320.4	O K
600 Summer	33.5	33.5	24.6308	0.2307	310.4	O K
720 Summer	31.5	31.5	24.6243	0.2242	300.9	O K
960 Summer	28.0	28.0	24.6128	0.2127	284.1	O K
1440 Summer	22.9	22.9	24.5938	0.1937	255.9	O K
2160 Summer	18.8	18.8	24.5723	0.1722	224.6	O K
2880 Summer	16.0	16.0	24.5573	0.1573	203.7	O K
4320 Summer	12.4	12.4	24.5383	0.1383	177.4	O K
5760 Summer	10.1	10.1	24.5263	0.1263	161.1	O K
7200 Summer	8.6	8.6	24.5183	0.1183	150.2	O K
8640 Summer	7.5	7.5	24.5123	0.1123	142.1	O K
10080 Summer	6.5	6.5	24.5073	0.1073	135.4	O K
15 Winter	20.7	20.7	24.5823	0.1822	239.4	O K
30 Winter	31.6	31.6	24.6248	0.2247	301.7	O K
60 Winter	40.6	40.6	24.6543	0.2542	346.3	O K
Storm Duration (mins)	Rain (mm/hr)		Time-Peak (mins)			
15 Summer	95.98		21			
30 Summer	63.05		35			
60 Summer	39.46		60			
120 Summer	23.88		90			
180 Summer	17.56		124			
240 Summer	14.04		158			
360 Summer	10.19		224			
480 Summer	8.12		290			
600 Summer	6.81		354			
720 Summer	5.89		418			
960 Summer	4.68		544			
1440 Summer	3.39		796			
2160 Summer	2.44		1168			
2880 Summer	1.94		1528			
4320 Summer	1.39		2252			
5760 Summer	1.10		2992			
7200 Summer	0.92		3680			
8640 Summer	0.79		4416			
10080 Summer	0.70		5152			
15 Winter	95.98		21			
30 Winter	63.05		34			
60 Winter	39.46		60			
(c) 1982-2006 Micro Drainage						

APPENDIX 6 – 100-YEAR PLUS CLIMATE CHANGE CALCULATION (225-YEAR)

Stevenson Associates			Page 1			
PO Box 58		Station Road Wombwell				
Monk Fryston		100 Year				
Leeds LS25 5WZ		Plus 20 percent				
Date February 2008		Designed By Stevenson				
File STATION ROAD 225.SRC		Checked By				
Micro Drainage		Storage Design W.10.4				
<u>Summary of Results for 225 year Return Period</u>						
Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
15 Summer	22.6	22.6	24.5923	0.1922	253.9	O K
30 Summer	35.4	35.4	24.6373	0.2372	320.2	O K
60 Summer	44.4	44.4	24.6668	0.2667	366.1	O K
120 Summer	49.3	49.3	24.6828	0.2827	391.2	O K
180 Summer	50.4	50.4	24.6863	0.2862	396.5	O K
240 Summer	49.9	49.9	24.6848	0.2847	393.7	O K
360 Summer	47.3	47.3	24.6763	0.2762	380.7	O K
480 Summer	44.6	44.6	24.6673	0.2672	366.5	O K
600 Summer	41.9	41.9	24.6583	0.2582	352.7	O K
720 Summer	39.4	39.4	24.6503	0.2502	340.1	O K
960 Summer	35.0	35.0	24.6358	0.2357	318.3	O K
1440 Summer	28.4	28.4	24.6143	0.2142	285.8	O K
2160 Summer	22.1	22.1	24.5898	0.1897	250.2	O K
2880 Summer	18.8	18.8	24.5723	0.1723	224.6	O K
4320 Summer	14.5	14.5	24.5493	0.1493	192.7	O K
5760 Summer	11.8	11.8	24.5353	0.1353	173.2	O K
7200 Summer	10.1	10.1	24.5263	0.1263	160.6	O K
8640 Summer	8.8	8.8	24.5193	0.1193	151.4	O K
10080 Summer	7.8	7.8	24.5138	0.1138	144.2	O K
15 Winter	28.0	28.0	24.6128	0.2127	283.7	O K
30 Winter	42.8	42.8	24.6613	0.2612	357.2	O K
60 Winter	52.8	52.8	24.6943	0.2942	408.7	O K
Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)				
15 Summer	114.33	21				
30 Summer	75.54	34				
60 Summer	47.44	60				
120 Summer	28.71	88				
180 Summer	21.08	122				
240 Summer	16.81	156				
360 Summer	12.15	222				
480 Summer	9.66	288				
600 Summer	8.08	352				
720 Summer	6.98	414				
960 Summer	5.53	540				
1440 Summer	3.98	786				
2160 Summer	2.86	1164				
2880 Summer	2.26	1528				
4320 Summer	1.62	2248				
5760 Summer	1.27	2952				
7200 Summer	1.06	3680				
8640 Summer	0.91	4408				
10080 Summer	0.80	5144				
15 Winter	114.33	21				
30 Winter	75.54	34				
60 Winter	47.44	58				
(c) 1982-2006 Micro Drainage						

APPENDIX 8 – ENVIRONMENT AGENCY’S INDICATIVE FLOOD ZONE MAP

