Ty Fry Farm, Glebe Road,

Loughor, Phase 2

Flood Consequence Assessment and Drainage Strategy Report

December 2020

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1. INTRODUCTION

1.1 Background

1.1.1 PHG Consulting has been commissioned by Barratt Homes to undertake this Flood Consequences Assessment and Drainage Strategy report to support the residential development of 23 units at the land off Glebe Road, Loughour.

1.1.2 The purpose of the report is to identify existing sources of flood risk to the site and ensure that surface and foul water drainage can be discharged from the site without affecting the downstream catchments detrimentally.

1.1.3 The report demonstrates how the drainage for the development will be discharged and how flows will be managed to prevent increased flood risk.

1.2 Existing Site

1.2.1 The site covers an area of approximately 0.94 ha of currently undeveloped land located at National Grid Reference SS577979. The approximate site location is shown in Figure 1 below.

Figure 1. Site location (approx. OSGB 1936: X = 257790, Y = 197870)

1.2.2 The site topography slopes relatively gently from north-east to south-west. The average gradient is approximately 1 in 14. Ground levels vary from 43.0 m AOD in the east to 53.5 m to the west.

1.3 Surface Water Features

1.3.1 The site is open greenfield.

1.3.2 There is a ditch running along the southern boundary to the west.

1.3.3 The nearest main river or water body to the development is the Afon Lliw, which is located approximately 600 m to the south west of the site.

1.4 Existing drainage

1.4.1 Phase 1 of the development private foul sewer is situated to the north of the site (DCWW reference SS57976925). The DCWW sewer map is included in Appendix C.

1.5 Geology and Hydrogeology

1.5.1 Findings of Phase 1 indicate that infiltration is unlikely to occur. Figure 2 below is an extract from WRAP map showing that the site is located in WRAP Class 3 that is relatively impermeable, permeable soil over rock, or moderately permeable soils with slowly permeable subsoils.

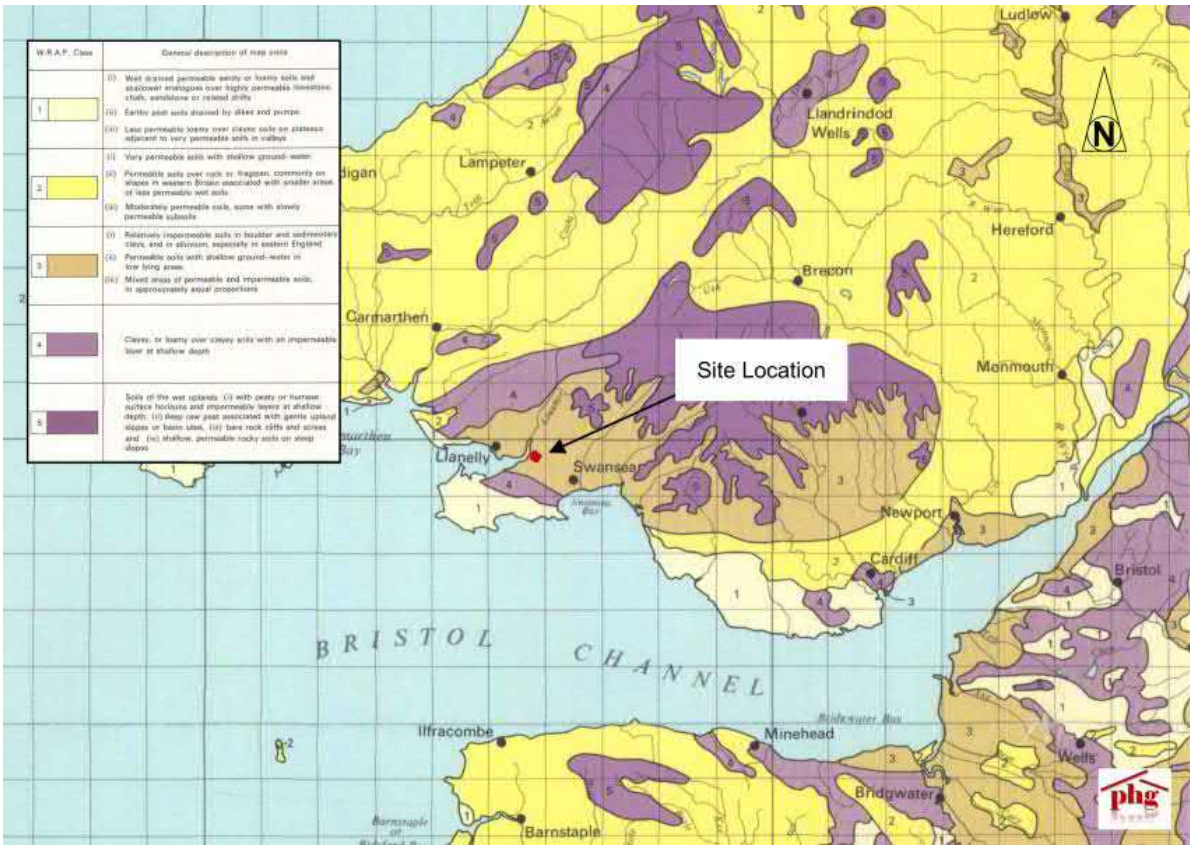

Figure 2. The Wallingford Procedure WRAP Map soil classification extract

1.5.2 To date no site investigation work has been carried out, but this will be undertaken shortly following an initial consultation on planning.

1.5.3 Soil infiltration testing will be carried out as part of this investigation to confirm whether partial infiltration occurs.

1.6 Development Proposals

1.6.1 The proposal comprises the provision of 23 residential units with associated infrastructure. Plan is included in Appendix A.

2. FLOOD CONSEQUENCES ASSESSMENT

2.1 Legislation

2.1.1 TAN 15 is the planning guidance used in Wales to assess flood risk. A requirement of TAN 15 is that developers making planning applications on sites that are potentially at risk from flooding should consult with Natural Resources Wales and produce a Flood Consequence Assessment (FCA) to support their proposals. This assessment has been conducted in accordance with TAN 15: Development and Flood Risk

2.2 Definition of Flood Risk

2.2.1 Flood risk is the product of the likelihood or chance of a flood occurring (flood frequency) and the consequence or impact of the flooding (flood consequence).

2.3 Flood Frequency

2.3.1 Flood frequency is identified in terms of the return period and annual probability. For example, a 1 in 100-year flood event has a 1% annual probability of occurring. Table 1 below provides a conversion between return periods and annual flood probabilities.

Table 1: Flood Probability Conversion Table

Return Period (years)	2	5	10	20	50	100	200	1000
Annual Flood Probability (%)	50	20	10	5	2	1	0.5	0.1

2.4 Flood Zone

2.4.1 The proposed development is located entirely within Zone A on Natural Resources Wales (NRW) flood maps so is at low risk of fluvial or tidal flooding.

2.5 Flood Risk Vulnerability Classification

2.5.1 The proposed development is residential so is classed as highly vulnerable in TAN 15.

2.6 Flood Risk Vulnerability Classification and Flood Zone Compatibility

2.6.1 As indicated by NRW Development Advice Map, the development is located entirely within Zone A the proposed land use is appropriate.

2.6.2 The development is in Flood Zone A, which indicates minimal or no risk of fluvial/tidal flooding.

2.7 Other Sources of Flooding

2.7.1 The site is generally well protected from overland flow by existing topography.

2.7.2 The NRW surface water flood map shows no surface water risk extents within the application area. The development will mimic natural flow conveyance with regards to direction of flow and flow rates.

2.8 Summary of Existing Flood Risk

2.8.1 The proposed development site is at low risk of flooding from rivers, groundwater and overland flows. NRW Flood Map is included in Appendix B.

3. DRAINAGE STRATEGY

3.1 Surface Water Management Approach

3.1.1 Surface water management proposals for the new development have been prepared to meet the following principles:

- Surface water runoff from the site will be restricted to the greenfield QBAR rate for all rainfall events up to and including the 100-year event with 40% increase in rainfall intensity to allow for climate change.
- Natural catchment for the site discharging into the watercourse to the south covers an area of 0.913 ha. Rural runoff rates calculated using ICP SuDS method are presented in Table 2 below.

Table 2. Rural runoff rates

Return period	Rural Runoff Rates ICP SUDS Mean Annual Flood Rate (l/s)
QBAR	6.2
1 in 1 year	5.4
1 in 2 year	5.7
1 in 30 year	10.9
1 in 100 year	13.5

- Natural point of discharge for the site will be maintained post-development. At present, the natural catchment discharges into the ditch south to the development.
- No increase in flooding to people and property elsewhere as a result of the development;
- No surface water flooding within the proposed development in all rainfall events up to and including a 1 in 30-year return period storm;
- Overland flows within the site from rainfall events in exceedance of a 1 in 30-year return period storm are to be managed to minimise risk to people and property, up to the 1 in 100-year return period storm;

- The surface water management proposals are to be designed to allow for a 40% increase in rainfall intensity in the 1 in 100-year rainfall event in the next 100 years.

3.1.2 In accordance with the Defra/EA guidance document 'Preliminary rainfall runoff management for developments' (Kellagher, 2012) and the SuDS Wales Design Guidance, the following approaches were considered (in order of preference):

1 Infiltration to ground via an adequate soakaway or soil infiltration.

3.1.3 Following various Phase 1 site visits with the local authority and local knowledge it has been concluded that infiltration drainage is not feasible. Infiltration rates will be confirmed by a BRE 365 test.

2 Discharge to a watercourse.

3.1.4 There is watercourse to the south of the development. Approx. 97% of the site constitutes natural catchment draining into this watercourse currently.

3 Discharge to a mains sewer.

3.1.5 Sewer records in the area show no appropriate surface water drainage in the area.

3.2 Surface Water Management Strategy

3.2.1 Site Investigation and appropriate infiltration testing will be carried out to confirm the infiltration rates. Based on information collected for phase 1 of the development, infiltration is insufficient to be a sole runoff destination. No infiltration has been assumed in the hydraulic calculations.

3.2.2 Following the guidance G2.30, the final discharge rate for 1 in 100-year event +40% will be restricted to the mean annual flood (QBAR) of 6.2 l/s.

3.2.3 The surface water runoff generated during the extreme rainfall events up to the 1 in 100-year event plus 40% climate change allowance will be managed on site via a network of private permeable paving units, raingardens, dry swales, and attenuation basin. The attenuation has been designed for up to and including the 1 in 100-year storm event with 40% increase in rainfall intensity to allow for climate change.

3.2.4 The scheme is also subject to legislation with regards sustainable surface water management and subject to SAB (SuDS Approval Body) approval via the local authority.

3.2.5 The SAB process will follow the pre-planning consultation and will include a full SAB application via Swansea City Council. The full SAB application will incorporate the sites detailed design.

3.2.6 Hydro-Brake® Optimum is proposed as the flow control chamber.

3.2.7 Proposed discharge rates calculated using FEH rainfall data, are presented in below.

Table 3. Proposed discharge rates

Proposed Discharge Rate FEH Network	
Return period	Proposed rate (l/s)
1 in 2 year	6.1
1 in 30 year	6.1
1 in 100 year	6.2 (accounted for 40% CC)

3.3 Existing Foul Drainage

3.3.1 There is existing Phase 1 private foul drainage to the north of the site that can accommodate Phase 2 flows.

3.4 Proposed Foul Drainage

3.4.1 Based on site topography a gravity connection is not achievable and cannot link to the existing system without pumping station.

3.4.2 Type 3 pumping station will be required.

3.4.3 Proposed foul connection is shown in Figure 3 below.

Figure 3. Proposed foul connection

4. CONCLUSIONS

4.1 Summary

4.1.1 The proposed development site is assessed to be of low risk of flooding from any sources of flooding, including rivers, groundwater, surface water, reservoirs, sewers and overland flows.

4.1.2 The new development is located in the low risk Flood Zone A and is therefore justified.

4.1.3 Infiltration is unlikely to be sufficient to manage runoff via soakaways. Existing ditch to the south of the site is proposed as runoff destination.

4.1.4 The surface water runoff generated during the extreme rainfall events for up to and including the 1 in 100-year event, will be restricted to QBAR 6.2 l/s directed away from proposed facilities and other vulnerable areas of the development, and conveyed into the proposed attenuation structures. The attenuation storage structure will be designed for the 1 in 100-year storm event with 40% increase in rainfall intensity to allow for climate change.

4.1.5 Foul water will discharge from site to the local sewer system via gravity or localised pumping stations.

4.2 Conclusion

4.2.1 It is evident from the report that the development is not at risk of flooding and a surface and foul water drainage solution is available for the site.

APPENDIX A – ENGINEERING LAYOUT

PROPOSED RISING MAIN
TO CONNECT INTO
EXISTING MANHOLE

DRY CONVEYANCE SWALE
SIDE SLOPE 1 in 3
AVERAGE DEPTH = 300 mm
FILTER MEDIUM = min. 400 mm

RAILING

FLOW CONTROL CHAMBER
IL = 43.388 m AOD
DESIGN HEAD = 1.3 m
DESIGN DISCHARGE RATE FOR 1 in
100 YR + 40 % CC TO QBAR = 6.2 l/s
HYDRO-BRAKE® OPTIMUM USED IN
HYDRAULIC DESIGN
REF: MD-SHE-0108-6200-1600-6200

PROPOSED ATTENUATION POND
TOP OF BANK LEVEL = 45.05 m AOD
BASE LEVEL = 43.450 m AOD
MAXIMUM DEPTH = 1.60 m
INTERNAL BANK 1 in 3
EXTERNAL BANK 1 in 2
MAXIMUM ATTENUATION STORAGE: 237 m³

PROPOSED PUMPING STATION COMPOUND.
COVER LEVEL = 46.60m AOD
INLET LEVEL = 43.275m
HWL ALARM = 42.225m (PROVIDING 1.05m STORAGE)
SUMP LEVEL = 41.225m
WET WELL BASE = 40.225m
EMERGENCY STORAGE FOR 23 UNITS @ 240 LITRES /
UNIT = 5.5m³
STORAGE WITHIN 2.7mØ WET WELL
THE COMPOUND FENCING IS WELD MESH MATERIAL
(COLOURED GREEN).
(EXACT COMPOUND LAYOUT TO BE CONFIRMED)

ADOPTED BIORETENTION AREA TAKING
HIGHWAY RUNOFF
PLAN AREA 10.6 m²
FILTER MEDIUM 400 mm
DRAINAGE MEDIUM MIN 250mm

FILTER DRAIN
WIDTH 900 mm

GENERAL NOTES

1. Do Not Scale
2. The contractor is to check and verify all buildings and site dimensions and levels, including sewer invert levels, before works start on site. The contractor is to comply in all aspects with the current building legislation, British Standards, building regulations etc.
3. Positions of existing services/statutory undertakers apparatus adjacent to or crossing proposed excavations are to be checked by the contractor prior to starting work
4. This drawing is to be read in conjunction with and checked against all other drawings, Engineering Details, Specification and any structural, geotechnical or other specialist document provided.
5. Any anomaly or contradiction between any of the above is to be reported to Barratt Homes.
6. This drawing is schematic for clarity only, positions of pipe runs and manholes may vary on site due to site conditions.

ROAD AND SEWER ADOPTION NOTES

1. All works for adoption under a Section 38 Agreement shall be carried out to the approval of the Swansea City Council.
2. All works for adoption under a Section 104 Agreement shall be carried out to the National Water Council guide 'Sewers for Adoption' 7th edition and Dwr Cymru Welsh Water's requirements.
3. Street lighting positions to be pegged on site and agreed by the Local Authority PRIOR to erection commencing.

Legend

- Proposed surface water drain
- Adoptable Foul Sewer & Manhole
- 36.614 — Adoptable rising main
- 38.60 — FFL
- Proposed spot level
- Proposed fall and gradient
- Underbuild
- Tanking
- Tanked retaining wall
- Retaining Wall
- Raingarden
- Bioretention area
- Dry swale
- Root protection area
- Channel / Aco drain or similar approved
- Channel Block
- Filter Drain
- Private surface water inspection chamber <3.0m deep with restricted access depths over 1.2m.
- Catchpit with gully grid
- Permeable paving/porous asphalt
- SuDS Inlet

REV.	DATE	DETAILS	BY.	CHK.
G	27/11/20	Minor amendments	PO	SJD
F	19/11/20	Site Layout Revised, Dwg amended to suit	PO	SJD
E	19/11/20	Drainage amended	PO	SJD
D	12/11/20	Minor amendments	PO	SJD
C	12/11/20	Site Layout Revised, Dwg amended to suit	PO	SJD
B	24/08/20	RPA added. Plot 1 raingarden replaced with porous paving	PO	SJD
A	21/08/20	Pre-SAB Issue	PO	SJD
-	16/07/20	First Issue	PO	SJD

AMENDMENTS

CLIENT:
BARRATT HOMES

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PROJECT:
Barratt Homes
Ty Fry Farm,
Glebe Road, Loughor

DRAWING TITLE:
Engineering Layout

DRAWN:	CHK:	STATUS:	SCALE:
TL	SD	Planning	1:250 @ A1

DATE:	JOB NO.	DRG. NO.	REV.
Jul-20	2071	001	G

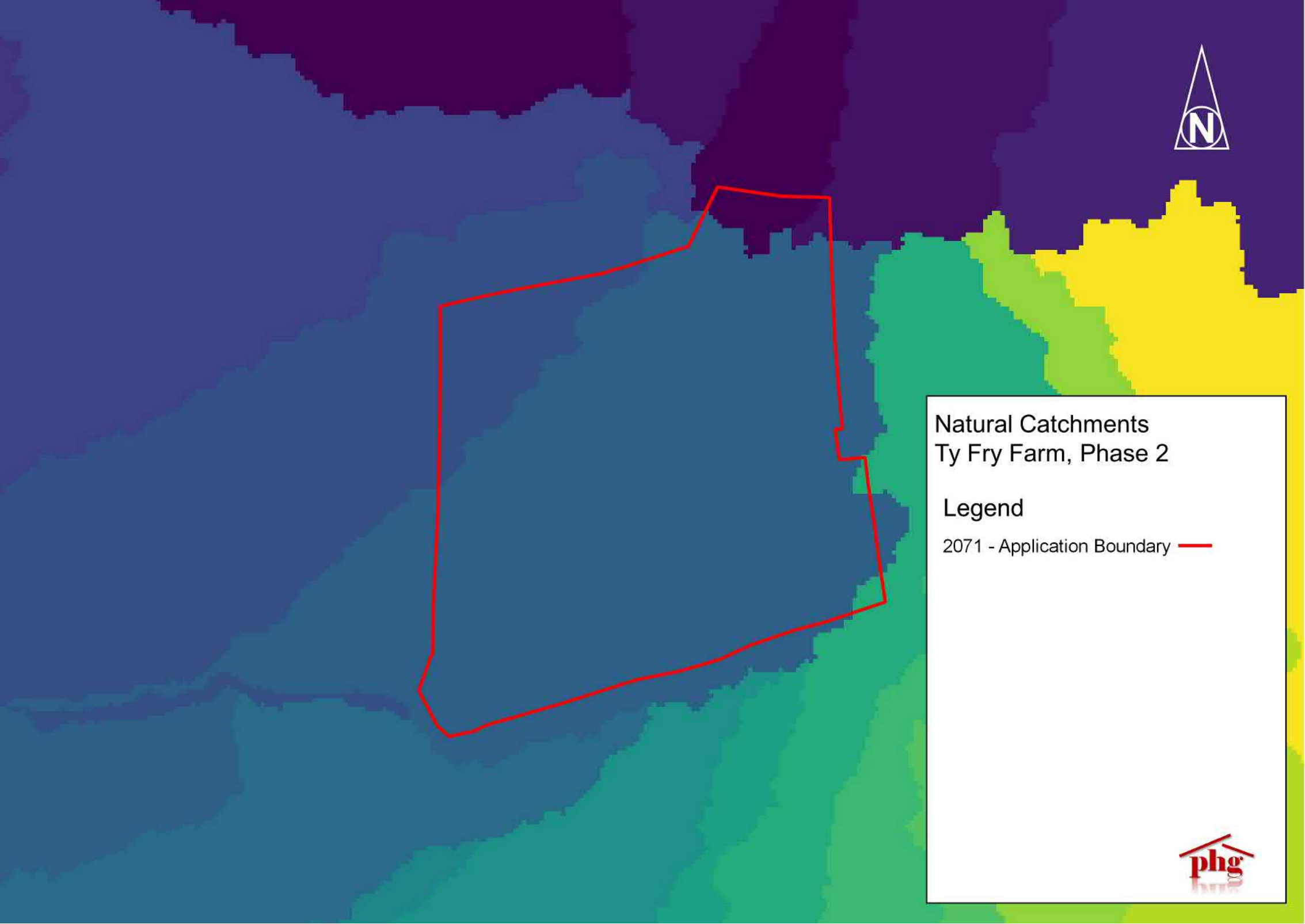
APPENDIX B – NRW FLOOD MAPS

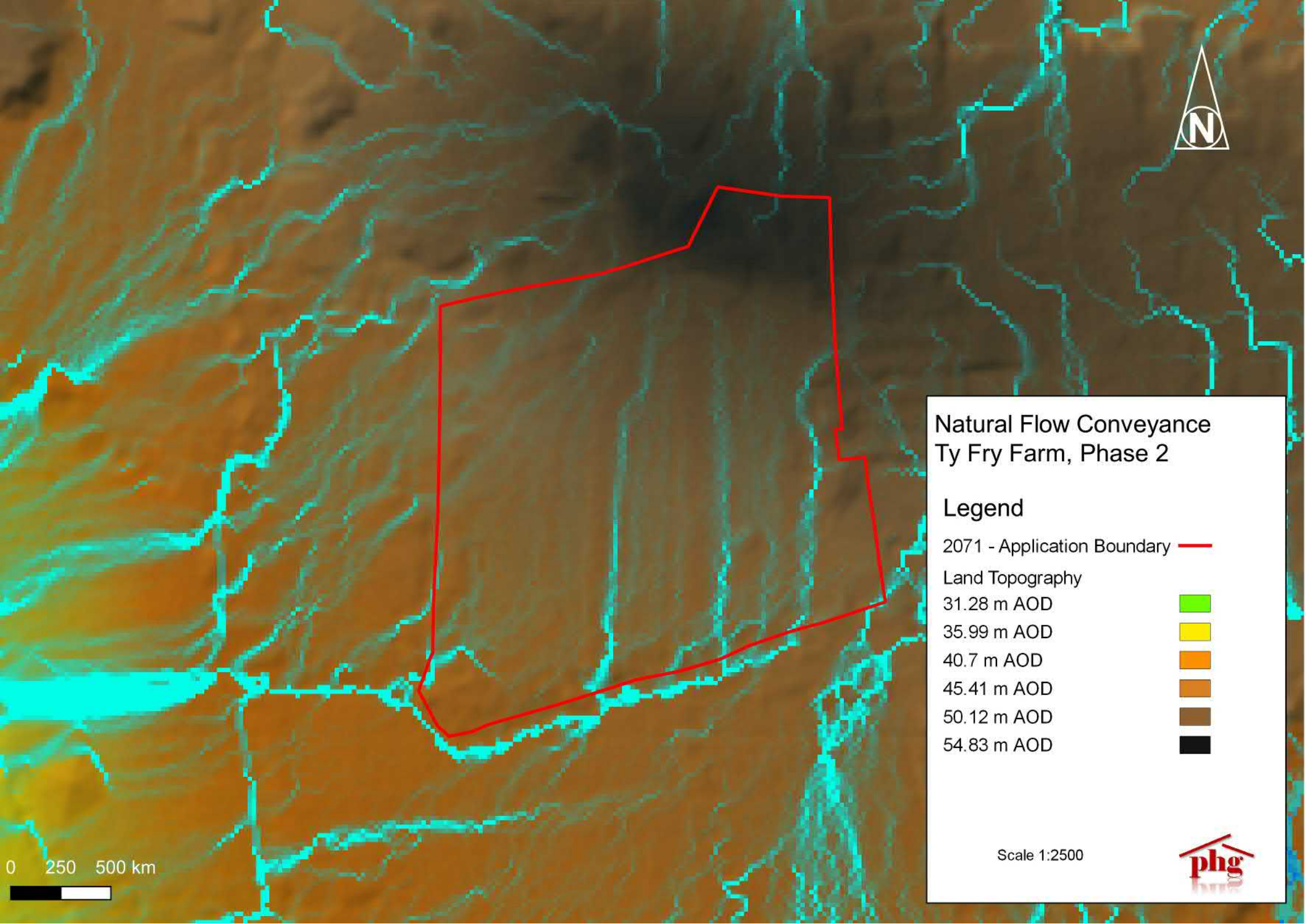

DEVELOPMENT
ADVICE MAP - NRW
Ty Fry Farm, Phase 2
Legend
2071 - Application boundary
NRW_DAM_Zone_B
NRW_DAM_Zone_C1
NRW_DAM_Zone_C2
Scale 1:10000
0
750
1,500 m


N
0
250
500 m
Surface Water Risk - NRW
Ty Fry Farm, Phase 2
Legend
2071-Application boundary
UFMFSW_EXTENT_1in30
UFMFSW_EXTENT_1in100
UFMFSW_EXTENT_1in1000
Scale 1:5000
phg

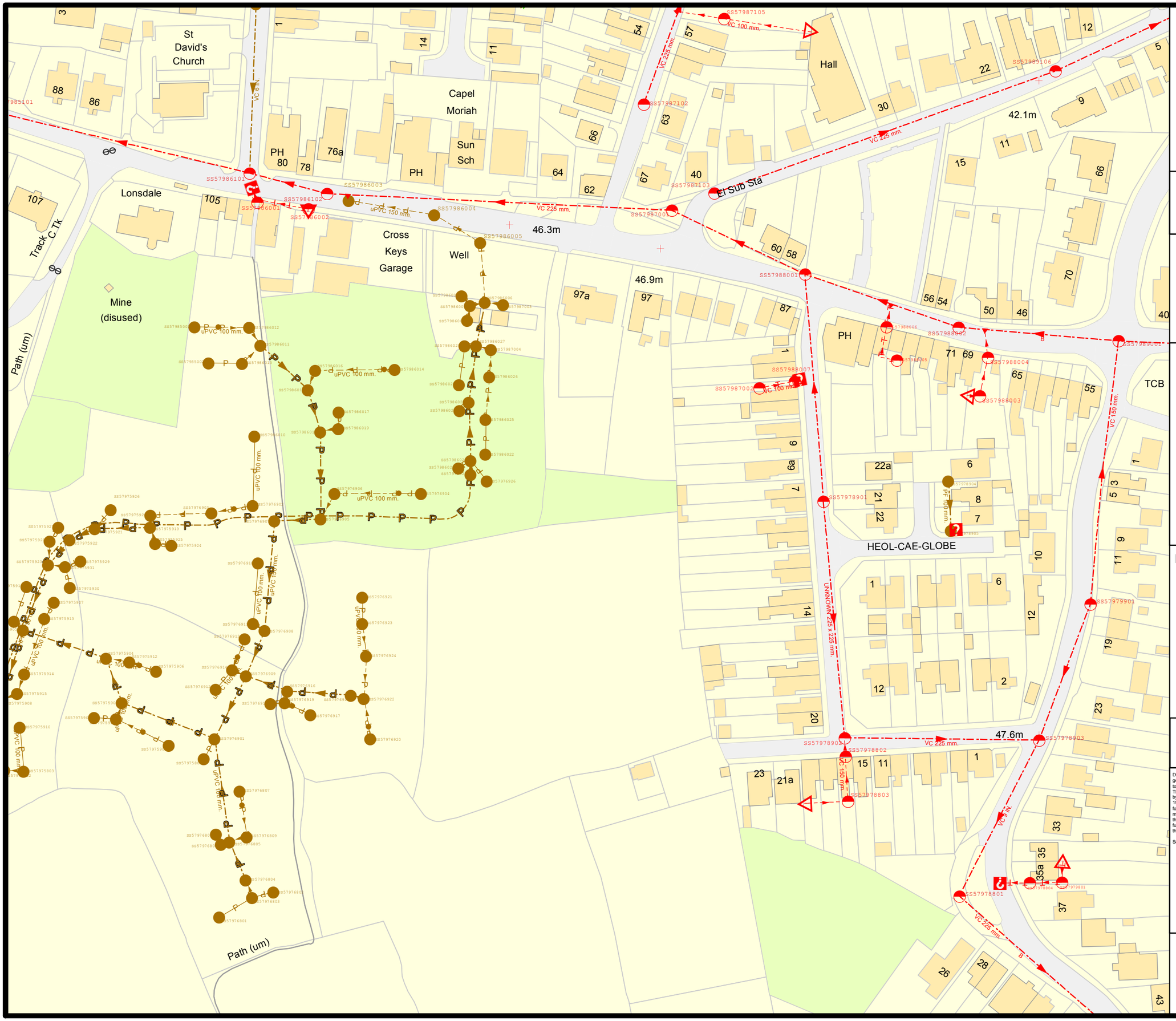

N
Flood Zones - NRW
Ty Fry Farm, Phase 2
Legend
2071 - Application boundary
NRW_FLOODMAP_FLOOD_ZONE_2
NRW_FLOODMAP_FLOOD_ZONE_3
Scale 1:10000
phg
0
750
1,500 m

APPENDIX C – NATURAL CATCHMENT


N
Natural Catchments
Ty Fry Farm, Phase 2
Legend
2071 - Application Boundary
phg


N
Natural Flow Conveyance
Ty Fry Farm, Phase 2
Legend
2071 - Application Boundary
Land Topography
31.28 m AOD
35.99 m AOD
40.7 m AOD
45.41 m AOD
50.12 m AOD
54.83 m AOD
Scale 1:2500
phg
0 250 500 km

APPENDIX D – WELSH WATER SEWER RECORDS



Dŵr Cymru
Welsh Water

PPA0004604

N
W E
S

LEGEND(Representative of most common features)

Waste network:

- Foul chamber
- Surface water chamber
- Combined chamber
- Combined sewer overflow
- Special purpose chamber
- Treatment works
- Pumping station
- Outfall
- Lamphole
- Storm Overflow
- Rising main
- Gravity sewer
- Private sewer
- Private sewer subject to Sect. 104 adoption agreement
- Private Sewer Transfer
- Lateral Drain
- Inspection Chamber

NB: Sewer symbol colour indicates the type.
RED - Combined
GREEN - Surface Water
BROWN - Foul
Purple - Former S24 sewers (for indicative purposes only)

Notes:

Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases pipe material (other than Asbestos Cement or Pitch Fibre) may be found to be asbestos cement (AC) or Pitch Fibre (PF) . It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation

EXACT LOCATIONS OF ALL APPARATUS TO BE DETERMINED ON SITE.

Map Ref:	257735,197987
Map scale:	1:1250
Printed by:	Williams Gillian
Printed on:	17 Feb 2020

APPENDIX E – HYDRAULIC CALCULATIONS – GREENFIELD RUNOFF

ICP SUDS Mean Annual Flood

Input

Return Period (years)	2	Soil	0.400
Area (ha)	0.913	Urban	0.000
SAAR (mm)	1260	Region Number	Region 9

Results l/s

QBAR Rural	6.2
QBAR Urban	6.2
Q2 years	5.7
Q1 year	5.4
Q30 years	10.9
Q100 years	13.5

APPENDIX F – HYDRAULIC CALCULATIONS – PROPOSED SUDS NETWORK

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	10
FEH Rainfall Version	2013
Site Location	GB 257631 197963 SS 57631 97963
Data Type	Point
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	0.800
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S2.000	29.476	2.125	13.9	0.056	5.00	0.0	0.600	o	150	Pipe/Conduit	
S2.001	21.180	0.118	180.0	0.052	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.000	19.292	0.763	25.3	0.027	5.00	0.0	0.600	o	100	Pipe/Conduit	
S4.000	9.071	0.306	29.6	0.055	5.00	0.0	0.600	o	150	Pipe/Conduit	
S4.001	7.938	0.750	10.6	0.052	0.00	0.0	0.600	o	150	Pipe/Conduit	
S4.002	17.840	1.306	13.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S4.003	8.170	0.036	224.1	0.009	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S2.000	50.00	5.18	47.720	0.056	0.0	0.0	0.0	2.72	48.1	7.6
S2.001	50.00	5.54	45.520	0.108	0.0	0.0	0.0	0.97	38.6	14.6
S3.000	50.00	5.21	48.500	0.027	0.0	0.0	0.0	1.54	12.1	3.7
S4.000	50.00	5.08	50.135	0.055	0.0	0.0	0.0	1.86	32.8	7.5
S4.001	50.00	5.13	49.829	0.107	0.0	0.0	0.0	2.91	51.5	14.5
S4.002	50.00	5.22	49.004	0.107	0.0	0.0	0.0	3.56	141.5	14.5
S4.003	50.00	5.37	47.698	0.116	0.0	0.0	0.0	0.87	34.6	15.7

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S3.001	5.153	0.045	114.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.002	16.078	0.873	18.4	0.030	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.003	9.541	1.341	7.1	0.095	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.002	23.634	1.223	19.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.003	8.634	0.654	13.2	0.076	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.004	11.187	0.062	180.0	0.006	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.005	12.970	1.755	7.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S3.001	50.00	5.44	47.662	0.143	0.0	0.0	0.0	1.22	48.5	19.4
S3.002	50.00	5.53	47.617	0.173	0.0	0.0	0.0	3.06	121.8	23.5
S3.003	50.00	5.56	46.744	0.268	0.0	0.0	0.0	4.94	196.3	36.3
S2.002	50.00	5.67	45.327	0.376	0.0	0.0	0.0	3.59	254.0	50.9
S2.003	50.00	5.71	44.104	0.452	0.0	0.0	0.0	4.35	307.5	61.3
S2.004	50.00	5.87	43.450	0.459	0.0	0.0	0.0	1.17	82.6	62.1
S2.005	50.00	5.90	43.388	0.459	0.0	0.0	0.0	5.82	411.3	62.1

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
2.000	User	-	100	0.056	0.056	0.056
2.001	User	-	100	0.052	0.052	0.052
3.000	User	-	100	0.027	0.027	0.027
4.000	User	-	100	0.055	0.055	0.055
4.001	User	-	100	0.052	0.052	0.052
4.002	-	-	100	0.000	0.000	0.000
4.003	User	-	100	0.009	0.009	0.009
3.001	-	-	100	0.000	0.000	0.000
3.002	User	-	100	0.030	0.030	0.030
3.003	User	-	100	0.077	0.077	0.077
	User	-	100	0.018	0.018	0.095
2.002	-	-	100	0.000	0.000	0.000
2.003	User	-	100	0.076	0.076	0.076
2.004	User	-	100	0.006	0.006	0.006
2.005	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.459	0.459	0.459

Network Classifications for Storm

PN	USMH Name	Pipe Dia (mm)	Min Cover Depth (m)	Max Cover Depth (m)	Pipe Type	MH Dia (mm)	MH Width (mm)	MH Ring Depth (m)	MH Type
S2.000	S1	150	0.728	1.255	Unclassified	1200	0	0.728	Unclassified
S2.001	S2	225	0.842	1.255	Unclassified	1200	0	1.255	Unclassified
S3.000	S3	100	0.588	0.778	Unclassified	1200	0	0.588	Unclassified
S4.000	S4	150	0.676	0.782	Unclassified	600	0	0.782	Unclassified
S4.001	S5	150	0.751	1.134	Unclassified	1200	0	0.751	Unclassified
S4.002	S6	225	0.984	1.134	Unclassified	1200	0	1.134	Unclassified
S4.003	S7	225	0.756	0.984	Unclassified	1200	0	0.984	Unclassified
S3.001	S8	225	0.530	0.756	Unclassified	1200	0	0.756	Unclassified
S3.002	S9	225	0.406	0.530	Unclassified	600	0	0.530	Unclassified
S3.003	S10	225	0.412	0.987	Unclassified	600	0	0.412	Unclassified
S2.002	S11	300	0.918	1.178	Unclassified	1200	0	0.987	Unclassified
S2.003	S12	300	0.918	1.300	Unclassified	1200	0	0.918	Unclassified
S2.004	S13	300	0.735	1.762	Unclassified	1200	0	1.300	Unclassified
S2.005	S14	300	0.933	1.762	Unclassified	1200	0	1.762	Unclassified

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S2.005	S	43.350	41.633	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	10	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	17.500	Storm Duration (mins)	30
Ratio R	0.265		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S14, DS/PN: S2.005, Volume (m³): 3.0

Unit Reference	MD-SHE-0108-6200-1600-6200
Design Head (m)	1.600
Design Flow (l/s)	6.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	108
Invert Level (m)	43.388
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	6.2
Flush-Flo™	0.472	6.2
Kick-Flo®	0.964	4.9
Mean Flow over Head Range	-	5.4

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	3.7	1.200	5.4	3.000	8.3	7.000	12.4
0.200	5.5	1.400	5.8	3.500	9.0	7.500	12.9
0.300	5.9	1.600	6.2	4.000	9.5	8.000	13.3
0.400	6.1	1.800	6.6	4.500	10.1	8.500	13.7
0.500	6.1	2.000	6.9	5.000	10.6	9.000	14.0
0.600	6.1	2.200	7.2	5.500	11.1	9.500	14.4
0.800	5.7	2.400	7.5	6.000	11.6		
1.000	5.0	2.600	7.8	6.500	12.0		

Storage Structures for Storm

Tank or Pond Manhole: S13, DS/PN: S2.004

Invert Level (m) 43.450

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	49.7	0.450	104.1	0.950	175.1	1.450	257.2
0.050	55.3	0.550	117.4	1.050	190.6	1.550	275.0
0.150	66.8	0.650	131.1	1.150	206.6		
0.250	78.8	0.750	145.3	1.250	223.0		
0.350	91.2	0.850	160.0	1.350	239.9		

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 257631 197963 SS 57631 97963
Data Type	Point
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S2.000	S1	15 Winter	2	+0%					47.764
S2.001	S2	15 Winter	2	+0%	100/15 Summer				45.625
S3.000	S3	15 Winter	2	+0%	100/15 Summer				48.542
S4.000	S4	15 Winter	2	+0%	100/15 Summer				50.191
S4.001	S5	15 Winter	2	+0%	100/15 Summer				49.888
S4.002	S6	15 Winter	2	+0%					49.056
S4.003	S7	15 Winter	2	+0%	30/15 Summer				47.825
S3.001	S8	15 Winter	2	+0%	30/15 Summer				47.799
S3.002	S9	15 Winter	2	+0%					47.689
S3.003	S10	15 Winter	2	+0%					46.816
S2.002	S11	15 Winter	2	+0%					45.425
S2.003	S12	15 Winter	2	+0%	30/120 Winter				44.217
S2.004	S13	240 Winter	2	+0%	2/15 Summer				44.006
S2.005	S14	240 Winter	2	+0%	2/15 Summer				44.014

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S2.000	S1	-0.106	0.000	0.19		8.6	OK	
S2.001	S2	-0.120	0.000	0.44		15.4	OK	
S3.000	S3	-0.058	0.000	0.36		4.2	OK	
S4.000	S4	-0.094	0.000	0.30		8.5	OK	
S4.001	S5	-0.091	0.000	0.32		15.2	OK	
S4.002	S6	-0.173	0.000	0.12		15.2	OK	
S4.003	S7	-0.098	0.000	0.59		16.4	OK	
S3.001	S8	-0.088	0.000	0.69		20.6	OK	
S3.002	S9	-0.153	0.000	0.23		24.4	OK	
S3.003	S10	-0.153	0.000	0.22		36.4	OK	
S2.002	S11	-0.203	0.000	0.23		51.8	OK	
S2.003	S12	-0.187	0.000	0.30		61.4	OK	
S2.004	S13	0.255	0.000	0.11		6.9	SURCHARGED	
S2.005	S14	0.325	0.000	0.02		6.2	SURCHARGED	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 257631 197963 SS 57631 97963
Data Type	Point
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S2.000	S1	15 Winter	30	+0%					47.782
S2.001	S2	15 Winter	30	+0%	100/15 Summer				45.691
S3.000	S3	15 Winter	30	+0%	100/15 Summer				48.561
S4.000	S4	15 Winter	30	+0%	100/15 Summer				50.216
S4.001	S5	15 Winter	30	+0%	100/15 Summer				49.920
S4.002	S6	15 Winter	30	+0%					49.081
S4.003	S7	15 Winter	30	+0%	30/15 Summer				47.993
S3.001	S8	15 Winter	30	+0%	30/15 Summer				47.924
S3.002	S9	15 Winter	30	+0%					47.727
S3.003	S10	15 Winter	30	+0%					46.857
S2.002	S11	15 Winter	30	+0%					45.479
S2.003	S12	240 Winter	30	+0%	30/120 Winter				44.418
S2.004	S13	240 Winter	30	+0%	2/15 Summer				44.415
S2.005	S14	240 Winter	30	+0%	2/15 Summer				44.426

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S2.000	S1	-0.088	0.000	0.35		16.2	OK	
S2.001	S2	-0.054	0.000	0.91		31.8	OK	
S3.000	S3	-0.039	0.000	0.67		7.9	OK	
S4.000	S4	-0.069	0.000	0.56		16.1	OK	
S4.001	S5	-0.059	0.000	0.67		32.0	OK	
S4.002	S6	-0.148	0.000	0.25		31.9	OK	
S4.003	S7	0.070	0.000	1.23		34.2	SURCHARGED	
S3.001	S8	0.037	0.000	1.42		42.5	SURCHARGED	
S3.002	S9	-0.114	0.000	0.47		51.1	OK	
S3.003	S10	-0.112	0.000	0.48		77.5	OK	
S2.002	S11	-0.149	0.000	0.49		109.9	OK	
S2.003	S12	0.014	0.000	0.15		31.0	SURCHARGED	
S2.004	S13	0.665	0.000	0.11		7.0	SURCHARGED	
S2.005	S14	0.737	0.000	0.02		6.2	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 257631 197963 SS 57631 97963
Data Type	Point
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S2.000	S1	15 Winter	100	+40%					47.805
S2.001	S2	15 Winter	100	+40%	100/15 Summer				45.918
S3.000	S3	15 Winter	100	+40%	100/15 Summer				48.801
S4.000	S4	15 Winter	100	+40%	100/15 Summer				50.354
S4.001	S5	15 Winter	100	+40%	100/15 Summer				50.098
S4.002	S6	15 Winter	100	+40%					49.103
S4.003	S7	15 Winter	100	+40%	30/15 Summer				48.207
S3.001	S8	15 Winter	100	+40%	30/15 Summer				48.054
S3.002	S9	15 Winter	100	+40%					47.763
S3.003	S10	15 Winter	100	+40%					46.898
S2.002	S11	15 Winter	100	+40%					45.541
S2.003	S12	360 Winter	100	+40%	30/120 Winter				44.941
S2.004	S13	360 Winter	100	+40%	2/15 Summer				44.937
S2.005	S14	360 Winter	100	+40%	2/15 Summer				44.945

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S2.000	S1	-0.065	0.000	0.61		28.1	OK	
S2.001	S2	0.173	0.000	1.55		54.5	SURCHARGED	
S3.000	S3	0.201	0.000	0.98		11.5	SURCHARGED	
S4.000	S4	0.069	0.000	0.92		26.6	SURCHARGED	
S4.001	S5	0.119	0.000	1.08		51.3	SURCHARGED	
S4.002	S6	-0.126	0.000	0.40		51.2	OK	
S4.003	S7	0.284	0.000	1.97		54.9	SURCHARGED	
S3.001	S8	0.167	0.000	2.22		66.3	SURCHARGED	
S3.002	S9	-0.079	0.000	0.74		79.8	OK	
S3.003	S10	-0.071	0.000	0.79		128.9	OK	
S2.002	S11	-0.086	0.000	0.80		181.1	OK	
S2.003	S12	0.536	0.000	0.19		38.9	SURCHARGED	
S2.004	S13	1.187	0.000	0.11		6.9	FLOOD RISK	
S2.005	S14	1.257	0.000	0.02		6.2	SURCHARGED	

APPENDIX G – IMPERMEABLE AREAS

GENERAL NOTES

1. Do Not Scale
2. The contractor is to check and verify all buildings and site dimensions and levels, including sewer invert levels, before works start on site. The contractor is to comply in all aspects with the current building legislation, British Standards, building regulations etc.
3. Positions of existing services/statutory undertakers apparatus adjacent to or crossing proposed excavations are to be checked by the contractor prior to starting work

Legend

Impermeable area type	Impermeable area code	Impermeable area (m^2)
Highway		1482.4
Parking and footways		1311.8
Roofs		1552.1
	TOTAL:	4346.4

DRY CONVEYANCE SWALE
SIDE SLOPE 1 in 3
AVERAGE DEPTH = 300 mm
FILTER MEDIUM = min. 400 mm

FLOW CONTROL CHAMBER
IL = 43.388 m AOD
DESIGN HEAD = 1.3 m
DESIGN DISCHARGE RATE FOR 1 in 100 YR + 40 % CC TO QBAR = 6.2 l/s
HYDRO-BRAKE® OPTIMUM USED IN HYDRAULIC DESIGN
REF: MD-SHE-0108-6200-1600-6200

PROPOSED ATTENUATION POND
TOP OF BANK LEVEL = 45.05 m AOD
BASE LEVEL = 43.450 m AOD
MAXIMUM DEPTH = 1.60 m
INTERNAL BANK 1 in 3
EXTERNAL BANK 1 in 2
MAXIMUM ATTENUATION STORAGE: 237 m^3

ADOPTED BIORETENTION AREA TAKING HIGHWAY RUNOFF
PLAN AREA 10.6 m^2
FILTER MEDIUM 400 mm
DRAINAGE MEDIUM MIN 250mm

FILTER DRAIN
WIDTH 900 mm

Rev.	Date	Details	By.	Chk.
C	01/12/20	Site layout revised	PBO	SJD
B	12/11/20	Site layout revised	PBO	SJD
A	27/08/20	Pre-SAB	PBO	SJD
-	21/08/20	First Issue	PBO	SJD

Amendments

Client:

BARRATT HOMES

Consulting Engineers
PHG Consulting Ltd
62A Albany Road
Cardiff CF24 3RR
T : +44(0)29 2030 2521
E : enquiries@phg-consulting.com
W: www.phg-consulting.co.uk
@PHG_consulting
www.linkedin.com/company/phg-consulting-engineers

Project:

Barratt Homes
Ty Fry Farm,
Glebe Road, Loughor

Drawing title:

Impermeable areas

Drawn:	Chk:	Status:	Scale:
PBO	SJD	Planning	1:250 @ A1

Date:	Job no.	Drg. no.	Rev.
Jul-20	2071	003	C

APPENDIX H – CORRESPONDENCE

Dŵr Cymru
Welsh Water

Developer Services
PO Box 3146
Cardiff
CF30 0EH

Tel: +44 (0)800 917 2652
Fax: +44 (0)2920 740472
E.mail: developer.services@dwrcymru.com

Gwasanaethau Datblygu
Blwch Post 3146
Caerdydd
CF30 0EH

Ffôn: +44 (0)800 917 2652
Ffacs: +44 (0)2920 740472
E.bost: developer.services@dwrcymru.com

Mr Richard Jones
BDW Trading Limited
Oak House
Village Way
Tongwynlais, Cardiff
Cardiff
CF15 7NE

Date: 17/02/2020
Our Ref: PPA0004604

Dear Mr Jones

Grid Ref: 257725 197946
Site Address: Chapel Fields Phase 2, Glebe Road, Loughor, Gorseinon
Development: Residential

I refer to your pre-planning enquiry received relating to the above site, seeking our views on the capacity of our network of assets and infrastructure to accommodate your proposed development. Having reviewed the details submitted I can provide the following comments which should be taken into account within any future planning application for the development.

Firstly, we note that the proposal relates to 24 no. residential units on Chapel Fields (Phase 2), Glebe Road, Loughor, and acknowledge that the site forms part of a wider allocation (Ref: H1.37) within the Local Development Plan (LDP) for 130 no. units. In reference to our representations during the LDP consultation process, namely the 'Statement of Common Ground', we can confirm that an assessment has been undertaken of the public sewerage system to accommodate 130 no. units, as well as phase 1 for 92 no. units (Ref: 2013/0617) previously, and informs our appraisal as follows.

Please note, notwithstanding the following assessment, we would advise there is also a mandatory requirement to undertake pre-application consultation with all 'Specialist Consultees', including Dwr Cymru Welsh Water as the statutory water and sewerage undertaker, in accordance with Schedule 4 of Town & Country Planning (Development Management Procedure) (Wales) (Amendment) Order 2016. As a major development, amounting to more than 10 units, you will be statutorily required to consult Welsh Water and a substantive response will be issued within 28 days from the date of the notice as per the requirements of Article 2E.

Public Sewerage Network

The proposed development site is located in the immediate vicinity of a separate sewerage system, comprising combined, foul and surface water public sewers, which drains to Llannant Wastewater Treatment Works (WwTW). The site also lies in proximity to a sewerage network that drains to Gowerton WwTW which discharges into national and international designated waters, comprising the Loughor Estuary which forms part of the Carmarthen Bay & Estuaries European Marine Site and is the collective name for three European 'Natura 2000' designated areas, namely Carmarthen Bay & Estuaries Special Area of Conservation, Carmarthen Bay Special Protection Area and Burry Inlet Special Protection Area.

A key fundamental issue associated with any proposed development(s) located on both the Carmarthenshire and Swansea side of the Estuary is the potential impact of any revised or additional water discharges, either foul of surface water, will have on the local drainage systems and ultimately the designated waters. Dwr Cymru Welsh Water is contributing towards improving the water quality in the Estuary by undertaking key infrastructure improvements at its Northumberland Avenue and Llanant Waste Water Treatment Works which are designed to improve arrangements for dealing with surface water, provide ultra violet treatment and phosphate removal. Equally developers too, can also play a significant part in mitigation measures by incorporating sustainable drainage facilities within their proposals.

You are also advised that some public sewers and lateral drains may not be recorded on our maps of public sewers because they were originally privately owned and were transferred into public ownership by nature of the Water Industry (Schemes for Adoption of Private Sewers) Regulations 2011. The presence of such assets may affect the proposal. In order to assist you may contact Dwr Cymru Welsh Water on 0800 085 3968 to establish the location and status of the apparatus in and around your site. Please be mindful that under the Water Industry Act 1991 Dwr Cymru Welsh Water has rights of access to its apparatus at all times.

Surface Water Drainage

As of 7th January 2019, this proposed development is subject to Schedule 3 of the Flood and Water Management Act 2010. The development therefore requires approval of Sustainable Drainage Systems (SuDS) features, in accordance with the 'Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems'. As highlighted in these standards, the developer is required to explore and fully exhaust all surface water drainage options in accordance with a hierarchy which states that discharge to a combined sewer shall only be made as a last resort. Disposal should be made through the hierarchical approach, preferring infiltration and, where infiltration is not possible, disposal to a surface water drainage body in liaison with the Land Drainage Authority and/or Natural Resources Wales.

As part of this pre-planning enquiry we acknowledge receipt of a 'Site Layout' which indicates proposals to discharge surface water flows into a *"stormwater outfall"* via swale features and attenuation basin and in principle we would offer no objection subject to consultation and an agreement with the SAB and Lead Local Flood Authority as the regulatory body.

Please refer to further detailed advice relating to surface water management included in our attached Advice & Guidance note. In addition, please note that no highway or land drainage run-off will be permitted to discharge directly or indirectly into the public sewerage system.

Foul Water Drainage – Sewerage Network

We have considered the impact of foul flows generated by the proposed development and concluded that flows can be accommodated within the public sewerage system which is consistent with our representations to the LDP consultation process and comments on the application for phase 1 (Ref: 2013/0617). We advise that the flows should be connected to the combined sewer between manholes SS57986102 and SS57987001 located in Glebe Road to the north. However, if draining to a point of connection in Gowerton WwTW catchment whereby the Memorandum of Understanding (MoU) requirements apply, we remind that a strategy for surface water removal shall be implemented delivering sufficient compensation for foul flows.

Should a planning application be submitted for this development we will seek to control these points of communication via appropriate planning conditions and therefore recommend that any drainage layout or strategy submitted as part of your application takes this into account. In addition, for the purpose of any forthcoming planning application submission, we recommend details are submitted for the proposed surface water removal strategy if a connection point in Gowerton WwTW catchment is proposed.

You may need to apply to Dwr Cymru Welsh Water for any connection to the public sewer under Section 106 of the Water industry Act 1991. However, if the connection to the public sewer network is either via a lateral drain (i.e. a drain which extends beyond the connecting property boundary) or via a new sewer (i.e. serves more than one property), it is now a mandatory requirement to first enter into a Section 104 Adoption Agreement (Water Industry Act 1991). The design of the sewers and lateral drains must also conform to the Welsh Ministers Standards for Foul Sewers and Lateral Drains, and conform with the publication "Sewers for Adoption"- 7th Edition. Further information can be obtained via the Developer Services pages of www.dwrcymru.com.

Foul Water Drainage – Sewerage Treatment

No problems are envisaged with the Waste Water Treatment Works for the treatment of domestic discharges from this site.

Potable Water Supply

A water supply can be made available to service this proposed development. Initial indications are that a connection can be made from the 6'' diameter watermain in 257725, 198082 location. The cost of providing new on-site watermains can be calculated upon the receipt of detailed site layout plans which should be sent to the above address.

I trust the above information is helpful and will assist you in forming water and drainage strategies that should accompany any future planning application. I also attach copies of our water and sewer extract plans for the area, and a copy of our Planning Guidance Note which provides further information on our approach to the planning process, making connections to our systems and ensuring any existing public assets or infrastructure located within new development sites are protected.

Please note that our response is based on the information provided in your enquiry and should the information change we reserve the right to make a new representation. Should you have any queries or wish to discuss any aspect of our response please do not hesitate to contact our dedicated team of planning officers, either on 0800 917 2652 or via email at **developer.services@dwrcymru.com**

Please quote our reference number in all communications and correspondence.

Yours faithfully,

Owain George
Planning Liaison Manager
Developer Services

Enc. Sewer plan
Water plan
Pre planning notes

<u>Please Note</u> that demands upon the water and sewerage systems change continually; consequently the information given above should be regarded as reliable for a maximum period of 12 months from the date of this letter.