Portland
consulting engineers

Flood Risk Assessment & Drainage Strategy

Former Snowdon Coaches

Seaside Lane, Easington

Revision Ø

2021031

September 2021

10 Bankside, The Watermark, Gateshead, Tyne & Wear NE11 9SY
T 0191 461 9770 F: 0191 460 3028 E: info@portlandconsulting.co.uk
www.portlandconsulting.co.uk

@portlandconsult
Portland Consulting Engineers

CONTENTS:

APPENDICES:

1.0 Introduction

Portland Consulting Engineers have been commissioned by Snowdon Coaches to undertake a flood risk assessment to cover the proposed development at Seaside Lane, Easington.

The site is situated approximately 400 metres north east of the centre of Easington at Ordnance Survey reference 441898, 543680, with an overall area of 1.77 hectares.

The site is predominantly greenfield site which is currently farmland. It is bounded to the west by farmland and by a new housing development to the north and existing housing to the east and south. There is also an existing building owned by Snowdon Coaches to the south of the site, with a large area of hardstanding.

This Flood Risk Assessment has been produced in accordance with the National Planning Policy Framework (NPPF) for Development and Flood Risk.

All sources of flooding have been assessed in accordance with the requirements of NPPF.

2.00 Site Features and Topography

2.01 Watercourses

The closest water course is a small burn to the north east of the site approximately 85m off site, beyond residential properties and third-party land.

2.02 Drainage

The Northumbrian Water (NWL) sewer record plans indicate a combined sewer running adjacent to the site in a southern direction. There is also a new development to the east with adopted foul and surface water sewers, which have yet to be added to the NWL Sewer Records.

(For sewer records refer to Appendix H).

2.03 Site Levels

A topographical survey has been produced for the site which shows levels fall from South West to North East from 116m AOD to 106.10 AOD.

2.04 Ground Conditions

A site investigation is yet to be undertaken for the proposed redevelopment. However British Geological Surveys borehole logs in the surrounding area show the site is predominantly underlain by clay. Intrusive site investigation works will be required to confirm these ground conditions prior to works commencing. (For British Geological Surveys information refer to Appendix D)

3.0 Sources of Flood Risk

Each potential source of flooding needs to be considered; rivers, sea, land, groundwater, sewers and artificial sources (such as reservoirs and canals). Consideration also needs to be given to the flood risk vulnerability classification for this type of development.

3.01 Tidal and Fluvial Flooding

Environment Agency flood maps have been acquired to assist with the assessment.
The flood maps indicate the site to be located within a Flood Zone 1 with a less than 1:1000 annual probability of flooding from rivers or sea. As such, the risk of flooding to the site due to these sources can be deemed as **low**, in accordance with Table 1 of NPPF.
(For map refer to Appendix C).

3.02 Flooding from Overland Flows

The Environment Agency surface water flood map shows a small area of ponding on site that is less than 300mm deep which is caused by the existing hardstanding. However, this will be removed by the development due to the new drainage that will be installed. Any rainfall that falls onto the proposed hardstanding will be drained into the system of gullies, plot drainage and basin, which in turn will be drained into the local sewer network at a restricted rate. As the impermeable area of the site is over 50% this will greatly reduce the amount of water that will produce ponding. Therefore, flooding due to overland run-off can be deemed as **low risk**.

3.03 Flooding due to Ground Water

Flooding due to ground water occurs when the levels of water below the ground rise and emanate above finished ground level. This occurs more frequently when the site is underlain by a permeable stratum. As stated earlier, an intrusive site investigation is yet to be undertaken however British Geological Survey Information indicates the site likely to be underlain by clay. Intrusive site investigation will need to be undertaken prior to commencement on site, however the risk of flooding due to groundwater can be deemed as low.

3.04 Sewer Flooding

There are no sewers currently crossing the development site and the NWL sewer flooding records show no historic flooding event in the vicinity of the site, therefore the risk of flooding from existing sewers can therefore be deemed as **low**.

The proposed sewers will be designed to achieve a self-cleansing velocity to prevent blockages which present the main risk of flooding to the systems. The risk of flooding as a result of failure to the drainage system can be deemed as **low**.

3.05 Artificial Sources

From inspection of the EA reservoir flood maps, aerial photographs and OS maps it can be seen that the potential risk for flooding from artificial sources is **low.**

4.00 Management of Surface Water – Option

Part H of the Building Regulations provides a recommended hierarchy for surface water disposal:

i) By infiltration;

ii) To watercourse;

iii) To sewer.

4.01 Discharge via Infiltration

As noted earlier an intrusive site investigation is yet to be undertaken, however British Geological Surveys information indicate the site is likely to be underlain by clay. Therefore, the ground conditions are unsuitable for the use of infiltration techniques.

4.02 Discharge to Watercourse

The closest water course is a small burn to the north east of the site approximately 85m off site beyond residential properties and third-party land, therefore unsuitable to discharge to.

4.03 Discharge to Public Sewers

The proposed development will utilise the existing adopted surface water sewer adjacent to the site to make an indirect connection to the watercourse with a restricted discharge rate of 2.9 l/s.

5.00 Proposed Drainage Solution

5.01 Proposed Maximum Flows from the Proposed Development

The flow rates for the site are to be restricted to satisfy the following bodies and standards Durham County Council (DCC).

DCC's requirements are such that surface water systems designed must accommodate all storms up to and including the 1/100 year storms with an allowance for climate change, allowing no surface water flooding to leave the site or affect any new properties. A Greenfield runoff rate of 2.9 l/s has been calculated for the 0.872 hectare developed area of the proposed site using the Greenfield Run off calculator on the 'HR Wallingford' website. Therefore, following preliminary drainage design using

a flow control device with a 75mm orifice, a discharge rate of 2.9 l/sec should be achieved on all storms up to and including the 100year + 40% cc event.

(See appendix E for drainage calculations)

5.02 Attenuation Options

Given that infiltration has been discounted due to risk; the volumes over and above those associated with 2.9 l/sec must be stored on site.

30 year and 100 year + 40% climate change return period volumes – A detention basin with a volume of 750m³ has been designed to accommodate these flows including an allowance for climate change. The structure will be sited within the development and will remain under the management of the developer of the land or a maintenance company employed by them.

5.03 Source Control SUDS

Private parking bays are to be constructed as permeable paving with connection to the main surface water system. These measures will act as a slowing down mechanism of flows into the main system and also provide greater pollution protection.

Maintenance of the permeable paving will be the responsibility of the developer or a maintenance company employed by them.

5.04 Climate Change

In accordance with NPPF a 40% increase in rainfall has been included in the drainage design to allow for climate change.

5.05 Urban Creep

An allowance for 10% urban creep has been included in the drainage design in accordance with current DCC recommendations.

6.00 Conclusions

6.01 Flood Risk

- Tidal and Fluvial Flooding – Low risk
- Flooding from Overland Flows - Low risk
- Flooding due to Ground Water – Low risk
- Sewer Flooding – Low risk
- Artificial Sources - Low risk

Overall site has low risk

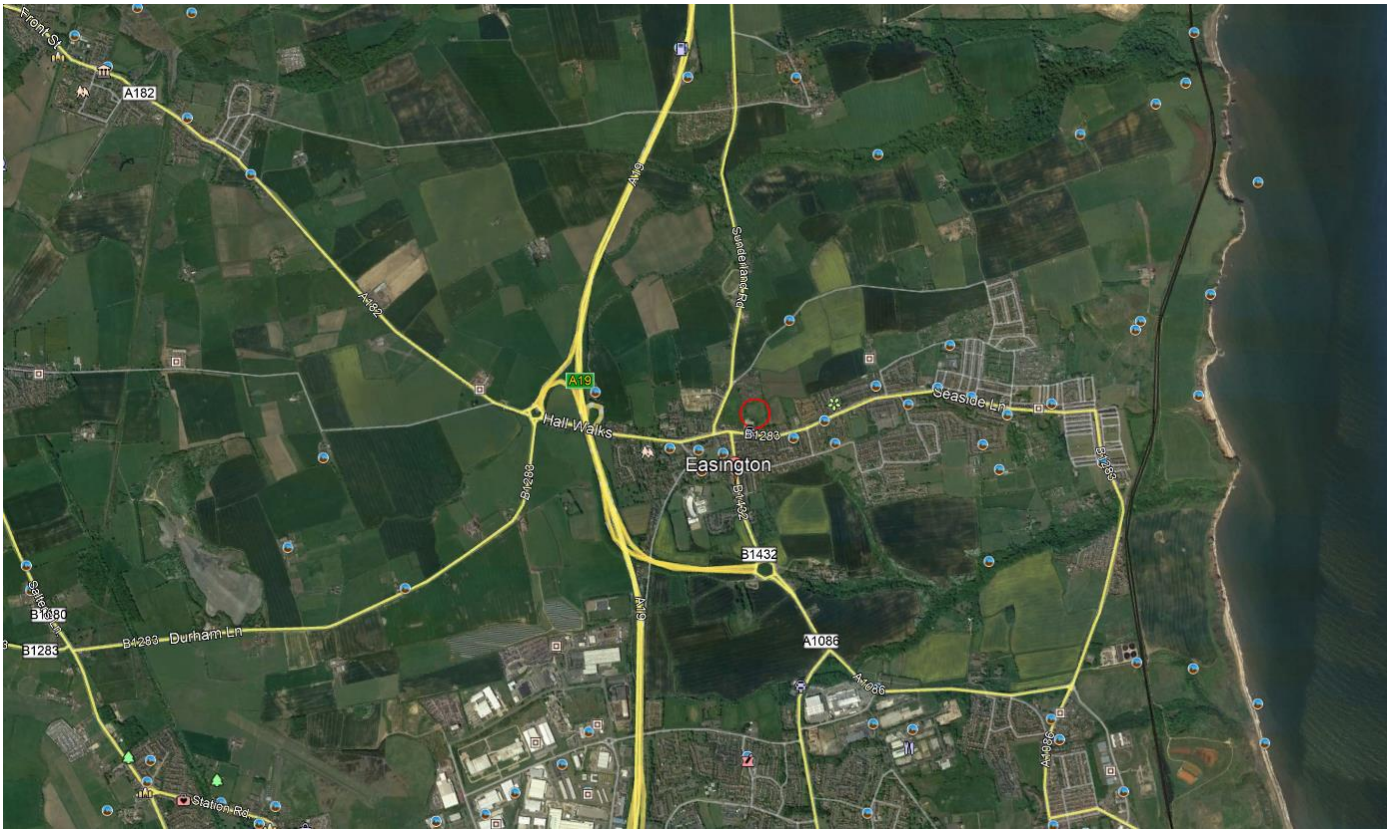
6.02 Surface Water Solution

- Infiltration has been discounted as the development site is assumed to be underlain by clay.
- **The proposed development will utilise the existing adopted surface water sewer adjacent to the site to make an indirect connection to the watercourse. To be confirmed during Pre-Planning Enquiry application to NWL.**
- **SuDS basin with discharge to existing sewer to be restricted to 2.9 l/s as above, to satisfy DCC.**

6.03 Foul Water Solution

- **Discharge to existing NWL combined sewer via a pumping station to be constructed on site. To be confirmed during Pre-Planning Enquiry application to NWL.**

Appendix A Location Plan


A182
A19
Hall Walks
Easington
B1283
B1432
A1086
Seaside Ln
Durham Ln
Station Rd

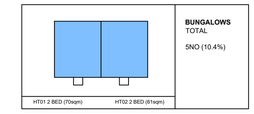

Petwell Ln
Cadwell Ln
Costcutter (Easington Village Store)
B1283
B1432
Hall Walks
St Marys Church, Easington
Norma & June Fashions Ltd (Mother of the...
Easington
The Half Moon
Club Motors
Ashwood Park Residential and...
Wordsworth Rd
Manisty Terrace
Monereiff Terrace
Whitehouse Ct
Sea View
South Side

Appendix B Proposed Site Plan

Do not scale the drawing. Use figured dimensions in all cases. Check all dimensions on site. Report any discrepancies to BH Architecture before proceeding.

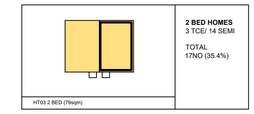
N

ACCOMMODATION SCHEDULE



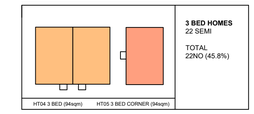
BUNGALOWS
TOTAL

5NO (10.4%)



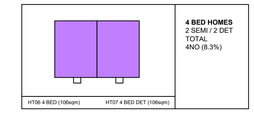
2 BED HOMES
3 TCE/ 14 SEMI

TOTAL
17NO (35.4%)



3 BED HOMES
22 SEMI

TOTAL
22NO (45.8%)



4 BED HOMES
2 SEMI / 2 DET
TOTAL
4NO (8.3%)

TOTAL 48NO. DWELLINGS

GROSS SITE AREA: 17732m²

NET SITE AREA: 13603m²

Suitability	Revision	Date	Drawn By	Checked By
[S2]	[P07]	[31.08.2021]	[LJ]	[DB]

P07. VISIBILITY SPLAY ADDED

Suitability	Revision	Date	Drawn By	Checked By
[S2]	[P06]	[26.08.2021]	[LJ]	[DB]

P06. PARKING ARRANGEMENTS AMENDED

Suitability	Revision	Date	Drawn By	Checked By
[S2]	[P05]	[18.08.2021]	[LJ]	[DB]

P05. RED LINE BOUNDARY UPDATED

Suitability	Revision	Date	Drawn By	Checked By
[S2]	[P04]	[29.07.2021]	[LJ]	[DB]

P04. LAYOUT UPDATED TO 48 UNITS

Suitability	Revision	Date	Drawn By	Checked By
[S2]	[P03]	[04.05.2021]	[LJ]	[DB]

P03. LAYOUT UPDATED TO INCLUDE NO BUILD ZONE, SUDS AND PUMPING STATION

Suitability	Revision	Date	Drawn By	Checked By
[S2]	[P02]	[18.01.2021]	[LJ]	[DB]

P02. LAYOUT AMENDED

Suitability	Revision	Date	Drawn By	Checked By
[S2]	[P01]	[08.01.2021]	[LJ]	[DB]

P01. FIRST ISSUE

Revision

BLAKE HOPKINSON ARCHITECTURE + DESIGN

BLAKE HOPKINSON ARCHITECTURE + DESIGN LTD
NORTH SHIELDS, TYNE + WEAR - 0191 2570022 - www.bharchitecture.co.uk

BHA Project No:
RES854

Project Name:
Residential Development at
Snowdon Coaches Site, Easington
Alan and Peter Snowdon

Drawing Title:
Proposed Site Plan

Model File Name: RES854-BHA-ST-XX-M2-A-1200

Drawn By:	Date Drawn:
LJ	08/01/2021
Checked By:	Date Checked:
DB	08/01/2021
Scale at A1:	Suitability: / Revision:
1:500	S2 / P07

File Name:
RES854-BHA-ST-XX-DR-A-1200

Appendix C Environment Agency Maps

Flood map for planning

Your reference	Location (easting/northing)	Created
Seaside Lane	**441871/543698**	**20 Sep 2021 10:43**

Your selected location is in flood zone 1, an area with a low probability of flooding.

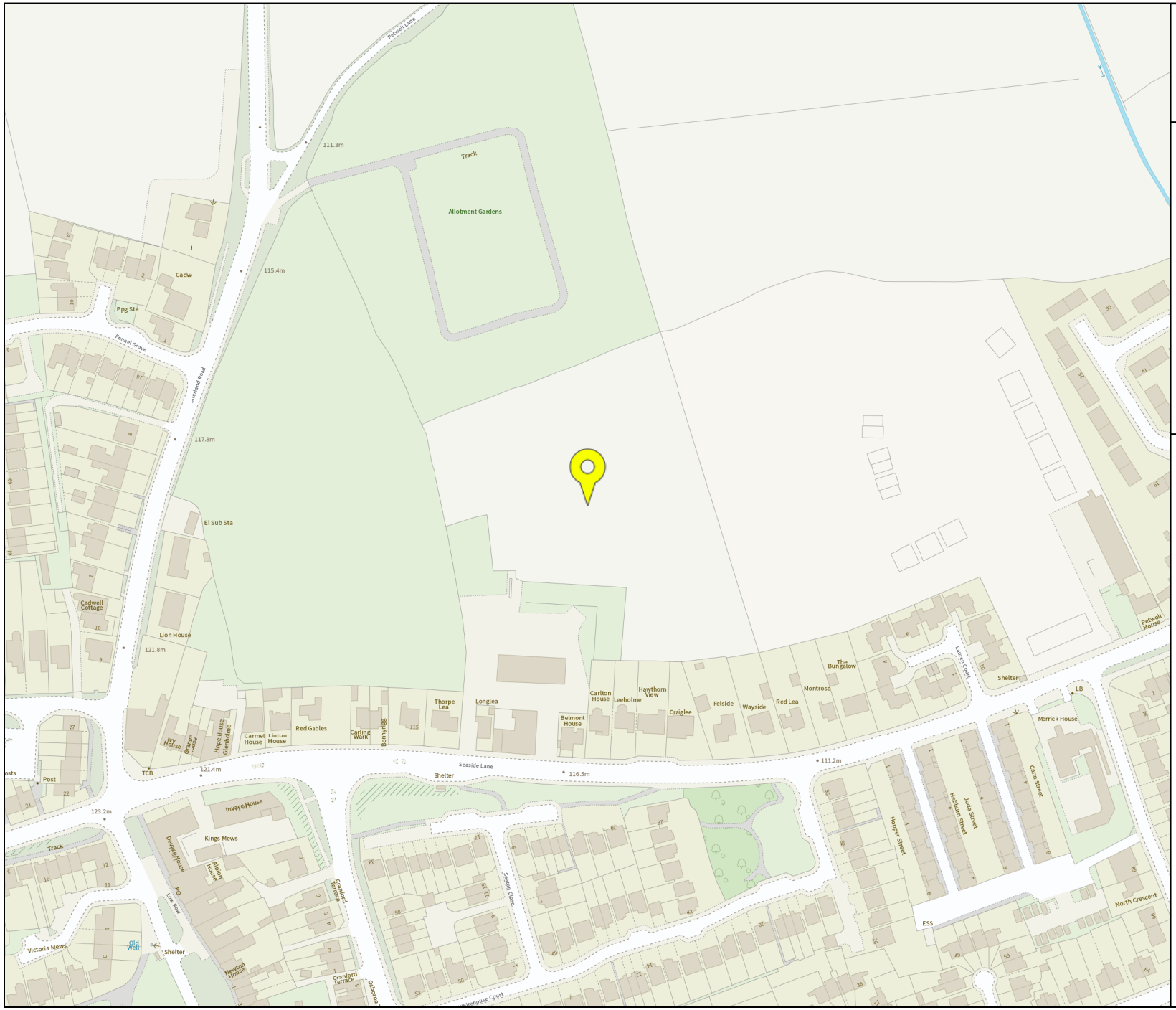
This means:

- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.



Environment Agency

Flood map for planning

Your reference
Seaside Lane

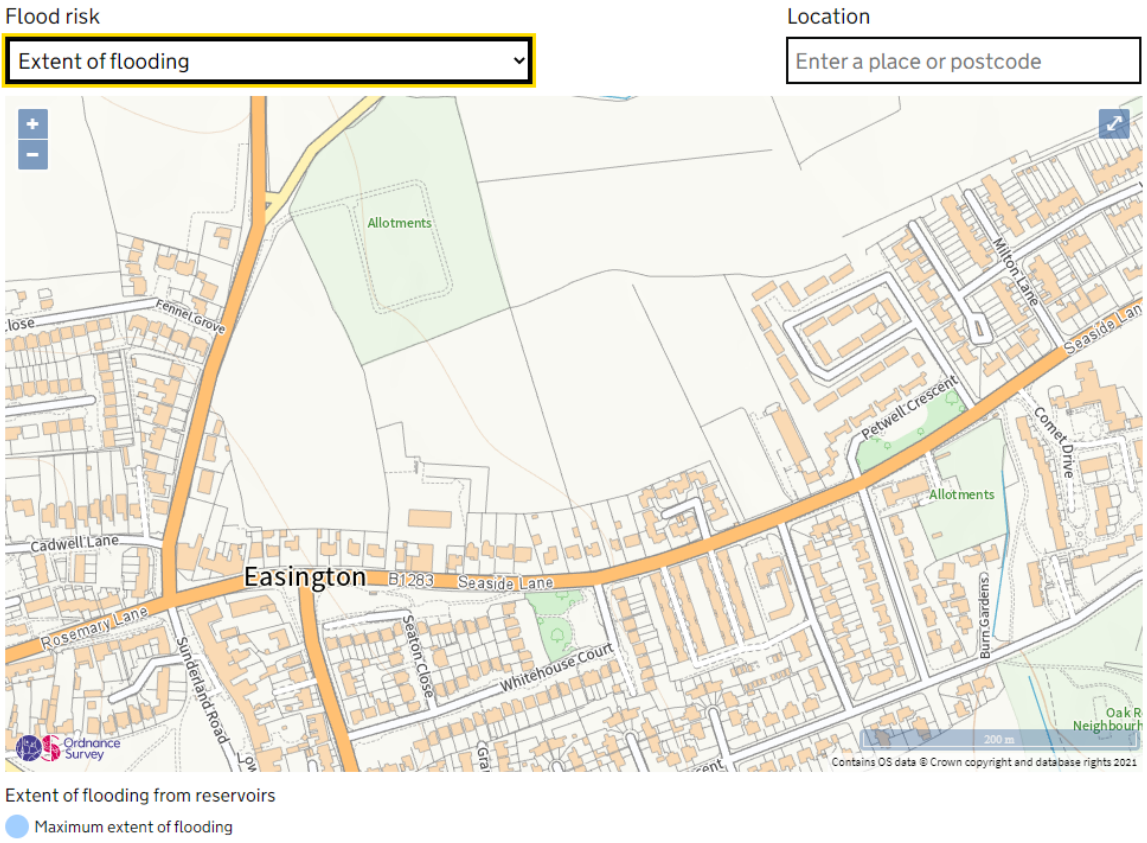
Location (easting/northing)
441871/543698

Scale
1:2500

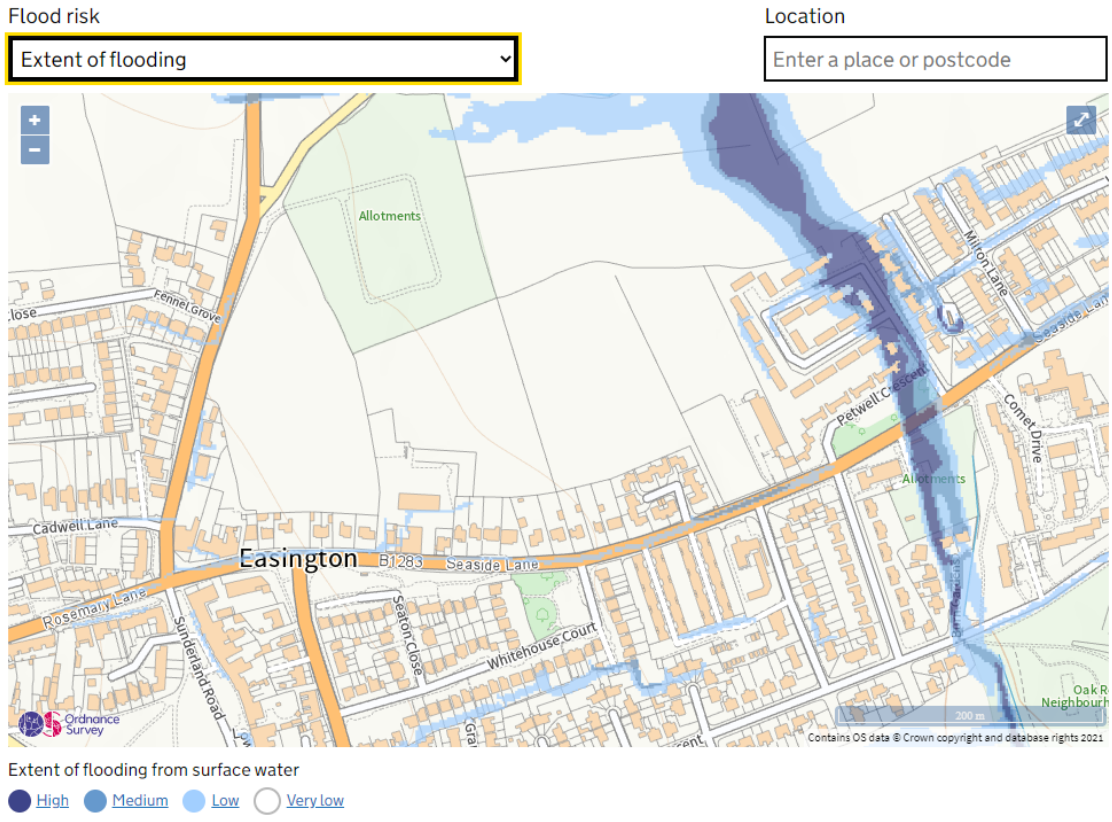
Created
20 Sep 2021 10:43

- Selected point
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 20 40 60m



Flooding from Reservoir Map



Flooding from Surface Water

Appendix D British Geological Survey Information

DUNELM DRILLING CO.

BOREHOLE RECORD

Contract No. C4468 Client ARCHITECTURAL DESIGN PARTNERSHIP

Ground Level ..... Location THORPE ROAD - EASINGTON VILLAGE

Date MAY '90 BOREHOLE No. TRIAL PIT 3

Depth	Thickness	Legend	Description of Strata	Type of Sample	C kN/m²	M %	Ø	Density Kg/m³	N
			TP3						
0.45	0.45		SOIL STONE BRICK & SHALE FILL	V 0.50	67.5				
	0.85		FIRM BROWN & GREY MOTTLED V. SANDY V. GRAVELLY CLAY	V 1.00	82.0				
1.30	0.70		WELL GRADED SANDS & GRAVELS WITH OCCASIONAL COBBLES PRESENT						
2.00			WATER STRUCK AT 1.30m F.S.L. = 1.40m						
			COLLAPSE OF PIT SIDES BELOW 1.30m.						

DUNELM DRILLING CO.

BOREHOLE RECORD

Contract No. C2850 Client PITTILLO BELL & PEARSON.

Ground Level ..... Location SEASIDE LANE — EASINGTON

Date AUG 1985 BOREHOLE No. 1

Depth	Thickness	Legend	Description of Strata	Type of Sample	C kN/m²	M %	Ø	Density Kg/m³	N
0.40	0.40		SOIL						
	0.70		FIRM LT BROWN SANDY CLAY	U 0.50	96.5	15.0	-	2140	
1.10				U 1.50	109.6	12.0	-	2250	
	2.50		STIFF DK BROWN STONY CLAY	U 3.20	151.8	12.0	-	2250	
3.60									
	0.60		FAIRLY HARD MAGNESIAN LIMESTONE	P 4.00	FOR 0.30" PENETRATION				79
4.20									

Appendix E Surface Water Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	17.000	Add Flow / Climate Change (%)	0
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	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
1.000	10.000	0.050	200.0	0.924	5.00	0.0	0.600	o	600	Pipe/Conduit	
1.001	10.000	0.050	200.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.002	10.000	0.050	200.0	0.000	0.00	0.0	0.600	o	600	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)
1.000	50.00	5.10	105.400	0.924	0.0	0.0	0.0	1.72	485.8	125.1
1.001	50.00	5.19	105.350	0.924	0.0	0.0	0.0	1.72	485.8	125.1
1.002	50.00	5.29	105.300	0.924	0.0	0.0	0.0	1.72	485.8	125.1

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	Region	England and Wales
Return Period (years)	2	M5-60 (mm)	17.000

Synthetic Rainfall Details

Ratio R	0.350	Cv (Winter)	0.840
Profile Type	Summer	Storm Duration (mins)	30
Cv (Summer)	0.750		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: 3, DS/PN: 1.002, Volume (m³): 14.3

Unit Reference	MD-SHE-0079-2900-1100-2900
Design Head (m)	1.100
Design Flow (l/s)	2.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	79
Invert Level (m)	105.300
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.100	2.9
Flush-Flo™	0.333	2.9
Kick-Flo®	0.679	2.3
Mean Flow over Head Range	-	2.5

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	2.3	1.200	3.0	3.000	4.6	7.000	6.9
0.200	2.8	1.400	3.2	3.500	5.0	7.500	7.1
0.300	2.9	1.600	3.4	4.000	5.3	8.000	7.3
0.400	2.9	1.800	3.6	4.500	5.6	8.500	7.5
0.500	2.8	2.000	3.8	5.000	5.9	9.000	7.7
0.600	2.6	2.200	4.0	5.500	6.1	9.500	7.9
0.800	2.5	2.400	4.2	6.000	6.4		
1.000	2.8	2.600	4.3	6.500	6.6		

Storage Structures for Storm

Tank or Pond Manhole: 2, DS/PN: 1.001

Invert Level (m) 105.350

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	410.9	1.000	1035.4

1 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		FSR	Ratio R 0.350
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	17.100	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 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)
1.000	1	15 Winter	1	+0%	100/15 Summer				105.643
1.001	2	480 Winter	1	+0%	100/60 Winter				105.584
1.002	3	480 Winter	1	+0%	30/480 Winter				105.586

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.357	0.000	0.34			104.2	OK	
1.001	2	-0.366	0.000	0.01			3.7	OK	
1.002	3	-0.314	0.000	0.01			2.8	OK	

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		FSR	Ratio R 0.350
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	17.100	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 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)
1.000	1	960 Winter	30	+0%	100/15 Summer				105.893
1.001	2	960 Winter	30	+0%	100/60 Winter				105.893
1.002	3	960 Winter	30	+0%	30/480 Winter				105.939

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.107	0.000	0.06			19.1	OK	
1.001	2	-0.057	0.000	0.05			13.9	OK	
1.002	3	0.039	0.000	0.01			2.9	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		FSR	Ratio R 0.350
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	17.100	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 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)
1.000	1	1440 Winter	100	+40%	100/15 Summer				106.297
1.001	2	1440 Winter	100	+40%	100/60 Winter				106.296
1.002	3	960 Winter	100	+40%	30/480 Winter				106.373

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.297	0.000	0.08			25.2	SURCHARGED	
1.001	2	0.346	0.000	0.03			9.5	FLOOD RISK	
1.002	3	0.473	0.000	0.01			2.9	SURCHARGED	

HR Wallingford
Working with water

Greenfield runoff estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	
Site name:	Snowdon Coaches
Site location:	Easington Lane

This is an estimation of the greenfield runoff rate limits that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site coordinates

Latitude:	54.78640° N
Longitude:	1.34959° W

Reference:	
Date:	2021-09-21 14:12

Methodology	IH124

Site characteristics

Total site area (ha)	1.77

Methodology

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type

	Default	Edited
SOIL type	2	2
HOST class	---	---
SPR/SPRHOST	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm)	658	658
Hydrological region	3	3
Growth curve factor: 1 year	0.86	0.86
Growth curve factor: 30 year	1.75	1.75
Growth curve factor: 100 year	2.08	2.08

Notes:

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

Normally limiting discharge rates which are less than 2.0 l/s/ha 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 consents are usually set at 5.0l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set in which case blockage work must be addressed by using appropriate drainage elements

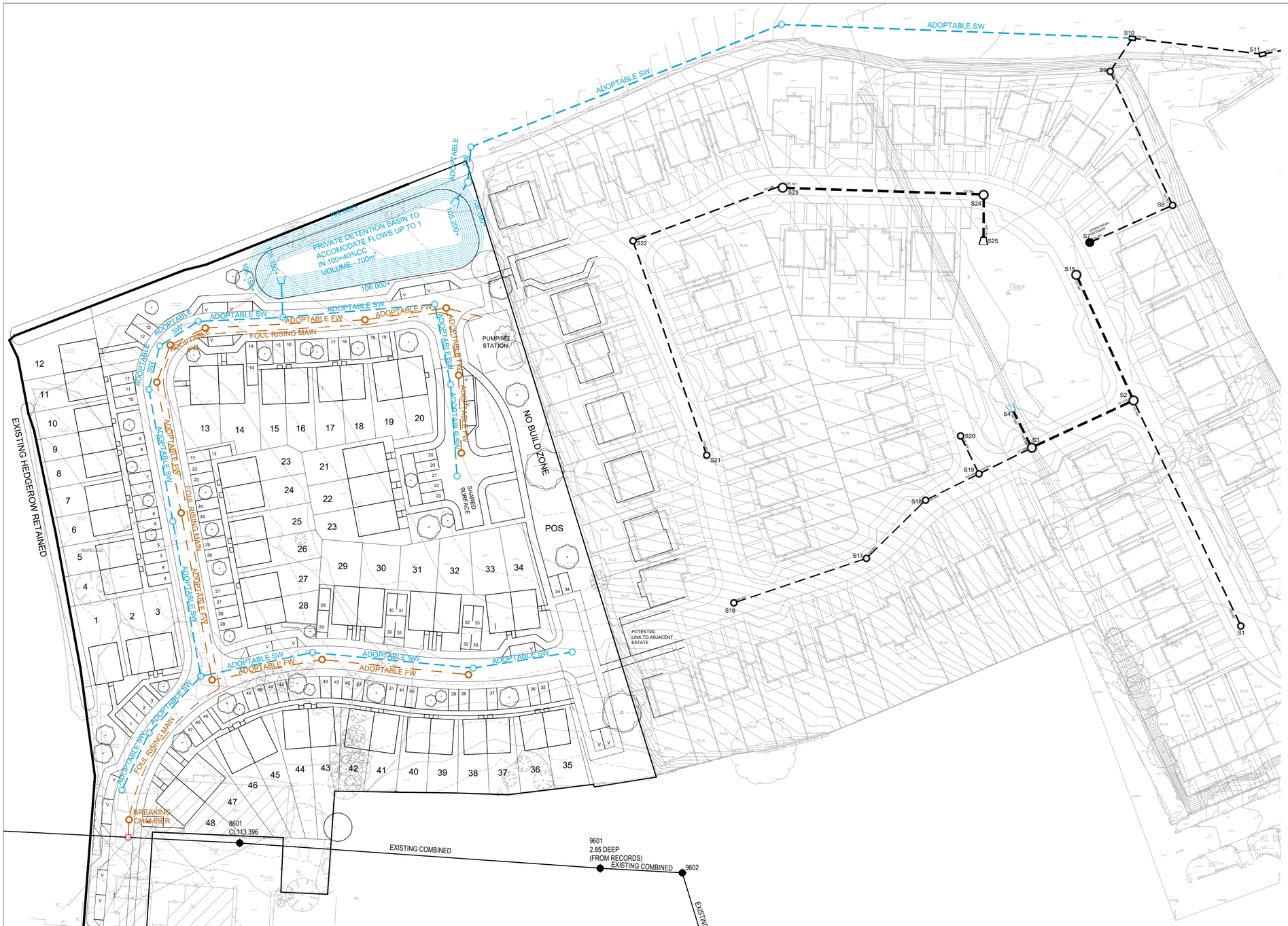
(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite may be a requirement for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Qbar (l/s)	3	3
1 in 1 year (l/s)	2.58	2.58
1 in 30 years (l/s)	5.25	5.25
1 in 100 years (l/s)	6.24	6.24

Appendix F Drainage Strategy Drawing



KEY

PROPOSED ADOPTABLE SURFACE	SW1
PROPOSED ADOPTABLE FOUL	FW1
PROPOSED ADOPTABLE COMBINED	C1
EXISTING ADOPTED COMBINED	ex. mh
EXISTING ADOPTED SURFACE	ex. mh

NOTES:

1. ALL DRAINAGE WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE WATER SERVICES ASSOCIATION "DESIGN AND CONSTRUCTION GUIDANCE FOR FOUL AND SURFACE WATER SEWERS" CURRENT EDITION AND LLFA REQUIREMENTS AND SPECIFICATIONS. ALL PRIVATE DRAINAGE WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH BUILDING REGULATIONS 2015 EDITION.
2. POSITION SIZE AND DEPTH OF ALL EXISTING SEWERS AND SERVICES SHALL BE ESTABLISHED BY MAIN CONTRACTOR PRIOR TO COMMENCEMENT ON SITE.
3. THE CONTRACTOR SHALL ALLOW FOR THE PROTECTION, TEMPORARY AND PERMANENT SUPPORT, AND TEMPORARY AND PERMANENT DIVERSION WORKS, AS NECESSARY TO ALL EXISTING SERVICES.
4. THE CONTRACTOR SHALL ALLOW FOR ALL TRAFFIC MANAGEMENT IN CONNECTION WITH ROAD AND SEWER WORKS.
5. THE CONTRACTOR SHALL ALLOW FOR KEEPING SEWER TRENCHES AND EXCAVATIONS AS DRY AS PRACTICABLE BY PUMPING FROM TEMPORARY SUMPS AND DEWATERING AS APPROPRIATE. THE POINT AND METHOD OF DISCHARGE TO BE AGREED WITH THE DRAINAGE AUTHORITY.
6. PIPES UP TO AND INCLUDING 225mm Ø TO BE EXTRA STRENGTH V.CLAY OR UNPLASTICISED PVC. VITRIFIED CLAY PIPES AND FITTINGS SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN295 AND BS 65 RESPECTIVELY. PIPES 300mm Ø AND GREATER TO BE IN ACCORDANCE WITH BS EN 1916 CLASS 120.
7. VITRIFIED CLAY PIPES AND FITTINGS SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN295 AND BS 65 RESPECTIVELY AND BE KITEMARKED. ALL PIPES SHALL BE EXTRA STRENGTH TO BS 65 OR EQUIVALENT BS EN295 PIPE CRUSHING STRENGTH.
8. WHERE COVER TO PIPE BARREL IS LESS THAN 0.9m IN VEHICULAR TRAFFICKED AREAS, PIPEWORK TO BE DUCTILE IRON
9. ALL PIPEWORK TO BE 100mm DIAMETER UNLESS NOTED OTHERWISE.
10. INSITU AND PRECAST CONCRETE UNITS SHALL HAVE SULPHATE RESISTING PORTLAND CEMENT TO BS 4027, UNLESS AGREED OTHERWISE WITH THE ADOPTING AUTHORITY.
11. PRECAST CONCRETE PRODUCTS SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS 5911 AND BE KITEMARKED.
    CONCRETE PIPES TO BE CLASS H UNLESS NOTED OTHERWISE.
12. MANHOLE COVERS AND FRAMES SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN124, HAVE MINIMUM 675 x 675 CLEAR OPENINGS WITH 150 DEEP FRAMES UNLESS OTHERWISE SPECIFIED. MANHOLE COVERS AND FRAMES TO BE OF A NON-ROCKING DESIGN WITHOUT CUSHION INSERTS AND BE KITEMARKED. LOAD CLASS D400 IN VEHICULAR TRAFFICKED AREAS AND LOAD CLASS B125 IN FOOTWAYS AND PEDESTRIAN AREAS.
13. GULLY GRATES AND FRAMES SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN124 AND BE OF A NON-ROCKING DESIGN WITH CAPTIVE HINGE ACCESS AND BE KITEMARKED. LOAD CLASS D400.
14. BED TYPE A BEDDING DETAIL SHALL BE PROVIDED WHERE COVER TO THE PIPE BARREL IS LESS THAN 1.2m IN VEHICULAR TRAFFICKED AREAS AND 0.9m ELSEWHERE, TO ALL ROAD GULLY CONNECTIONS AND WITHIN AREAS OF DEEP ROOTING VEGETATION.
15. WHERE TYPE A TRENCH BEDDING DETAIL IS USED, THE CONCRETE BED AND SURROUND SHALL BE DISCONTINUED AT EACH PIPE JOINT OVER THE FULL CROSS SECTION BY MEANS OF A SHAPED COMPRESSIBLE FILLER.
16. SELECTED BACKFILL MATERIAL SHALL CONSIST OF UNIFORM MATERIAL FREE FROM STONES LARGER THAN 40mm, CLAY LUMPS LARGER THAN 75mm, TREE ROOTS, ORGANIC MATTER AND FROZEN SOIL. SELECTED BACKFILL MATERIAL SHALL BE PLACED IN LAYERS NOT EXCEEDING 225mm, EACH LAYER COMPACTED TO FORM A STABLE TRENCH BACKFILL.
17. GENERAL BACKFILL MATERIAL TO BE FREE FROM STONES LARGER THAN 40mm. GENERAL BACKFILL MATERIAL IS TO BE PLACED IN LAYERS NOT EXCEEDING 150mm THICKNESS AND EACH LAYER COMPACTED BY HAND. NO MECHANICAL COMPACTION OF FILL MATERIAL SHALL BE PERMITTED WITHIN 300mm ABOVE THE CROWN/BARREL OF THE PIPE.
18. BACKFILLING AND REINSTATEMENT TO TRENCHES IN PUBLIC HIGHWAYS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS AND SPECIFICATIONS OF THE ADOPTING AUTHORITY, OR, IN THE ABSENCE OF SUCH, IN ACCORDANCE WITH THE REQUIREMENTS OF "THE STREET WORKS REGULATIONS 1992" AND RELEVANT PROVISIONS OF H.A.U.C. "SPECIFICATION FOR THE REINSTATEMENT OF OPENINGS IN HIGHWAYS" JUNE 1992, BOTH UNDER SECTION 71 OF THE NEW ROADS AND STREET WORKS ACT 1991.
19. BACKFILL TO DRAINAGE TRENCHES IN HARD PAVED AREAS SHALL BE G.S.B. TYPE 1.
20. ALL RW DOWNCOMERS TO DISCHARGE TO TRAPPED GULLIES
21. ALL ROAD GULLIES ARE TO BE TRAPPED GULLIES.
22. ALL GULLY LEADS TO BE 150mm DIAMETER.
23. ALL REDUNDANT EXISTING DRAINAGE TO BE GRUBBED UP OR GROUTED, ANY EXISTING LIVE DRAINAGE SHOULD BE REPORTED TO THE ENGINEER AND RECONNECTED.
24. ALL ROAD GULLIES & LEADS TO BE CLEARED OF DEBRIS UPON COMPLETION OF WORKS.
25. ANY EXISTING DRAINAGE WHICH BECOMES UNDER TRAFFICKED AREAS IN THE NEW SCHEME SHOULD BE SUBJECT TO THE FOLLOWING REMEDIALS/REVISIONS. WHERE DEPTH OF COVER IS LESS THAN 1200mm, THE EXISTING PIPEWORK SHALL BE EXPOSED & SURROUNDED WITH 150mm CONCRETE AS BED TYPE A. WHERE THE EXISTING MANHOLE COVER & FRAME IS NOT AS MANHOLE DETAIL A OR B, OR TO BS497 GRADE A, OR EN124 CLASS D, THEN IT SHOULD BE CHANGED FOR SUCH.
26. THE CONTRACTOR MUST ENSURE THAT ANY OF THE EXISTING DRAINAGE WHICH IS LIVE IS KEPT CLEAR OF DEBRIS AND SHOULD ALLOW FOR JETTING THROUGH THE NEW & EXISTING DRAINAGE UPON COMPLETION.
27. CONTRACTOR TO TAKE MEASURES TO PROTECT HIS OPERATIVES WITH RESPECT TO THE PRESENCE OF GAS IN SEWER TRENCHES AND MANHOLES THROUGH THE USE OF GAS MONITORING EQUIPMENT AND BREATHING APPARATUS AS REQUIRED.
28. CONTRACTOR TO APPLY FOR SEWER PERMITS AND ROAD OPENING PERMITS AS NECESSARY FROM THE APPROPRIATE AUTHORITIES, PRIOR TO COMMENCING WORKS.

HEALTH & SAFETY

1. CONTRACTOR SHOULD BE AWARE OF GENERAL CONSTRUCTION RISKS TO PREVENT SLIPS, TRIPS AND FALLS AND TAKE NECESSARY PRECAUTIONS WITHOUT SPECIAL INSTRUCTION.

ROADS & DRAINAGE

2. CONTRACTOR TO PROVIDE TRENCH SUPPORTS AS APPROPRIATE AND ENSURE THAT PLANT REMAINS A SAFE DISTANCE FROM TRENCHES PRIOR TO INSTALLING DRAINAGE
3. THE TIME THAT EXCAVATIONS ARE OPEN ON SITE SHOULD BE KEPT TO A MINIMUM AND ALL TRENCHES SHOULD BE SURROUNDED BY A BARRIER.
4. CONTRACTOR TO MAKE OPERATIVES AWARE OF ASSOCIATED DANGERS TO HEALTH SUCH AS LEPTOSPIROSIS (WEILS DISEASE) AND RECOMMENDED PRECAUTIONS. ADEQUATE WELFARE FACILITIES AND PROTECTIVE CLOTHING TO BE PROVIDED AS REQUIRED.
5. UNFINISHED MANHOLES MUST BE COVERED WITH LOAD BEARING MATERIALS AND SURROUNDED WITH BARRIER.

PIPES & CABLES

6. SERVICE RECORDS TO BE REFERRED TO PRIOR TO WORK COMMENCING. CONTRACTOR TO PROCEED WITH CAUTION AND SERVICES TO BE LOCATED BY HAND DIG AND PROTECTED ACCORDINGLY

EXCAVATION/FILL

7. CONTRACTOR TO ENSURE RELEVANT MEASURES ARE TAKEN TO KEEP PLANT AND PEOPLE A SAFE DISTANCE FROM STEEP SLOPES DURING THE WORKS.
8. CONTRACTOR TO ENSURE THAT PROCEDURES ARE IN PLACE TO KEEP PEOPLE A SAFE DISTANCE FROM WORKING PLANT WHERE NECESSARY.
9. CONTRACTOR TO REFER TO GROUND INVESTIGATION REPORT FOR CONTAMINATION TESTS AND TO PROVIDE ADEQUATE WELFARE FACILITIES AND PROTECTIVE CLOTHING AS REQUIRED.

Rev.	Description	By	Chk	App	Date
Ø	Initial Issue	KC	SH	LRB	20/09/21

Portland consulting engineers
10 Bankside, The Watermark, Gateshead, Tyne & Wear, NE11 9SY
T: 0191 4619770 W: www.portlandconsulting.co.uk
F: 0191 4603028 E: info@portlandconsulting.co.uk

Client
Snowdon Coaches

Project
Snowdon Coaches
Seaside Lane
Easington

Drawing Title
Drainage Strategy

Scale	Sheet Size
1:500	A1

Drawn By	Checked By	Approved By	Date
KC	SH	SH	16/09/21

Drawing Status
Preliminary

Project No.	Drawing No.	Revision
2021031	000-00	Ø

Appendix G Maintenance Schedule

Section 1.
General Maintenance & Inspection Requirements
For Below Ground Gravity Drainage. (Including Drainage Channels)

1. No work shall be carried out on the drainage system without permission from a nominated person, who has access to information/a working knowledge of the system.

2. Maintenance/inspection work shall be carried out in a safe/planned manner.

3. All work is to be carried out by competent persons suitably trained and equipped in accordance with current statutory safe working policies.

4. Entry into confined spaces shall be kept to a minimum and be restricted to suitably qualified/equipped persons working in accordance with current statutory safe working policies.

5. High levels of hygiene shall be maintained at all times, with adequate welfare facilities being provided for the personnel.

6. Drainage systems shall be inspected on a regular basis or should any problems be suspected. Any debris/ defects discovered shall be recorded and a programme of cleaning/ repair initiated. Urgent repairs/ cleaning shall be actioned as soon as practicable.

7. The following operations should be carried out annually.
    a) Covers of inspection chambers and manholes shall be removed and the sides, benchings and channels cleared.
    b) Accumulated deposits of silt in soakaways, catchpit manholes, drainage channels, gullies etc. shall be removed. Any traps shall then be plunged and thoroughly flushed out with clean water.
    c) Main and branch drains shall be cleared as required and afterwards be flushed with clean water. Any obstructions found shall be removed and not flushed down the system.
    d) Covers of inspection chambers, manholes, gullies etc. shall be replaced, bedded in suitable grease or other sealing material as required and bolted/locked down as appropriate. Missing bolts and broken items shall be replaced in accordance with the manufacturer's details.

8. Trapped gullies shall be checked and replenished as necessary in order to maintain the seal preventing the escape of odours.

9. Clearing of the drainage system can be achieved by a number of methods depending on the nature of the work
    a) Rodding – Manual/Mechanical with flexible rods.
    b) Jetting – High pressure water jetting.
    c) Plunging.

<u>All non-adopted drainage to be maintained by the developer or by a management company appointed by them.</u>

Section 2.
Specific Items

Regular Maintenance		
Element	**Maintenance/Action required**	**Frequency**
Permeable Paving.	Regular cleaning will be required, brushing should suffice to remove surface dirt and silt build up between blocks. Following the routine maintenance, it may be necessary to redress the surface with 2-4mm gritstone as per manufacturer's recommendations.	Bi-Annual – In the spring Autumn after leaf fall.
Regular Monitoring		
Element	**Maintenance/Action required**	**Frequency**
Permeable Paving	Regular cleaning will be required, brushing should suffice to remove surface dirt and silt build up between blocks. Following the routine maintenance, it may be necessary to redress the surface with 2-4mm gritstone as per manufacturer's recommendations.	Bi-Annual – In the spring Autumn after leaf fall.
Regular Monitoring		
Permeable Paving: Initial Inspections	1- Inspect for poor operation 2- Inspect for evidence of poor operation and or weed growth. Take remedial action if required.	1- Monthly for 3 months after installation 2- Every 3 months, 48hours after large storms.
Permeable Paving	Check surface is draining adequately during storms.	Annually – during storm conditions.
Remedial Actions		
Rutting of paving /broken blocks.	Repair areas as necessary.	As required.
Surface and upper substructure if poor operation is encountered and cannot be rectified by cleaning of surface etc.	Rehabilitation/Replacement of these layers.	As required.
Adjacent landscaping.	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving.	As required.

Maintenance Schedule for Hydrobrake Manhole

Regular Maintenance		
Element	**Maintenance/Action required**	**Frequency**
Manhole.	1-Clear out sump 2-Check pivoting bypass door is operational.	1- Bi annual – after leaf fall and after first large storm 2-Annually in dry weather.
Regular Monitoring		
Manhole.	Check manhole to ensure emptying is occurring satisfactorily.	Annually – during heavy storm conditions.
Outlet pipe.	Check for blockages or pipe damage.	Annually.
Remedial Actions		
Manhole flooding.	Activate pivoting bypass door to release the water. Once system is empty check and remove blockages and silt deposits.	As required.
Outlet pipe: Damaged or blocked.	Repair pipe/unblock pipe Clear out all silt from catch pit.	As required.

Maintenance schedule for SUDS basin

Regular Maintenance		
Element	**Maintenance/Action required**	**Frequency**
Litter removal	Litter collection should be undertaken at each visit and at the beginning of any maintenance task, particularity grass cutting. All litter to be removed off-site.	Monthly
Grass cutting on slopes and in bottom of basin	All grass cuttings managed on site in wildlife or compost piles	Monthly
Scrub clearance from bankside	Overhanging branches and encroaching growth to be removed	Annually
Occasional Maintenance		
Element	**Maintenance/Action required**	**Frequency**
Silt removal	Remove silt from base and place in site piles	Once every 10 years
Re-seed areas of poor vegetation growth	Less likely when vegetation has established.	Annually
Remedial Actions		
Element	**Maintenance/Action required**	**Frequency**
Repair of erosion or damage	Re-turfing or seeding	Once every 10 years
Re-level uneven surfaces and reinstate design levels	Scraping, profiling and levelling	Once every 40 years
Management		
Element	**Maintenance/Action required**	**Frequency**
Inspect and clean debris screens	Ensure no obstructions at screen	Monthly