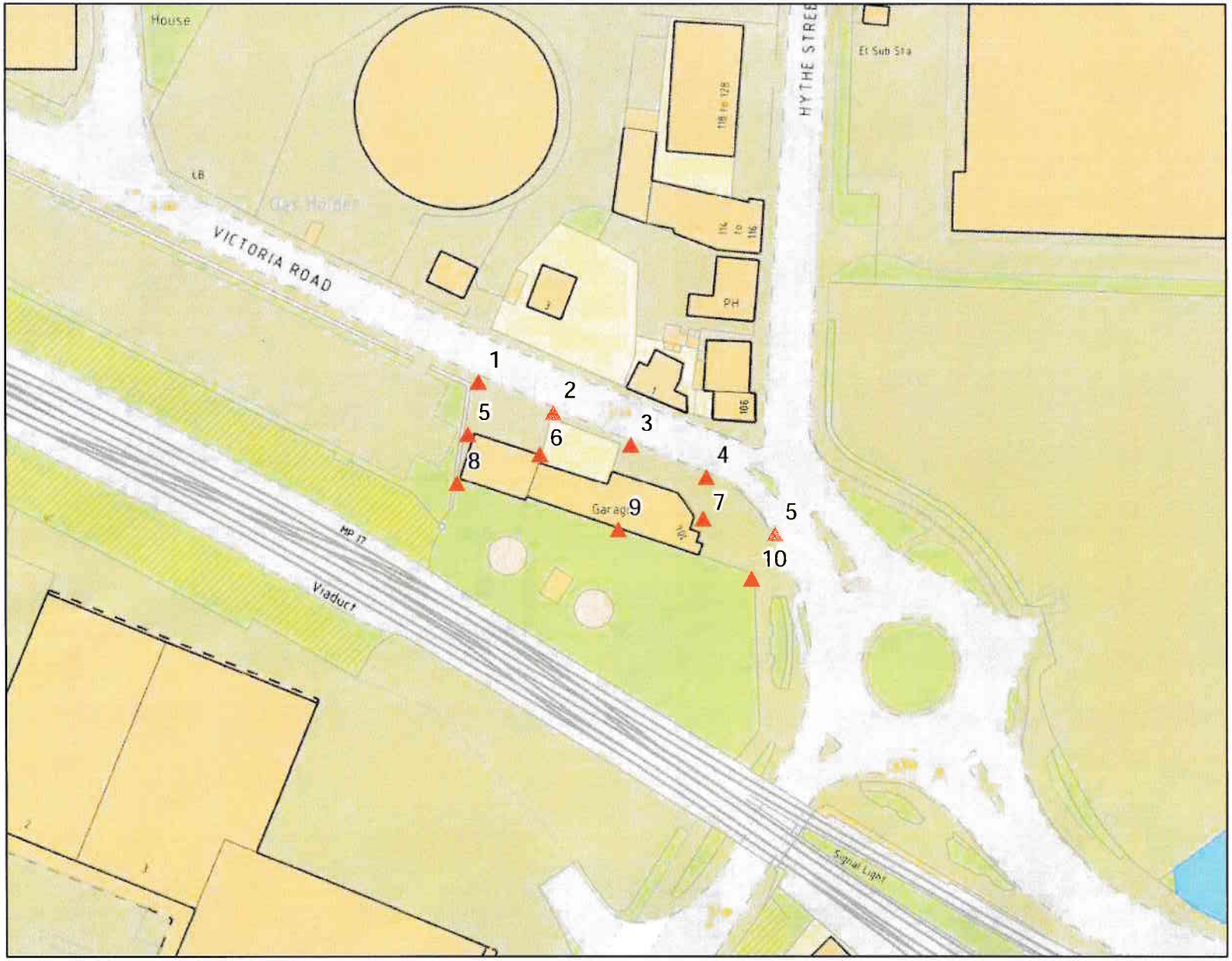
Node Location Map centred on DA1 1BW created 15 April 2019 [Ref: KSL 120378 LB]



Environment Agency

Scale 1: 1,000

Legend

▲ Node Point Locations

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Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Defence Details

The design standard of protection of the flood defences in this area of the Thames is 0.1% AEP; they are designed to defend London up to a 1 in 1000 year **tidal** flood event. The defences are all raised, man-made and privately owned. It is the riparian owners' responsibility to ensure that they are maintained to a crest level of 5.48m AODN (the Statutory Flood Defence Level in this reach of the Thames). We inspect them twice a year to ensure that they remain fit for purpose. The current condition grade for defences in the area is 2 (good), on a scale of 1 (very good) to 5 (very poor). For more information on your rights and responsibilities as a riparian owner, please see our document 'Living on the edge' found on our website at:

https://www.gov.uk/government/publications/riverside-ownership-rights-and-responsibilities

There are no planned improvements in this area. Please see the 'Thames Estuary 2100' document on our website for the short, medium and long term Flood Risk Management strategy for London:

https://www.gov.uk/government/publications/thames-estuary-2100-te2100

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Customer services line: 020 8474 6848
Email: kslenquiries@environment-agency.gov.uk
Website: https://www.gov.uk/government/organisations/environment-agency

Recorded Flood Events Data

We hold records of historic flood events from rivers and the sea. Information on the floods that may have affected the area local to your site is provided below and in the enclosed map (if relevant).

Flood Event Data

1953 – The site was within approximately 400m of the tidal flooding, due to a storm surge in the North Sea, on the night of the 31st January into the morning of 1st February. An approximate level in the Thames at the time was 5.06m AODN.

1968 - The site was subject to fluvial flooding, due the channel capacity being exceeded.

Due to the fact that our records are not comprehensive, we would advise that you make further enquiries locally with specific reference to flooding at this location. You should consider contacting the relevant Local Planning Authority and/or water/sewerage undertaker for the area.

We map flooding to land, not individual properties. Our historic flood event record outlines are an indication of the geographical extent of an observed flood event. Our historic flood event outlines do not give any indication of flood levels for individual properties. They also do not imply that any property within the outline has flooded internally.

Please be aware that flooding can come from different sources. Examples of these are:

- from rivers or the sea;
- surface water (i.e. rainwater flowing over or accumulating on the ground before it is able to enter rivers or the drainage system);
- overflowing or backing up of sewer or drainage systems which have been overwhelmed,
- groundwater rising up from underground aquifers

Currently the Environment Agency can only supply flood risk data relating to the chance of flooding from rivers or the sea. However you should be aware that in recent years, there has been an increase in flood damage caused by surface water flooding and drainage systems that have been overwhelmed.

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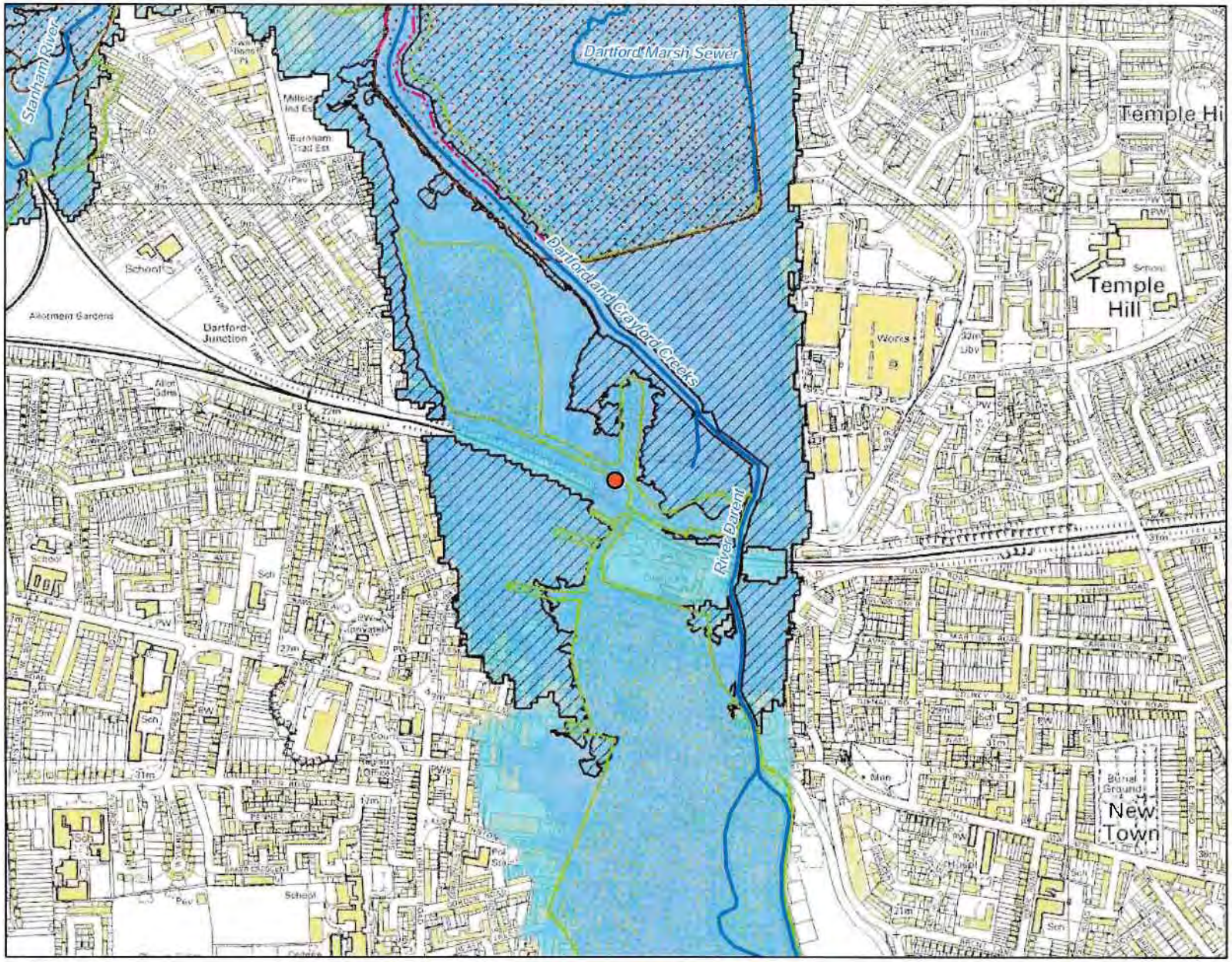
Historic Flood Map centred on DA1 1BW created 15 April 2019 [Ref: KSL 120378 LB]



Environment Agency

Scale 1: 10,000

Legend

- Site Location
- TE2100 Model Nodes
- Main Rivers
- Flood Map - Defences
- Flood Map - Flood Storage Areas
- Areas Benefiting from Flood Defences
- Flood Map - Flood Zone 3
- Flood Map - Flood Zone 2
- Jan 1953 Flood Outline
- Sep 1968 Flood Outline

Flood Map for Planning (assuming no defences)

Flood Zone 3 shows the area that could be affected by flooding:
- from the sea with a 0.5% or greater chance of occurring each year
- or from a river with a 1% or greater chance of occurring each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 0.1% chance of occurring each year.

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Additional Information

Information Warning - OS background mapping

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Planning advice and guidance

The Environment Agency are keen to work with partners to enable development which is resilient to flooding for its lifetime and provides wider benefits to communities. If you have requested this information to help inform a development proposal, then we recommend engaging with us as early as possible by using the pre-application form available from our website:
https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion

Complete the form in the link and email back to kslplanning@environment-agency.gov.uk

We recognise the value of early engagement in development planning decisions. This allows complex issues to be discussed, innovative solutions to be developed that both enables new development and protects existing communities. Such engagement can often avoid delays in the planning process following planning application submission, by reaching agreements up-front. We offer a charged pre-application advice service for applicants who wish to discuss a development proposal.
We can also provide a preliminary opinion for free which will identify environmental constraints related to our responsibilities including flooding, waste, land contamination, water quality, biodiversity, navigation, pollution, water resources, foul drainage or Environmental Impact Assessment.

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Environment Agency

Flood Risk Assessments guidance

Flood risk standing advice for applicants

In preparing your planning application submission, you should refer to the Environment Agency's Flood Risk Standing Advice and the Planning Practice Guidance for information about what flood risk assessment is needed for new development in the different Flood Zones. This information can be accessed via:

https://www.gov.uk/flood-risk-assessment-standing-advice

http://planningguidance.planningportal.gov.uk/

https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications

https://www.gov.uk/guidance/flood-risk-and-coastal-change

You should also consult the Strategic Flood Risk Assessment and flood risk local plan policies produced by your local planning authority.

You should note that:

1. Information supplied by the Environment Agency may be used to assist in producing a Flood Risk Assessment where one is required, but does not constitute such an assessment on its own.
2. This information covers flood risk from main rivers and the sea, and you will need to consider other potential sources of flooding, such as groundwater or overland runoff. You should discuss surface water management with your Lead Local Flood Authority.
3. Where a planning application requires a FRA and this is not submitted or deficient, the Environment Agency may well raise an objection due to insufficient information

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Surface Water

We have provided two national Surface Water maps, under our Strategic Overview for flooding, to your Lead Local Flood Authority who are responsible for local flood risk (i.e. surface runoff, ground water and ordinary watercourse), which alongside their existing local information will help them in determining what best represents surface water flood risk in your area.

Your Lead Local Flood Authority have reviewed these and determined what it believes best represents surface water flood risk. You should therefore contact this authority so they can provide you with the most up to date information about surface water flood risk in your area.

You may also wish to consider contacting the appropriate relevant Local Planning Authority and/or water/sewerage undertaker for the area. They may be able to provide some knowledge on the risk of flooding from other sources. We are working with these organisations to improve knowledge and understanding of surface water flooding.

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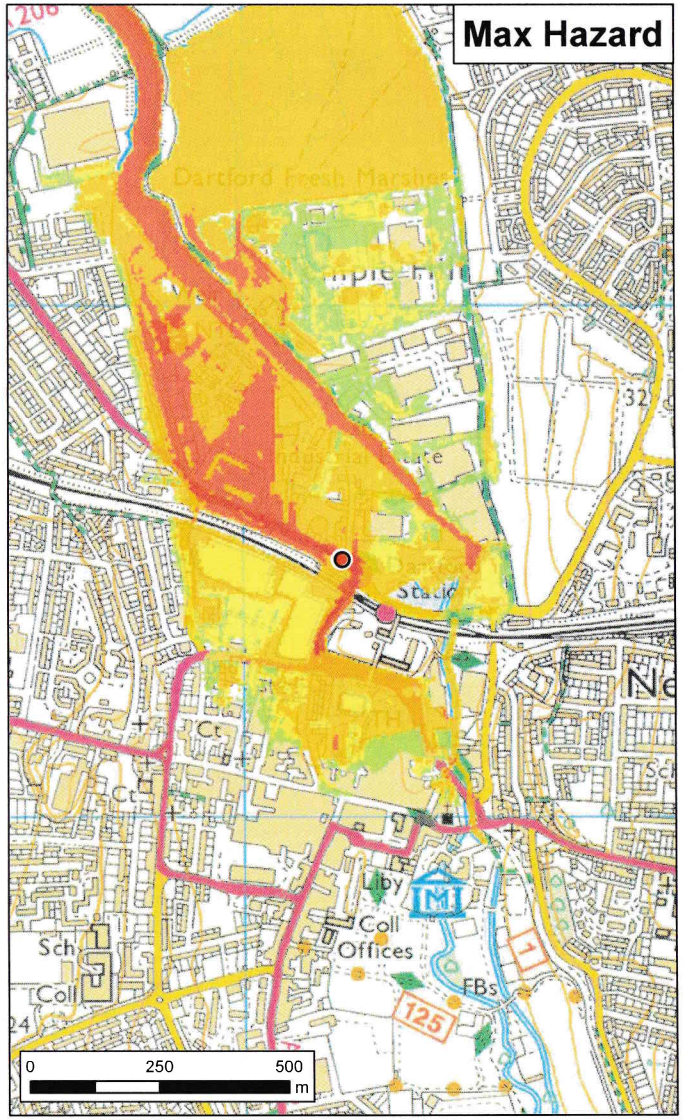

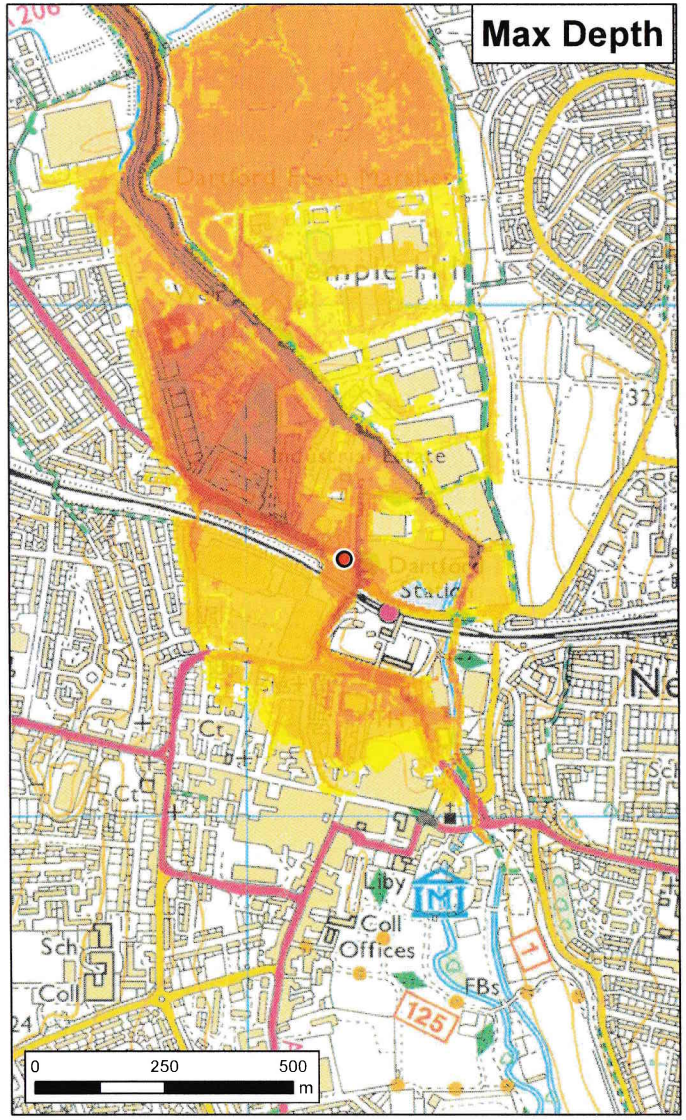

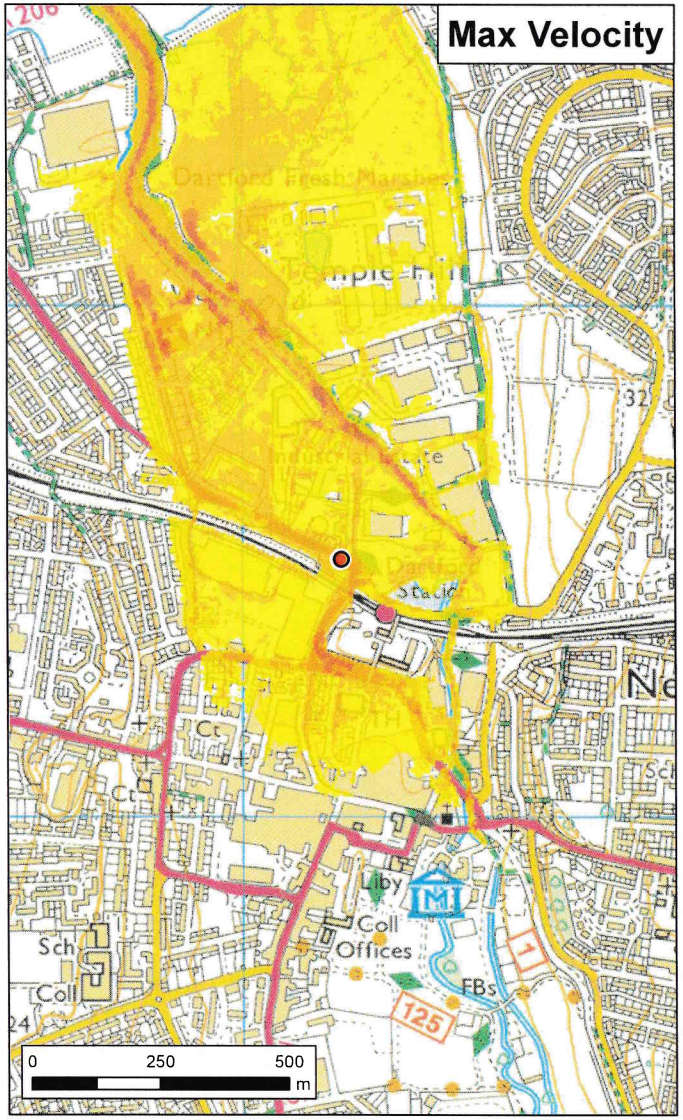

Site Location

Max Hazard

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.00 (Danger for Most)
- Greater than 2.00 (Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- > 2.00

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- > 2.5

Date Printed	06/08/2019	Scenario year	2115	Scenario Annual Chance	0.5% (1 in 200)

This map shows the combined flood hazard to people (called a hazard rating) if our flood defences are breached at any given single location, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.

The map is based on computer modelling of simulated breaches covering the entire extent between the Thames Barrier and Gravesend. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.

The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains.

Please contact the Environment Agency for further information on emergency planning associated with flood risk in this area.

General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary

Environment Agency

Thames Tidal Downriver Breach Hazard Mapping

Map Centred on DA1 1BW
KSL 136329 CM

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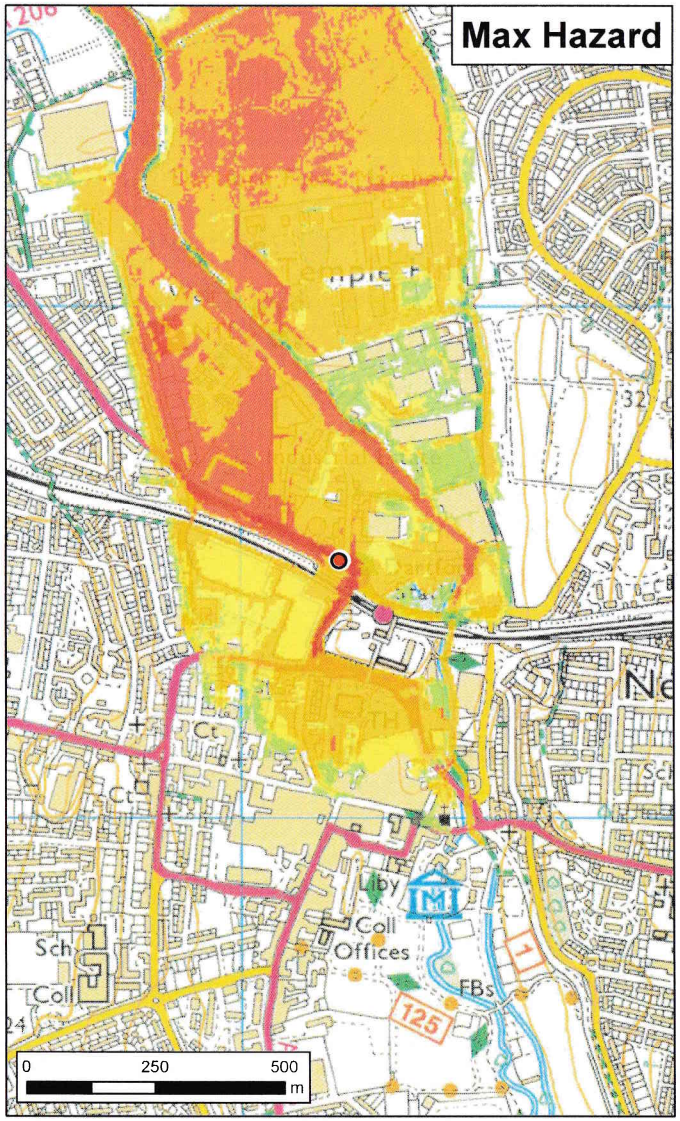

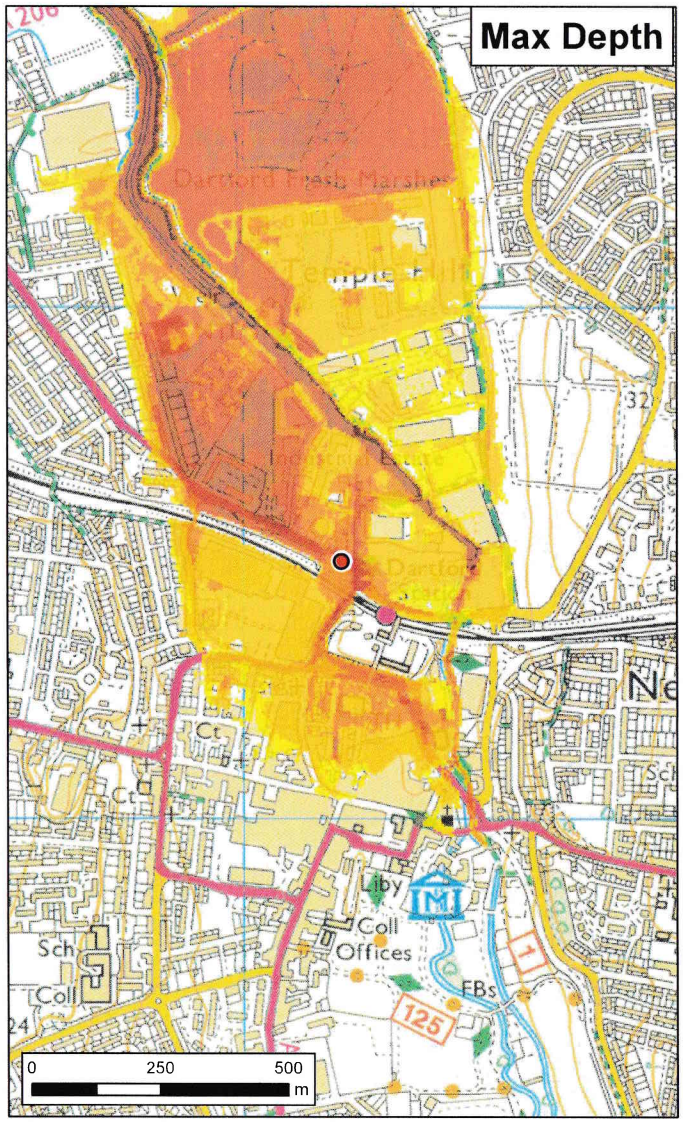

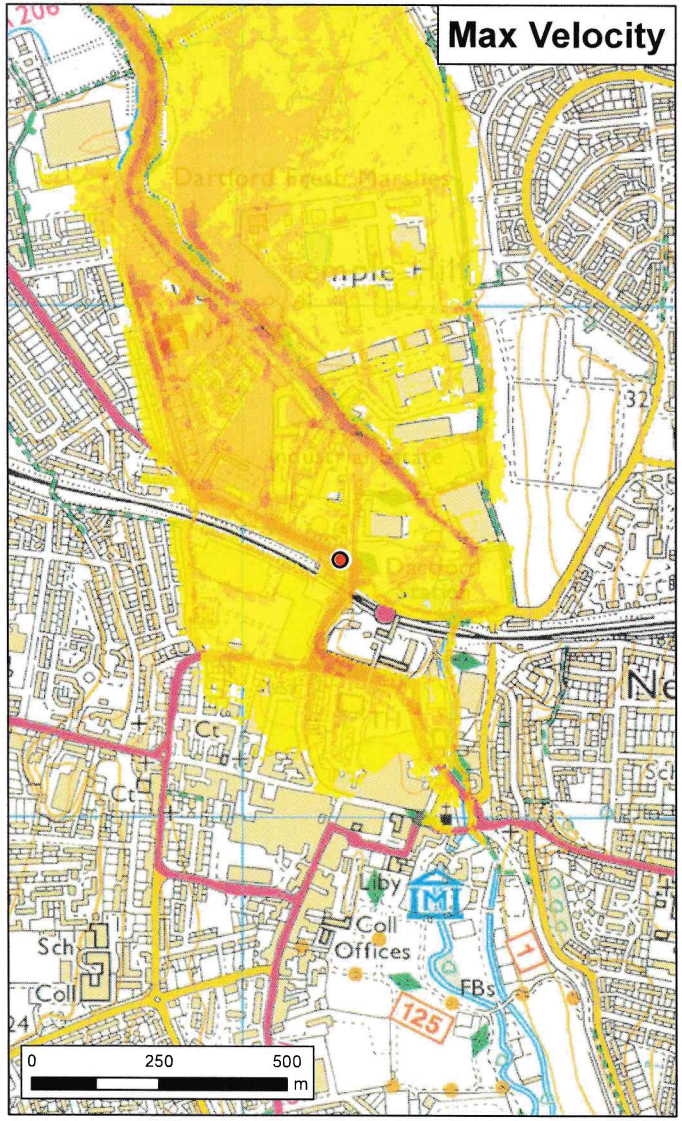

Site Location

Max Hazard	Max Depth (m)	Max Velocity (m/s)
Less than 0.75 (Low Hazard)	0 - 0.25	0 - 0.3
Between 0.75 and 1.25 (Danger for Some)	0.25 - 1.00	0.3 - 1.0
Between 1.25 and 2.00 (Danger for Most)	1.00 - 1.50	1.0 - 1.5
Greater than 2.00 (Danger for All)	1.50 - 2.00	1.5 - 2.5
	> 2.00	> 2.5

Date Printed	06/08/2019	Scenario year	2115	Scenario Annual Chance	0.1% (1 in 1000)

This map shows the combined flood hazard to people (called a hazard rating) if our flood defences are breached at any given single location, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.

The map is based on computer modelling of simulated breaches covering the entire extent between the Thames Barrier and Gravesend. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.

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Appendix F

Borehole Logs

installed to depth of 10m.

	2.00	6602	J	2.05			
		6604	D	3.35	3.65	26	
		6605	J	4.00			
		6606	D	4.65	4.95	28	
		6607	J	5.50			
		6608	D	6.00			
		6609	J	7.00			
		6610	D	7.40			

Driller:

eet No.

—: Length of Core Run, + Extrapolated 'N' Value.

British Geological Survey

				6614	D	10.40		
				6618	D	13.40		
				6619	D	14.00	14.60	43

Notes:

Driller:

Shea

CODES: U—Undisturbed Sample, B Piston Sample, D Large Disturbed Sample, Water Sample

British Geological Survey

Appendix G

Foul & Surface Water Calculations

PRELIMINARY DRAINAGE CALCULATIONS

22/04/2020

EXISTING SURFACE WATER

ARDENT
CONSULTING ENGINEERS

Existing site information:

Site Boundary Area	480	m2
Developable Area	0.048	ha
Impermeable Area	0.0480	ha

Modified Rational Method Equation:

$$Q_n = 2.78\ CiA$$

where:

C	*Runoff Coeffi* =	1 (in this case 1 as using impermeable area)
i_n	*Rainfall Intensity for n return period (mm/hr)*	
A	*Impermeable Area (Ha)*	
Q_n	*Runoff for n return period (l/s)*	

Rainfall Intensity:

The rainfall intensities for various return periods were extracted from Table 1(a) of the Transport and Road Research Laboratory Report - Estimated rainfall for drainage calculations in the United Kingdom (TRRL Report LR 595) by C. P. Young. For the 5 min duration.

i_1	50.8	mm/hr
i_{30}	113.02	mm/hr
i_{100}	143.9	mm/hr

Existing Surface Water Runoff:

Therefore:

			C		i_n		*A*		Q_n	
Q_1	2.78	x	1	x	50.8	x	0.048	=	**6.78**	**l/s**
Q_{30}	2.78	x	1	x	113.0	x	0.048	=	**15.08**	**l/s**
Q_{100}	2.78	x	1	x	143.9	x	0.048	=	**19.20**	**l/s**

PRELIMINARY DRAINAGE CALCULATIONS

22/04/2020

EXISTING FOUL WATER

ARDENT
CONSULTING ENGINEERS

Unit Type	Existing Area/Units	Hours (hrs)	Foul Water Flow Rate l/day	Peak Factor	Peaked Loading l/s	Loading (l/s)
Garage	170 m2	10	300 per 100 m sq	6.6	0.055 per 100 m sq	0.094

TOTAL EXISTING FOUL LOADING = 0.094

PROPOSED FOUL WATER

Unit Type	Proposed Area/Units	Hours (hrs)	Foul Water Flow Rate l/day	Peak Factor	Peaked Loading l/s	Loading (l/s)
General Housing	11 property	24	600 per property	6.6	0.0458 per property	0.504
Commercial	54 m2	10	300 per 100 m sq	6.6	0.055 per 100 m sq	0.030

TOTAL PROPOSED FOUL LOADING = 0.534

PRELIMINARY DRAINAGE CALCULATIONS

22/04/2020

	Dry weather flow (in litres per day)	Daily Discharge (in litres)
General Housing per property	600	4000
School per pupil	80	528
Assembly Hall per seat	10	66
Cinema per seat	10	66
Theatre per seat	10	66
Sports Hall per person	50	330
Hotel per room	550	3630
Guest House per room	200	1320
Motel per room	300	1980
Holiday Apartment per person	150	990
Leisure Park per person	220	1452
Caravan Pk standard per space	250	1650
Caravan Site serviced per space	450	2970
Camping site standard per space	200	1320
Camping site serviced per space	350	2310
Public House per seat	150	990
Restaurant/Day Care Centre per person	270	1782
Drive in restaurant per seat	380	2508
Hospital per bed	750	4950
Nursing/Care Home per bed	375	2475
Offices per 100m sq	750	4950
Shopping Centre per 100m sq	400	2640
Warehouse per 100m sq	150	990
Commercial premises per 100 m sq	300	1980
Manufacturing unit per 100m sq	550	3630

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	SAAR (mm)	600	Urban	0.000
Area (ha)	0.048	Soil	0.150	Region Number	Region 6

Results	**l/s**
QBAR Rural	0.0
QBAR Urban	0.0
Q100 years	0.1
Q1 year	0.0
Q30 years	0.0
Q100 years	0.1

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.900
Region	England and Wales	Cv (Winter)	0.900
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.435	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.046

Time (mins) From:	To:	Area (ha)
0	4	0.046

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Model Details

Storage is Offline Dividing Weir Level (m) 2.495
Cover Level (m) 3.850

Cellular Storage Structure

Invert Level (m) 2.495 Safety Factor 1.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	30.0	0.0	0.601	0.0	0.0
0.600	30.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0064-2000-1200-2000
Design Head (m)	1.200
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	64
Invert Level (m)	2.360
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.0	Kick-Flo®	0.573	1.4
Flush-Flo™	0.282	1.8	Mean Flow over Head Range	-	1.6

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	1.5	1.200	2.0	3.000	3.0	7.000	4.5
0.200	1.7	1.400	2.1	3.500	3.3	7.500	4.7
0.300	1.8	1.600	2.3	4.000	3.5	8.000	4.8
0.400	1.7	1.800	2.4	4.500	3.7	8.500	5.0
0.500	1.6	2.000	2.5	5.000	3.9	9.000	5.1
0.600	1.5	2.200	2.6	5.500	4.0	9.500	5.2
0.800	1.7	2.400	2.7	6.000	4.2		
1.000	1.8	2.600	2.8	6.500	4.4		

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Summary of Results for 1 year Return Period

Half Drain Time : 12 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	2.561	0.066	0.0	1.7	1.7	1.9	O K
30 min Summer	2.562	0.067	0.0	1.7	1.7	1.9	O K
60 min Summer	2.554	0.059	0.0	1.7	1.7	1.7	O K
120 min Summer	2.534	0.039	0.0	1.7	1.7	1.1	O K
180 min Summer	2.516	0.021	0.0	1.7	1.7	0.6	O K
240 min Summer	2.504	0.009	0.0	1.6	1.6	0.3	O K
360 min Summer	2.495	0.000	0.0	1.6	1.6	0.0	O K
480 min Summer	2.495	0.000	0.0	1.3	1.3	0.0	O K
600 min Summer	2.495	0.000	0.0	1.1	1.1	0.0	O K
720 min Summer	2.495	0.000	0.0	0.9	0.9	0.0	O K
960 min Summer	2.495	0.000	0.0	0.8	0.8	0.0	O K
1440 min Summer	2.495	0.000	0.0	0.6	0.6	0.0	O K
2160 min Summer	2.495	0.000	0.0	0.4	0.4	0.0	O K
2880 min Summer	2.495	0.000	0.0	0.3	0.3	0.0	O K
4320 min Summer	2.495	0.000	0.0	0.2	0.2	0.0	O K
5760 min Summer	2.495	0.000	0.0	0.2	0.2	0.0	O K
7200 min Summer	2.495	0.000	0.0	0.2	0.2	0.0	O K
8640 min Summer	2.495	0.000	0.0	0.1	0.1	0.0	O K
10080 min Summer	2.495	0.000	0.0	0.1	0.1	0.0	O K
15 min Winter	2.561	0.066	0.0	1.7	1.7	1.9	O K
30 min Winter	2.560	0.065	0.0	1.7	1.7	1.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	31.866	0.0	3.2	14
30 min Summer	20.528	0.0	4.3	23
60 min Summer	12.800	0.0	5.3	40
120 min Summer	7.811	0.0	6.4	72
180 min Summer	5.820	0.0	7.2	102
240 min Summer	4.717	0.0	7.8	130
360 min Summer	3.497	0.0	8.7	0
480 min Summer	2.815	0.0	9.3	0
600 min Summer	2.378	0.0	9.8	0
720 min Summer	2.072	0.0	10.3	0
960 min Summer	1.668	0.0	11.0	0
1440 min Summer	1.228	0.0	12.2	0
2160 min Summer	0.905	0.0	13.5	0
2880 min Summer	0.728	0.0	14.5	0
4320 min Summer	0.536	0.0	16.0	0
5760 min Summer	0.431	0.0	17.1	0
7200 min Summer	0.365	0.0	18.1	0
8640 min Summer	0.318	0.0	18.9	0
10080 min Summer	0.283	0.0	19.7	0
15 min Winter	31.866	0.0	3.2	15
30 min Winter	20.528	0.0	4.2	24

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Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
60 min Winter	2.545	0.050	0.0	1.7	1.7	1.4	O K
120 min Winter	2.514	0.019	0.0	1.7	1.7	0.5	O K
180 min Winter	2.496	0.001	0.0	1.6	1.6	0.0	O K
240 min Winter	2.495	0.000	0.0	1.4	1.4	0.0	O K
360 min Winter	2.495	0.000	0.0	1.0	1.0	0.0	O K
480 min Winter	2.495	0.000	0.0	0.8	0.8	0.0	O K
600 min Winter	2.495	0.000	0.0	0.7	0.7	0.0	O K
720 min Winter	2.495	0.000	0.0	0.6	0.6	0.0	O K
960 min Winter	2.495	0.000	0.0	0.5	0.5	0.0	O K
1440 min Winter	2.495	0.000	0.0	0.4	0.4	0.0	O K
2160 min Winter	2.495	0.000	0.0	0.3	0.3	0.0	O K
2880 min Winter	2.495	0.000	0.0	0.2	0.2	0.0	O K
4320 min Winter	2.495	0.000	0.0	0.2	0.2	0.0	O K
5760 min Winter	2.495	0.000	0.0	0.1	0.1	0.0	O K
7200 min Winter	2.495	0.000	0.0	0.1	0.1	0.0	O K
8640 min Winter	2.495	0.000	0.0	0.1	0.1	0.0	O K
10080 min Winter	2.495	0.000	0.0	0.1	0.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	12.800	0.0	5.3	42
120 min Winter	7.811	0.0	6.5	74
180 min Winter	5.820	0.0	7.2	98
240 min Winter	4.717	0.0	7.8	0
360 min Winter	3.497	0.0	8.7	0
480 min Winter	2.815	0.0	9.3	0
600 min Winter	2.378	0.0	9.8	0
720 min Winter	2.072	0.0	10.3	0
960 min Winter	1.668	0.0	11.0	0
1440 min Winter	1.228	0.0	12.2	0
2160 min Winter	0.905	0.0	13.5	0
2880 min Winter	0.728	0.0	14.5	0
4320 min Winter	0.536	0.0	16.0	0
5760 min Winter	0.431	0.0	17.1	0
7200 min Winter	0.365	0.0	18.1	0
8640 min Winter	0.318	0.0	18.9	0
10080 min Winter	0.283	0.0	19.7	0

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Summary of Results for 30 year Return Period

Half Drain Time : 41 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	2.719	0.224	0.0	1.8	1.8	6.4	O K
30 min Summer	2.750	0.255	0.0	1.8	1.8	7.3	O K
60 min Summer	2.746	0.251	0.0	1.8	1.8	7.2	O K
120 min Summer	2.720	0.225	0.0	1.8	1.8	6.4	O K
180 min Summer	2.689	0.194	0.0	1.8	1.8	5.5	O K
240 min Summer	2.658	0.163	0.0	1.8	1.8	4.7	O K
360 min Summer	2.605	0.110	0.0	1.8	1.8	3.1	O K
480 min Summer	2.564	0.069	0.0	1.7	1.7	2.0	O K
600 min Summer	2.534	0.039	0.0	1.7	1.7	1.1	O K
720 min Summer	2.514	0.019	0.0	1.7	1.7	0.5	O K
960 min Summer	2.495	0.000	0.0	1.6	1.6	0.0	O K
1440 min Summer	2.495	0.000	0.0	1.2	1.2	0.0	O K
2160 min Summer	2.495	0.000	0.0	0.8	0.8	0.0	O K
2880 min Summer	2.495	0.000	0.0	0.7	0.7	0.0	O K
4320 min Summer	2.495	0.000	0.0	0.5	0.5	0.0	O K
5760 min Summer	2.495	0.000	0.0	0.4	0.4	0.0	O K
7200 min Summer	2.495	0.000	0.0	0.3	0.3	0.0	O K
8640 min Summer	2.495	0.000	0.0	0.3	0.3	0.0	O K
10080 min Summer	2.495	0.000	0.0	0.2	0.2	0.0	O K
15 min Winter	2.720	0.225	0.0	1.8	1.8	6.4	O K
30 min Winter	2.753	0.258	0.0	1.8	1.8	7.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	78.218	0.0	8.1	17
30 min Summer	50.225	0.0	10.4	31
60 min Summer	30.811	0.0	12.7	48
120 min Summer	18.353	0.0	15.1	82
180 min Summer	13.421	0.0	16.7	116
240 min Summer	10.706	0.0	17.8	148
360 min Summer	7.758	0.0	19.3	212
480 min Summer	6.173	0.0	20.4	270
600 min Summer	5.167	0.0	21.4	326
720 min Summer	4.467	0.0	22.2	382
960 min Summer	3.548	0.0	23.5	0
1440 min Summer	2.562	0.0	25.5	0
2160 min Summer	1.848	0.0	27.5	0
2880 min Summer	1.465	0.0	29.1	0
4320 min Summer	1.055	0.0	31.5	0
5760 min Summer	0.836	0.0	33.2	0
7200 min Summer	0.697	0.0	34.6	0
8640 min Summer	0.601	0.0	35.8	0
10080 min Summer	0.530	0.0	36.9	0
15 min Winter	78.218	0.0	8.1	17
30 min Winter	50.225	0.0	10.4	30

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Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
60 min Winter	2.745	0.250	0.0	1.8	1.8	7.1	O K
120 min Winter	2.706	0.211	0.0	1.8	1.8	6.0	O K
180 min Winter	2.659	0.164	0.0	1.8	1.8	4.7	O K
240 min Winter	2.615	0.120	0.0	1.8	1.8	3.4	O K
360 min Winter	2.546	0.051	0.0	1.7	1.7	1.5	O K
480 min Winter	2.505	0.010	0.0	1.6	1.6	0.3	O K
600 min Winter	2.495	0.000	0.0	1.5	1.5	0.0	O K
720 min Winter	2.495	0.000	0.0	1.3	1.3	0.0	O K
960 min Winter	2.495	0.000	0.0	1.0	1.0	0.0	O K
1440 min Winter	2.495	0.000	0.0	0.7	0.7	0.0	O K
2160 min Winter	2.495	0.000	0.0	0.5	0.5	0.0	O K
2880 min Winter	2.495	0.000	0.0	0.4	0.4	0.0	O K
4320 min Winter	2.495	0.000	0.0	0.3	0.3	0.0	O K
5760 min Winter	2.495	0.000	0.0	0.2	0.2	0.0	O K
7200 min Winter	2.495	0.000	0.0	0.2	0.2	0.0	O K
8640 min Winter	2.495	0.000	0.0	0.2	0.2	0.0	O K
10080 min Winter	2.495	0.000	0.0	0.2	0.2	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	30.811	0.0	12.7	50
120 min Winter	18.353	0.0	15.1	88
180 min Winter	13.421	0.0	16.7	122
240 min Winter	10.706	0.0	17.7	156
360 min Winter	7.758	0.0	19.2	214
480 min Winter	6.173	0.0	20.4	264
600 min Winter	5.167	0.0	21.4	0
720 min Winter	4.467	0.0	22.2	0
960 min Winter	3.548	0.0	23.5	0
1440 min Winter	2.562	0.0	25.5	0
2160 min Winter	1.848	0.0	27.5	0
2880 min Winter	1.465	0.0	29.1	0
4320 min Winter	1.055	0.0	31.5	0
5760 min Winter	0.836	0.0	33.2	0
7200 min Winter	0.697	0.0	34.6	0
8640 min Winter	0.601	0.0	35.8	0
10080 min Winter	0.530	0.0	36.9	0

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Summary of Results for 100 year Return Period

Half Drain Time : 52 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	2.802	0.307	0.0	1.8	1.8	8.7	O K
30 min Summer	2.862	0.367	0.0	1.8	1.8	10.5	O K
60 min Summer	2.876	0.381	0.0	1.8	1.8	10.8	O K
120 min Summer	2.845	0.350	0.0	1.8	1.8	10.0	O K
180 min Summer	2.811	0.316	0.0	1.8	1.8	9.0	O K
240 min Summer	2.776	0.281	0.0	1.8	1.8	8.0	O K
360 min Summer	2.709	0.214	0.0	1.8	1.8	6.1	O K
480 min Summer	2.652	0.157	0.0	1.8	1.8	4.5	O K
600 min Summer	2.606	0.111	0.0	1.8	1.8	3.2	O K
720 min Summer	2.571	0.076	0.0	1.7	1.7	2.2	O K
960 min Summer	2.523	0.028	0.0	1.7	1.7	0.8	O K
1440 min Summer	2.495	0.000	0.0	1.5	1.5	0.0	O K
2160 min Summer	2.495	0.000	0.0	1.1	1.1	0.0	O K
2880 min Summer	2.495	0.000	0.0	0.8	0.8	0.0	O K
4320 min Summer	2.495	0.000	0.0	0.6	0.6	0.0	O K
5760 min Summer	2.495	0.000	0.0	0.5	0.5	0.0	O K
7200 min Summer	2.495	0.000	0.0	0.4	0.4	0.0	O K
8640 min Summer	2.495	0.000	0.0	0.3	0.3	0.0	O K
10080 min Summer	2.495	0.000	0.0	0.3	0.3	0.0	O K
15 min Winter	2.803	0.308	0.0	1.8	1.8	8.8	O K
30 min Winter	2.865	0.370	0.0	1.8	1.8	10.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	101.615	0.0	10.5	17
30 min Summer	65.766	0.0	13.6	32
60 min Summer	40.510	0.0	16.7	60
120 min Summer	24.124	0.0	20.0	88
180 min Summer	17.594	0.0	21.8	122
240 min Summer	13.991	0.0	23.2	156
360 min Summer	10.080	0.0	25.1	220
480 min Summer	7.992	0.0	26.4	282
600 min Summer	6.671	0.0	27.6	340
720 min Summer	5.753	0.0	28.6	398
960 min Summer	4.552	0.0	30.1	510
1440 min Summer	3.267	0.0	32.5	0
2160 min Summer	2.342	0.0	34.9	0
2880 min Summer	1.848	0.0	36.7	0
4320 min Summer	1.322	0.0	39.4	0
5760 min Summer	1.041	0.0	41.4	0
7200 min Summer	0.865	0.0	43.0	0
8640 min Summer	0.743	0.0	44.3	0
10080 min Summer	0.653	0.0	45.4	0
15 min Winter	101.615	0.0	10.5	17
30 min Winter	65.766	0.0	13.6	31

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Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
60 min Winter	2.882	0.387	0.0	1.8	1.8	11.0	O K
120 min Winter	2.838	0.343	0.0	1.8	1.8	9.8	O K
180 min Winter	2.788	0.293	0.0	1.8	1.8	8.3	O K
240 min Winter	2.735	0.240	0.0	1.8	1.8	6.8	O K
360 min Winter	2.641	0.146	0.0	1.8	1.8	4.2	O K
480 min Winter	2.572	0.077	0.0	1.7	1.7	2.2	O K
600 min Winter	2.524	0.029	0.0	1.7	1.7	0.8	O K
720 min Winter	2.498	0.003	0.0	1.6	1.6	0.1	O K
960 min Winter	2.495	0.000	0.0	1.3	1.3	0.0	O K
1440 min Winter	2.495	0.000	0.0	1.0	1.0	0.0	O K
2160 min Winter	2.495	0.000	0.0	0.7	0.7	0.0	O K
2880 min Winter	2.495	0.000	0.0	0.5	0.5	0.0	O K
4320 min Winter	2.495	0.000	0.0	0.4	0.4	0.0	O K
5760 min Winter	2.495	0.000	0.0	0.3	0.3	0.0	O K
7200 min Winter	2.495	0.000	0.0	0.3	0.3	0.0	O K
8640 min Winter	2.495	0.000	0.0	0.2	0.2	0.0	O K
10080 min Winter	2.495	0.000	0.0	0.2	0.2	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	40.510	0.0	16.8	58
120 min Winter	24.124	0.0	20.0	94
180 min Winter	17.594	0.0	21.8	130
240 min Winter	13.991	0.0	23.2	166
360 min Winter	10.080	0.0	25.0	230
480 min Winter	7.992	0.0	26.5	288
600 min Winter	6.671	0.0	27.6	338
720 min Winter	5.753	0.0	28.6	378
960 min Winter	4.552	0.0	30.1	0
1440 min Winter	3.267	0.0	32.5	0
2160 min Winter	2.342	0.0	34.9	0
2880 min Winter	1.848	0.0	36.7	0
4320 min Winter	1.322	0.0	39.4	0
5760 min Winter	1.041	0.0	41.4	0
7200 min Winter	0.865	0.0	43.0	0
8640 min Winter	0.743	0.0	44.3	0
10080 min Winter	0.653	0.0	45.4	0

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Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 80 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	2.950	0.455	0.0	1.8	1.8	13.0	O K
30 min Summer	3.052	0.557	0.0	1.8	1.8	15.9	O K
60 min Summer	3.366	0.871	0.0	1.8	1.8	17.4	O K
120 min Summer	3.079	0.584	0.0	1.8	1.8	16.7	O K
180 min Summer	3.042	0.547	0.0	1.8	1.8	15.6	O K
240 min Summer	3.005	0.510	0.0	1.8	1.8	14.5	O K
360 min Summer	2.931	0.436	0.0	1.8	1.8	12.4	O K
480 min Summer	2.862	0.367	0.0	1.8	1.8	10.5	O K
600 min Summer	2.794	0.299	0.0	1.8	1.8	8.5	O K
720 min Summer	2.736	0.241	0.0	1.8	1.8	6.9	O K
960 min Summer	2.643	0.148	0.0	1.8	1.8	4.2	O K
1440 min Summer	2.536	0.041	0.0	1.7	1.7	1.2	O K
2160 min Summer	2.495	0.000	0.0	1.5	1.5	0.0	O K
2880 min Summer	2.495	0.000	0.0	1.2	1.2	0.0	O K
4320 min Summer	2.495	0.000	0.0	0.8	0.8	0.0	O K
5760 min Summer	2.495	0.000	0.0	0.7	0.7	0.0	O K
7200 min Summer	2.495	0.000	0.0	0.5	0.5	0.0	O K
8640 min Summer	2.495	0.000	0.0	0.5	0.5	0.0	O K
10080 min Summer	2.495	0.000	0.0	0.4	0.4	0.0	O K
15 min Winter	2.951	0.456	0.0	1.8	1.8	13.0	O K
30 min Winter	3.055	0.560	0.0	1.8	1.8	16.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	142.261	0.0	14.7	18
30 min Summer	92.072	0.0	19.1	32
60 min Summer	56.713	0.0	23.4	60
120 min Summer	33.773	0.0	27.9	104
180 min Summer	24.632	0.0	30.7	134
240 min Summer	19.588	0.0	32.3	168
360 min Summer	14.112	0.0	35.0	236
480 min Summer	11.189	0.0	37.1	302
600 min Summer	9.339	0.0	38.6	362
720 min Summer	8.054	0.0	39.9	424
960 min Summer	6.372	0.0	42.1	540
1440 min Summer	4.574	0.0	45.4	764
2160 min Summer	3.279	0.0	48.9	0
2880 min Summer	2.587	0.0	51.4	0
4320 min Summer	1.850	0.0	55.2	0
5760 min Summer	1.458	0.0	57.9	0
7200 min Summer	1.211	0.0	60.2	0
8640 min Summer	1.040	0.0	62.0	0
10080 min Summer	0.915	0.0	63.6	0
15 min Winter	142.261	0.0	14.7	18
30 min Winter	92.072	0.0	19.0	32

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
60 min Winter	3.499	1.004	0.0	2.0	2.0	17.5	O K
120 min Winter	3.084	0.589	0.0	1.8	1.8	16.8	O K
180 min Winter	3.034	0.539	0.0	1.8	1.8	15.4	O K
240 min Winter	2.982	0.487	0.0	1.8	1.8	13.9	O K
360 min Winter	2.871	0.376	0.0	1.8	1.8	10.7	O K
480 min Winter	2.765	0.270	0.0	1.8	1.8	7.7	O K
600 min Winter	2.678	0.183	0.0	1.8	1.8	5.2	O K
720 min Winter	2.609	0.114	0.0	1.8	1.8	3.3	O K
960 min Winter	2.522	0.027	0.0	1.7	1.7	0.8	O K
1440 min Winter	2.495	0.000	0.0	1.3	1.3	0.0	O K
2160 min Winter	2.495	0.000	0.0	1.0	1.0	0.0	O K
2880 min Winter	2.495	0.000	0.0	0.8	0.8	0.0	O K
4320 min Winter	2.495	0.000	0.0	0.5	0.5	0.0	O K
5760 min Winter	2.495	0.000	0.0	0.4	0.4	0.0	O K
7200 min Winter	2.495	0.000	0.0	0.4	0.4	0.0	O K
8640 min Winter	2.495	0.000	0.0	0.3	0.3	0.0	O K
10080 min Winter	2.495	0.000	0.0	0.3	0.3	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	56.713	0.0	23.4	60
120 min Winter	33.773	0.0	27.9	112
180 min Winter	24.632	0.0	30.6	140
240 min Winter	19.588	0.0	32.4	178
360 min Winter	14.112	0.0	35.0	250
480 min Winter	11.189	0.0	37.0	314
600 min Winter	9.339	0.0	38.7	374
720 min Winter	8.054	0.0	40.0	428
960 min Winter	6.372	0.0	42.2	530
1440 min Winter	4.574	0.0	45.5	0
2160 min Winter	3.279	0.0	48.9	0
2880 min Winter	2.587	0.0	51.4	0
4320 min Winter	1.850	0.0	55.2	0
5760 min Winter	1.458	0.0	57.9	0
7200 min Winter	1.211	0.0	60.2	0
8640 min Winter	1.040	0.0	62.0	0
10080 min Winter	0.915	0.0	63.6	0

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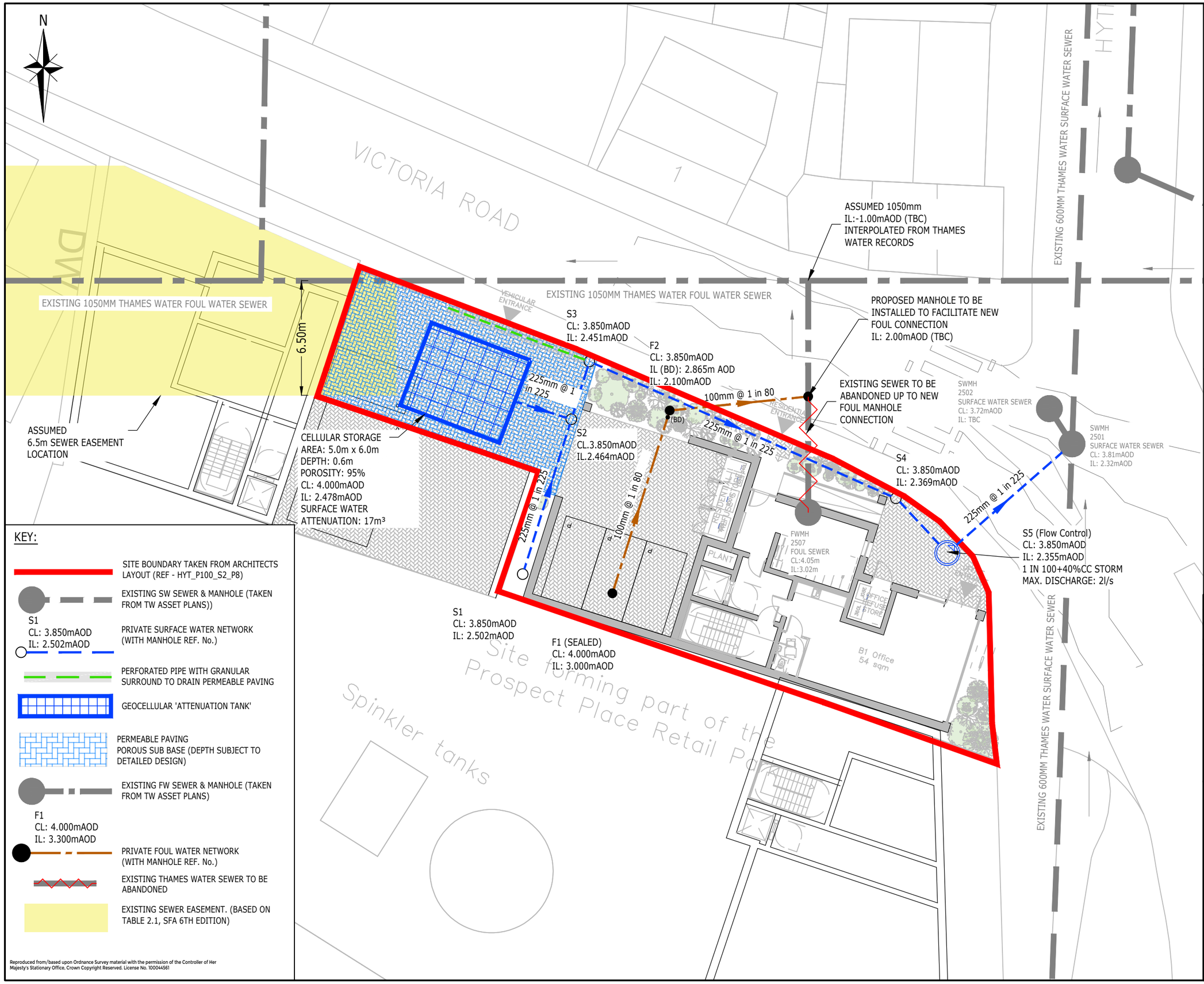
Appendix H

Proposed Drainage Strategy



KEY:

- SITE BOUNDARY TAKEN FROM ARCHITECTS LAYOUT (REF - HYT_P100_S2_P8)
- EXISTING SW SEWER & MANHOLE (TAKEN FROM TW ASSET PLANS))
- S1 CL: 3.850mAOD IL: 2.502mAOD — PRIVATE SURFACE WATER NETWORK (WITH MANHOLE REF. No.)
- PERFORATED PIPE WITH GRANULAR SURROUND TO DRAIN PERMEABLE PAVING
- GEOCELLULAR 'ATTENUATION TANK'
- PERMEABLE PAVING POROUS SUB BASE (DEPTH SUBJECT TO DETAILED DESIGN)
- EXISTING FW SEWER & MANHOLE (TAKEN FROM TW ASSET PLANS)
- F1 CL: 4.000mAOD IL: 3.300mAOD — PRIVATE FOUL WATER NETWORK (WITH MANHOLE REF. No.)
- EXISTING THAMES WATER SEWER TO BE ABANDONED
- EXISTING SEWER EASEMENT. (BASED ON TABLE 2.1, SFA 6TH EDITION)

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NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION, INC. RISK ASSESSMENTS (SEE CDM NOTES) AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
2. DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY.
3. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES UNLESS OTHERWISE STATED.
4. THIS IS AN OUTLINE DRAINAGE STRATEGY ONLY AND IS SUBJECT TO DETAILED DESIGN.
5. ALL COVER LEVELS, INVERT LEVELS, PIPE SIZES AND ATTENUATION VOLUMES ARE INDICATIVE ONLY AND SUBJECT TO DETAILED DESIGN.
6. THIS DRAWING IS BASED ON THE FOLLOWING PLANS:
   -PROPOSED GROUND FLOOR PLAN (HYT-P100-S2-P10)
   -TOPOGRAPHICAL SURVEY (REF 01-19/2346)
7. THE FINISHED FLOOR LEVEL HAS BEEN ESTIMATED AS 4.000M AOD BASED ON THE SURROUNDING GROUND LEVELS AND IS SUBJECT TO CHANGE.
8. THIS DRAINAGE STRATEGY IS BASED ON THE PRINCIPLES SET OUT IN THE FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY REPORT (REF. 191680-01) AND IS SUBJECT TO LLFA AND THAMES WATER APPROVAL.
9. SURFACE WATER RUN-OFF IS PROPOSED TO BE LIMITED TO A MAXIMUM OF 2 L/S DURING THE 1 IN 100 YR + 40% ALLOWANCE FOR CLIMATE CHANGE.

FOR PLANNING

Rev	Description	Drn	Chk	App	Date
C	UPDATED MASTERPLAN	BNW	CD	PS	24.04.20
B	ISSUED FOR PLANNING	BNW	CD	PS	25.02.20
A	ISSUED FOR PLANNING	CJC	DG	PS	10.09.18
-	PRELIMINARY ISSUE	CJC	DG	-	30.08.19

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Client
MILLMORE PROPERTIES LTD.

Project Title:
HYTHE STREET, DARTFORD

Drawing Title:
DRAINAGE STRATEGY

A3 Scale	Date	Designed by
1:200	10.09.19	CJC
Drawn by	Checked by	Approved by
CJC	DG	PS

Drawing Number 191680/001 Rev C