FERNLEIGH TERRACE

FLOOD RISK ASSESSMENT

PROPOSED DEVELOPMENT,
FERNLEIGH TERRACE,
NANPEAN,
CORNWALL, UK

JULY 2023 | PROJECT REF: 22228

DOCUMENT CONTROL SHEET

To ensure this is the latest issue, a control table can be found below with updates identified.

Document Control				
Client	Job Number			
GARDEN BUILDINGS CORNWALL	22228			
Version	Date	Description	Prepared By	Checked By
A	20.07.23	Suitable for issue to Client.	TT	MP

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APPENDICES

1.0 INTRODUCTION

1.1 MBA Consulting's Client is Garden Buildings Cornwall Ltd.

1.2 The Client is proposing to develop land at Fernleigh Terrace, Nanpean. Cornwall. (Please refer to figure 1.0)

1.3 The Planning Practice Guidance to the National Planning Policy Framework dated July 2021 states that a Flood Risk Assessment (FRA) is required where a proposed development is greater than 1 ha in size or in an area where the Environment Agency (EA) have indicated there may be drainage problems, i.e. Critical Drainage Areas.

1.4 The proposed site is less than 1Ha and outside a Critical Drainage Area, however the site does reside in an area susceptible to drainage problems. Accordingly, MBA Consulting have been commissioned to carry out a Flood Risk Assessment (FRA) to support the planning application for the proposed development.

1.5 This report therefore comprises a site-specific flood risk assessment and outlines the proposals for the disposal of surface water from the site.

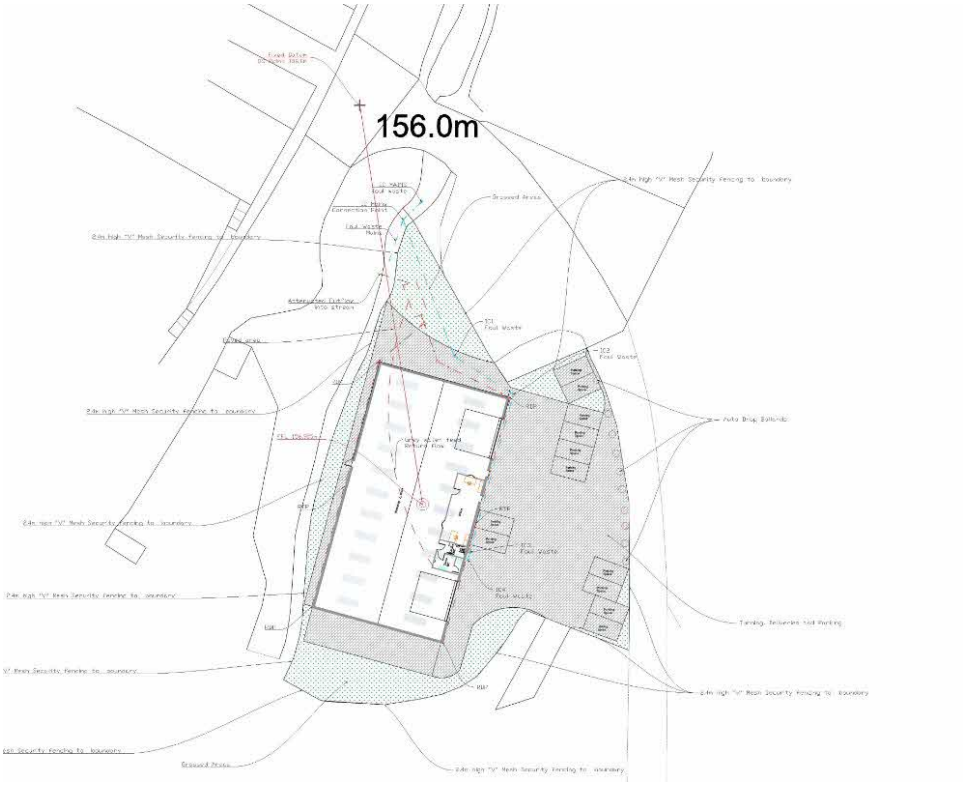


FIGURE 1.0 – SITE LOCATION PLAN

2.0 SITE LOCATION AND DESCRIPTION

2.1 The site is located off Fernleigh Terrace, Drinnick road, Nanpean at Ordnance Survey Grid Reference (OSGR) SW 95770 55370.

2.2 The site is situated at approximately 160.00 AOD and is generally gently sloping from the north east to south west.

2.3 The site currently consists of a concrete surfacing with a gravel parking area located to the south east, and small trees and shrubs to the west.

2.4 The development site area is approximately 0.26 hectares.

3.0 EXISTING HYDROLOGY

3.1 The EA Drainage Guidance for Cornwall v2 Jan 2010 and Cornwall Council's Strategic Flood Risk Assessment – Level 1 (SFRA1) identifies the development to be outside any Critical Drainage Areas. (See Appendix A).

3.2 The closest river within the vicinity of the site is the Gwindra stream. The Cornwall Council Strategic Flood Risk Assessment Mapping identifies the stream approximately 2.00m to the west of the site (See Appendix B).

3.3 The development is elevated approximately 3m above this watercourse or any known surface water features.

3.4 The existing surface water system suggests it drains to the Gwindra Stream located along the western boundary.

4.0 FLOOD RISK ASSESSMENT

4.1 The site has been assessed taking into account the Planning Policy Guidance to the National Planning Policy Framework published July 2021 and the Level 1 Strategic Flood Risk Assessment published in 2012 by Cornwall Council. The individual parameters are set out below.

4.2 The site is in an area designated outside a Critical Drainage Area in the Cornwall SFRA.

4.3 Flooding from rivers or from the sea

4.4 The Environment Agency has identified the site as an area which falls within the extent of extreme flood (please refer to extracts from the Environment Agency Flood Risk mapping in Appendix B) at the time of their assessment of the likelihood of flooding. Generally this means that the chance of flooding each year from rivers or the sea is 1% or greater (1 in a 100) yearly probability of river flooding, or a 0.5% or greater (1 in 200) yearly probability of sea flooding, assuming there are no flood defences. and places the development area wholly within Flood Zone 3a. Appendix B contains the surface water flood risk map from the Cornwall SFRA showing risk of flooding to the site in the 1 in 100, and 1 in 1000 year storms.

4.5 The site is elevated above sea level as approximately 160.00m AOD. Therefore the risk of flooding from sea is low.

4.6 The site is adjacent to the Gwindra stream located along the western boundary approximately 2.00m away.

4.7 In order to understand the potential fluvial flood depths that could impact the development resulting from extreme fluvial flood, flows for the catchment have been modelled to provide a conservative representation of flood risk. This represents the scenario of the Gwindra stream being blocked and as such the river flow overtopping and being conveyed within the confines of the site.

4.8 Flows have been estimated for the catchment upstream of the site using the Revitalised Rainfall Runoff (ReFH) method using software from the UK Centre for Ecology & Hydrology. Please refer to Appendix G for copies of Revitalised Rainfall Runoff (ReFH) method estimation of flows (m^3/s).

4.9 The catchment descriptors for the site were entered, and a time step of 0.5 hours and a duration of 5.5 hours for calculating the flow data as recommended by the ReFH software.

4.10 The table below summarises the calculated flows for various return period events;

RETURN PERIOD	FLOW (m^3/s)
100 YR	9.93
100 YR + 50% CC	16.22
1000 YR	19.78

TABLE 4.1 ReFH FLOW ESTIMATION

4.11 Steady state flood modelling of the adjacent road has been completed to review the extent of the flood zones on the site using HEC-RAS version 6.3.1 software developed by the US Army Corps of Engineers and Hydrologic Engineering Center. The modelling has been completed to review the potential extent, depth and velocity of the flood flows adjacent to the site.

4.12 The HEC-RAS model has been created using sections derived from topographical and Ordnance Survey data of the site. The model looks at the flooding of site should the upstream Gwindra Stream become blocked.

4.13 Conservative Manning's n values of 0.06 for both banks and 0.04 for the channel were used to represent the stream.

4.14 A summary of the flood levels (water surface elevation) and channel flood velocity is shown in Table 4.2 below. A full set of results are included within Appendix H;

RIVER STATION	PROFILE	W.S. ELEV (m)	VEL CHNL. (m/s)
0.00	100 YR	155.07	2.62
0.00	100 YR + 50% CC	155.35	3.05
0.00	1000 YR	155.48	3.27
47.88	100 YR	155.79	0.97
47.88	100 YR + 50% CC	156.29	0.81
47.88	1000 YR	156.51	0.78
87.2	100 YR	155.83	0.85
87.2	100 YR + 50% CC	156.3	1.01
87.2	1000 YR	156.51	1.08

TABLE 4.2 SUMMARY OF HEC-RAS RESULTS

4.15 The proposed industrial units finished floor level is to be elevated from existing levels, with an FFL of 156.915 AOD and as such above the flood depth by 1085mm during an extreme 1 in 100 Year flood event should the Gwindra Stream become blocked. During the extreme 1 in 100 Year flood event with 50% climate change allowance the flood depth increases by circa 470mm. Therefore, the FFL is above the flood depth by

615mm. During the extreme 1 in 1000 Year flood event the FFL is 405mm above the flood level.

4.16 Access and Egress

4.17 The site has safe dry access and egress at the existing entrance bridge. Crossing the stream Gwindra.

4.18 The flood modelling undertaken has demonstrated the safe access and egress route from the building onto existing access is at risk of flooding under the modelled conditions should the Gwindra Stream become blocked. The flood modelling anticipates the maximum flood depth at the proposed building location to be 790mm from existing levels (circa 155.511). The anticipated velocity of the flood water could be up to 3.28m/s (please refer to HEC-RAS model results – Table 4.2). The building has a FFL (circa 156.915m AOD) above flood levels which can be used as a safe haven as required.

4.19 To achieve safe access and egress to the unit from the entrance a footpath route can be achieved with a 300mm freeboard above maximum flood depths. With minimal grades of 1:24. Therefore, demonstrating safe access and egress for inhabitants/visitors to site can be achieved during an extreme flood event.

4.20 Flooding from Land.

4.21 The site is generally gently sloping from the north east to the south west. The north and south boundaries are above or generally level with neighbouring land. There is a significant amount of hardstanding in this location with no known history of flooding from overland flows in this locale, the site genteelly slopes towards the west where an exceedance flows will discharge to the Gwindra stream.

4.22 The Environment Agency has identified the property in flood zone 3, an area with high probability of flooding. The Environment Agency has produced mapping (Flood Map For Planning) illustrating the risk of flooding. Please refer to Appendix B for copy of EA Flood Mapping for Planning.

4.23 The site is boarded on its western boundary by the road Fernleigh Terrace and access road to the site. The Gwindra stream is situated between the road and site with the entrance being a bridge formation over the stream. Any exceedance flows channelled towards the site from road will discharge to the stream before reaching the site due to the topography therefore risk of flooding from the road is considered low.

4.24 The Flood modelling undertaken indicates that the plot will reduce the flood plain area by circa 400m3. The introduction of the industrial unit has a minor effect to the flood level across the site, with a maximum increase of 50mm flood level.

4.25 In addition, the Cornwall Council Strategic Flood Risk Assessment Mapping identifies the extent of flooding from surface water run-off for the 1 in 30, 100 and 1000 year event storm intensities. This mapping shows the property free of any flooding during the 30 and 100 year storm, with storm exceedance flows being contained within the Gwindra stream adjacent. During the 1000 year event, the majority of the site is identified as suffering from flooding. Please refer to Appendix B for copies of Cornwall Council Strategic Flood Risk Assessment Mapping.

4.26 The Environment Agency has identified the site as an area at more risk of flooding from surface water. This means that each year this area has a chance of flooding of 1% or greater (1 in a 100) yearly probability. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding. Please see Appendix B for copies of EA flood risk mapping.

4.27 Design of the surface water disposal systems within the site will be required to comply with the current 'Drainage Guidance for Cornwall' published by the Environment Agency in 2015 (see section 4). This will ensure that the risk to adjacent property resulting from the development of this site is minimal.

4.28 Flooding from Groundwater.

4.29 The Cornwall Council Strategic mapping has shown the site to be within an area susceptible to ground water.

4.30 The development proposals do not involve significant changes to existing ground levels and therefore there is low risk of flooding from groundwater.

4.31 Flooding from Sewers

4.32 The south west water record is included at Appendix C. This shows a combined public sewer to run through the site.

4.33 This is a publicly maintained sewer and will be designed to SWW standards and maintained by SWW.

4.34 There are no known flooding issues from these sewers. The risk of flooding from these sewers is low.

4.35 Flooding from Reservoirs, Canals and Other Artificial Sources

4.36 There are no reservoirs, canals or other artificial sources in the vicinity of the development which might give rise to a risk of flooding.

5.0 SEQUENTIAL TEST

5.1 Whilst this development is within Flood Zone 3a, the planning application does not involve a change of use, previously owned by IMERYS for storage and movement of materials produced by IMERYS. Therefore, a sequential test isn't required.

6.0 EXCEPTION TEST

6.1 Applications for 'less vulnerable' uses located within Flood Zones 3a are not subject to the Exception Test as confirmed within Table 6.1 of this report below, and Table 3 of the Planning Practice Guidance to the NPPF. Development is deemed appropriate.

Less vulnerable

- Police, ambulance and fire stations which are not required to be operational during flooding.
- Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'more vulnerable' class; and assembly and leisure.
- Land and buildings used for agriculture and forestry.
- Waste treatment (except landfill* and hazardous waste facilities).
- Minerals working and processing (except for sand and gravel working).
- Water treatment works which do not need to remain operational during times of flood.
- Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.
- Car parks.

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

Key:

✓ Development is appropriate

✗ Development should not be permitted.

TABLE 6.1 FLOOD RISK VULNERABILITY AND FLOOD ZONE 'COMPATIBILITY'

7.0 SURFACE WATER DRAINAGE DESIGN STRATEGY

7.1 Design of the development's drainage infrastructure and Sustainable Urban Drainage System (SUDS) is to be carried out in line with best practice and to industry standard design procedures. A number of publications, including statutory instruments, design guidance and best practice guidance will apply to different components of the final infrastructure.

7.2 The sections below provide an overview of the design standards to be used on this project for various aspects of the surface water drainage design.

7.3 The design of the surface water drainage is required to follow the 'Drainage Guidance for Cornwall' issued by the Environment Agency (EA) published as part of the Cornwall Council Strategic Flood Risk Assessment (SFRA). These both comply with the Planning Policy Guidance for the National Planning Policy Framework dated March 2012. Compliance is deemed to satisfy the Environment Agency in controlling the risk of flooding of and from the proposed development.

7.4 The site is identified as outside any Critical Drainage Area in the Cornwall Council SFRA. This requires the drainage system to comply with the 'Outside Critical Drainage Areas Drainage Standards Guidance' included in Appendix A.

7.5 This requires previously developed sites of operational development less than 1 hectare to follow the Building Regulations hierarchy, and surface water should;

i. Drain to a soakaway or infiltration system designed in accordance with the SUDS Manual - CIRIA C697, using a minimum of a 30-year return period storm.

Where a Flood Risk Assessment demonstrates that infiltration is not possible;

ii. A sustainable drainage system shall be provided ensuring flow attenuation, no adverse impact on water quality and where possible habitat creation.

The total discharge from the site shall be no more than the theoretical greenfield run-off rates from the corresponding 1 and 10 year storms. For the 30 and 100 year storms, the total discharge from the site should not increase further but should also be restricted to the run-off rate for the 10 year storm. When these values are less than 5 litres/second, a rate of 5 litres/second can be used. Attenuation may not be necessary if the discharge is directly to coastal waters. In these cases the impact on the receiving environment in terms of habitat, erosion and water quality should be assessed.

The design must take into account the appropriate allowance for increased rainfall from climate change. This should be based on the lifetime of the development, the guidance in Annex B of PPS25 and the PPS25 Practice Guide.

Underground attenuation and piped sections should be designed for a minimum of the 30-year storm. However the total discharge rates from the site must still be controlled from the 100-year storm at the greenfield run-off rate from the 10 year storm. Attenuation of events exceeding the piped system may be achieved by temporary flooding of open spaces or car parks. If surface flooding of open areas is not appropriate, the formal drainage system should be designed to accommodate the 100 year storm.

Safe and appropriate flow routes from blockage and exceedance of the drainage system must be evaluated. This must demonstrate no property flooding or increase in flood risk, either offsite or to third parties.

7.6 The surface water drainage design will take into account future climate change as outlined within Technical Guidance for the National Planning Policy Framework. This recommends that a 40% increase in the rainfall intensities be allowed for future climate change over the next 100 years. However, the Lead Local Flood Authority (LLFA – Cornwall Council) request the climate change allowance be 50%. Therefore, a 50% climate change allowance will be applied to design calculations.

7.7 In accordance with Ciria report C753 The SuDs Manual para 24.7.2, to allow for future urban expansion within the development, it is recommended an increase in paved surface area of 10% be applied to soakaway/attenuation calculations.

7.8 In accordance with Cornwall Councils policies and standards for SUDS, if soakaways are a viable method of surface water disposal , these will be designed with a Factor of safety of 10.

7.9 It is prudent to consider the impact of blockage or similar on the development. The potential impact of events in excess of the drainage design standard, or blockage occurring have therefore been assessed. The overland (exceedance) flows head towards the southern boundary. There are significant grassed areas in this locale. The site offers good percolation to ground so it would not be envisaged there would be significant flows at this point. The River Kenwyn forms part of the sites southern boundary.

7.10 Soil infiltration testing will need to be completed prior to confirming the surface water discharge strategy for this property.

7.11 Should soil infiltration testing prove the ground be unsuitable for the use of soakaways, at attenuated discharge to the watercourse would be sought. Should this be required the point of connection and discharge rate will be agreed with the LLFA as this is not a main river.

7.13 There are no surface water sewers in the vicinity of the site.

7.14 The detailed design of the drainage systems will need to be submitted to the LLFA for approval prior to construction. It should include at that stage the following information.

- A description of the foul and surface water drainage systems operation
- Details of the final drainage schemes including calculations and layout
- A Construction Environmental Management Plan
- A Construction Quality Control Procedure
- A plan indicating the provisions for exceedance pathways, overland flow routes and proposed detention features
- A timetable of construction including a plan indicating the phasing of development including the implementation of the drainage systems
- Confirmation of who will maintain the drainage systems and a plan for the future maintenance and management, including responsibilities for the drainage systems and overland flow routes

8.0 FLOOD RESISTANCE AND RESILIANCE MEASURES

8.1 Flood Resistance Measures

8.2 Flood risk can be mitigated through the design of buildings. The appropriate measures have been selected for the type of building and its intended use. Flood resistant measures will be used, including:

- Low flood wall resistant to water.
- Concrete floors will be used.
- Sealant will be used around external doors and windows
- All external doors and windows will be constructed from hard wearing materials.
- All windows will be a minimum of 600mm above the ground level on a flood resistant wall.
- Fit non-return valves/anti flow valves at last point of inspection chamber before connection to existing drains.
- There will be no air bricks.
- Ground levels will slope away from the building.

8.3 Flood Resilience Measures

8.4 Flood resilience measures are designed in such a way as to reduce the cost and time required to reinstate the property should it be flooded.

8.5 The building will be constructed in such a way that although floodwater may enter the building, elements that are damaged by floodwater can be easily repaired or replaced. This is a form of flood resilience. They are suitable as no other measure is practicable. Robust materials and finishes will be used, including:

- Laying 1 or 2 layers of plasterboards at base of internal studwork construction to ground floors.
- Fixings to be galvanised/stainless steel or copper - no mild steel to be used - cause rust/staining or walls.
- Water resistant render.
- Low permeability paints to be used rather than emulsion - allows walls to dry out quickly.
- Cavities insulated with Polyisocyanurate (PIR) closed cell type insulation (e.g. celotex).
- All electrics wiring, switches, sockets, socket outlets, gas meters etc. to be located a minimum of 450mm above the finished floor level.
- The majority of the internal stock will be located a minimum of 1000mm above ground level on 'racking' (base level plus 3 tiers high). Stock at ground level is palletized so can be moved if required.

8.6 Flood Warning and Evacuation

8.7 The industrial unit is located in a flood risk area; therefore, the unit will participate in the Environment Agency flood warning telephone service. The unit will register contact details with the Environment Agency' Flood Warning Service (Floodline 0345 988 1188) in order to receive Flood Warnings. Please refer to Appendix E for copy of the site operators Flood Warning and Evacuation Plan template.

8.8 The Environment Agency operate a free flood warning service providing alerts by phone, text, or email when flooding is anticipated providing an opportunity for owners to take necessary precautions, giving enough time for the building to be safely evacuated and/or mitigation measures to be put in place.

8.9 All employees will be made aware of the Environment Agency Floodline telephone number (Call Floodline on 0345 988 1188) and the Flood Warning Codes and their meaning. The onsite manager will carry out the role of Flood Warden for the site and ensure they have an understanding of the flood mechanisms of the site and will ensure that the safety of the employees will not be compromised.

8.10 The Environment Agency uses Flood Warnings Codes. They can be issued in any order, usually ending with an 'all clear'. They are issued by the Environment Agency through their website and Floodline. The flood warning will be passed onto the visitors of the property verbally, by telephone and/or in person. It will be ensured that everyone receives the flood warnings when required.

9.0 FOUL DRAINAGE ASSESSMENT

9.1 The public sewers maintained by South West Water within the vicinity of the site are shown in Appendix C.

9.2 There is a public combined water sewer running through the site with a chamber onsite.

9.3 Recent changes to the application and charging process introduced by Ofwat mean that SWW no longer review sewer capacity and are obliged to fund any improvements required to the network form the infrastructure charge imposed on any development within their area of operation.

9.4 Prior to construction South West Water will confirm the foul water point of connection through completion of a *Point of Connection* application.

10.0 CONCLUSIONS AND RECOMMENDATIONS

10.1 The flood risk has been assessed following the principals of National Planning Policy Framework and the level 1 Strategic Flood risk Assessment for Cornwall. It is concluded that the proposed development of the site does not significantly increase the risk of flooding offsite and the property is not considered to be at significant risk of flooding.

10.2 It is further concluded that the design of a surface water drainage system using the principles of SUDS and compliant with the requirements of the Cornwall Strategic Flood Risk Assessment is achievable within the confines of the site.

Signed.....
TYLER TOOGOOD BEng
FOR AND ON BEHALF O
MBA CONSULTING

Dated: July 2023

APPENDIX A

Cornwall Council

Outside Critical Drainage Areas - Drainage Standards Guidance for Cornwall

Revised January 2010

This sheet is intended as guidance for drainage not in areas identified as Critical Drainage Areas.

Greenfield Development Sites - greater than 1 hectare

Following the Building Regulations Drainage hierarchy, surface water should:-

i. Drain to a soakaway or infiltration system designed in accordance with the SUDS Manual - CIRIA C697, using a minimum of a 30-year return period storm.

Where an FRA demonstrates that infiltration is not possible:-

ii. A sustainable drainage system shall be provided ensuring flow attenuation, no adverse impact on water quality and where possible habitat creation.

The total discharge from the site should aim to mimic greenfield rates. These shall be no more than the theoretical greenfield run-off rates from each of the corresponding 1, 10, 30 and 100 year storms. When these values are less than 5 litres/second, a rate of 5 litres/second can be used. Attenuation may not be necessary if the discharge is directly to coastal waters. In these cases the impact on the receiving environment in terms of habitat, erosion and water quality should be assessed.

The design must take into account the appropriate allowance for increased rainfall from climate change. This should be based on the lifetime of the development, the guidance in Annex B of PPS25 and the PPS25 Practice Guide.

Underground attenuation and piped sections should be designed for a minimum of the 30-year storm. However total discharge rates from the site must still be controlled for the 100-year storm. Attenuation of events exceeding the piped system may be achieved by temporary flooding of open spaces or car parks. If surface flooding of open areas is not appropriate, the formal drainage system should be designed for the 100 year storm.

Where infiltration is not used, long-term storage must be provided to store the additional volume of run-off caused by any increase in impermeable area. This is in addition to the attenuation storage required to address flow rates, see Appendix F of the Drainage Guidance for Cornwall Council. Alternatively rainwater harvesting can be used to offset this volume.

The long-term storage should discharge at a rate not exceeding 2 litres/second/hectare, as per *Preliminary rainfall run-off management for developments DEFRA /Environment Agency guidance W5-074 Revision D.*

Safe and appropriate flow routes from blockage and exceedance of the drainage system must be evaluated. This must demonstrate no property flooding or increase in flood risk, either offsite or to third parties.

Previously Developed Sites - greater than 1 hectare

Development should aim for the standards of a greenfield site outlined above. Where this is not possible the FRA should demonstrate how a sustainable drainage system is being provided which meets the policy aims of PPS25 to reduce flood risk on and off site. The FRA should demonstrate how the development will reduce run-off rates as much as is reasonably practicable.

Small Development Sites, less than 1 hectare.

Note that the Environment Agency are not consulted on sites of less than 1 hectare that are not in Critical Drainage Areas unless there are other constraints such as Main Rivers or the site lies within Flood Zone 2 or 3. Therefore the guidance for sites less than 1 hectare are based on best practice to address flood risk.

Following the Building Regulations Drainage hierarchy, surface water should aim to:-

i. Drain to a soakaway or infiltration system designed in accordance with the SUDS Manual - CIRIA C697, using a minimum of a 30-year return period storm.

Where infiltration is not possible:-

ii. A sustainable drainage system should be provided ensuring flow attenuation, no adverse impact on water quality and where possible habitat creation.

The total discharge from the site should be no more than the theoretical greenfield run-off rates from each of the corresponding 1, 10, 30 and 100 year storms. When these values are less than 5 litres/second, a rate of 5 litres/second can be used. Attenuation may not be necessary if the discharge is directly to coastal waters. In these cases the impact on the receiving environment in terms of habitat, erosion and water quality should be assessed.

(Products exist that allow individual properties to restrict run-off to of 1.5 litres/second, using private underground storage tanks. A discharge of this rate is typically achieved on the commercially available systems using a proprietary device on the outlet with an orifice of around 30mm. This is combined with a sediment trap and a filter to prevent blockage. Storage is provided on the property in an underground tank or crate system, operating with a maximum depth of water of approximately 500mm. The size of the tank is based on the impermeable area draining to the system. Due to the small orifice size these systems would remain in private ownership as they are unlikely to be adopted.)

The design should take into account the appropriate allowance for increased rainfall from climate change. This should be based on the lifetime of the development, the guidance in Annex B of PPS25 and the PPS25 Practice Guide.

Underground attenuation and piped sections should be designed for a minimum of the 30-year storm. However total discharge rates from the site should still be controlled from the 100-year storm at the greenfield run-off rate from the 100 year storm. Attenuation of events exceeding the piped system may be achieved by temporary flooding of open spaces or car parks. If surface flooding of open areas is not appropriate, the formal drainage system should be designed to accommodate the 100 year storm.

Safe and appropriate flow routes from blockage and exceedance of the drainage system should be evaluated. This should demonstrate no property flooding or increase in flood risk, either offsite or to third parties.

APPENDIX B

Flood map for planning

Your reference	Location (easting/northing)	Created
22228 FLOOD ZONE	**195770/55370**	**16 Sep 2022 11:20**

Your selected location is in flood zone 3, an area with a high probability of flooding.

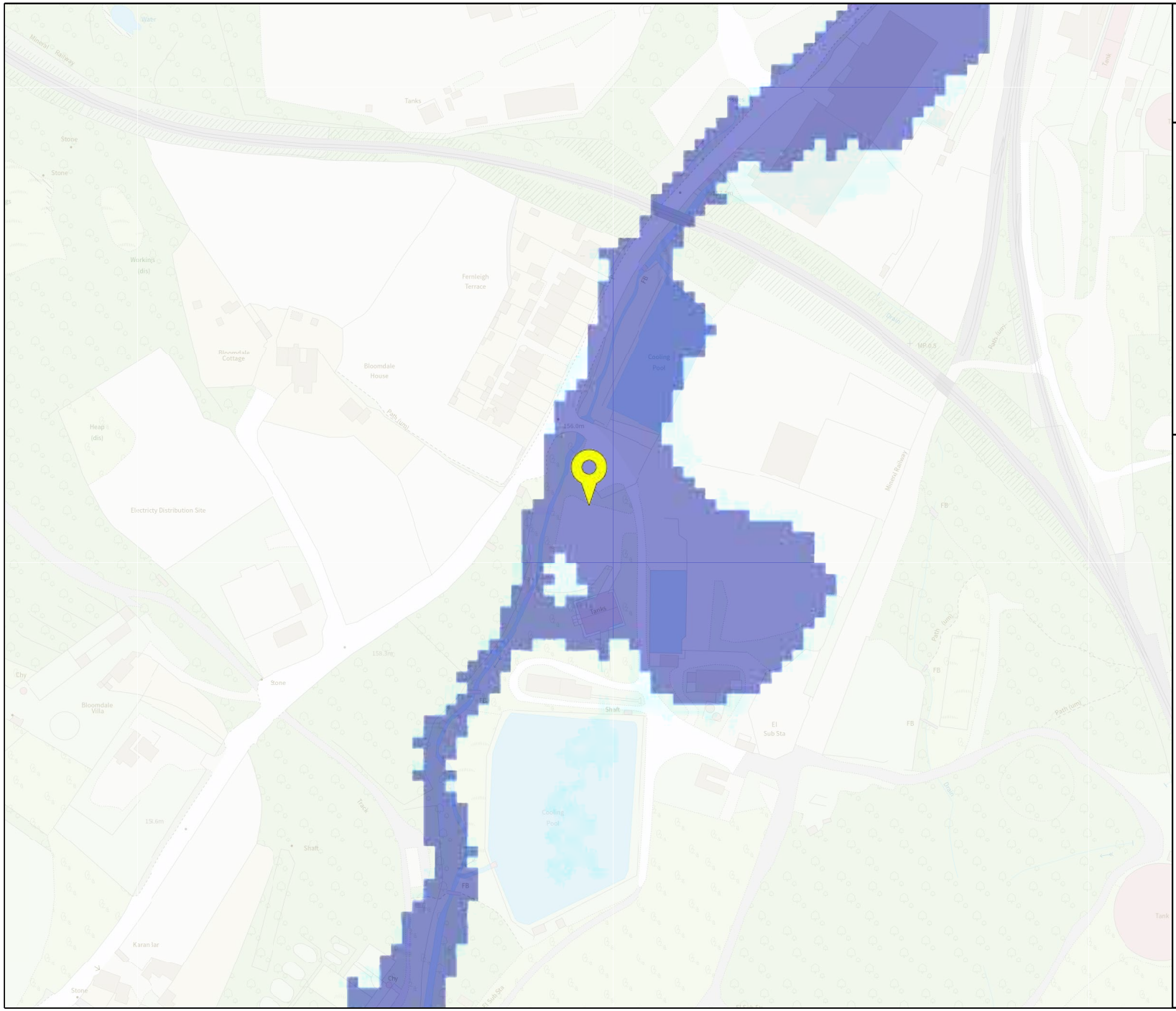
This means:

- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see www.gov.uk/guidance/flood-risk-assessment-standing-advice)

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
22228 FLOOD ZONE

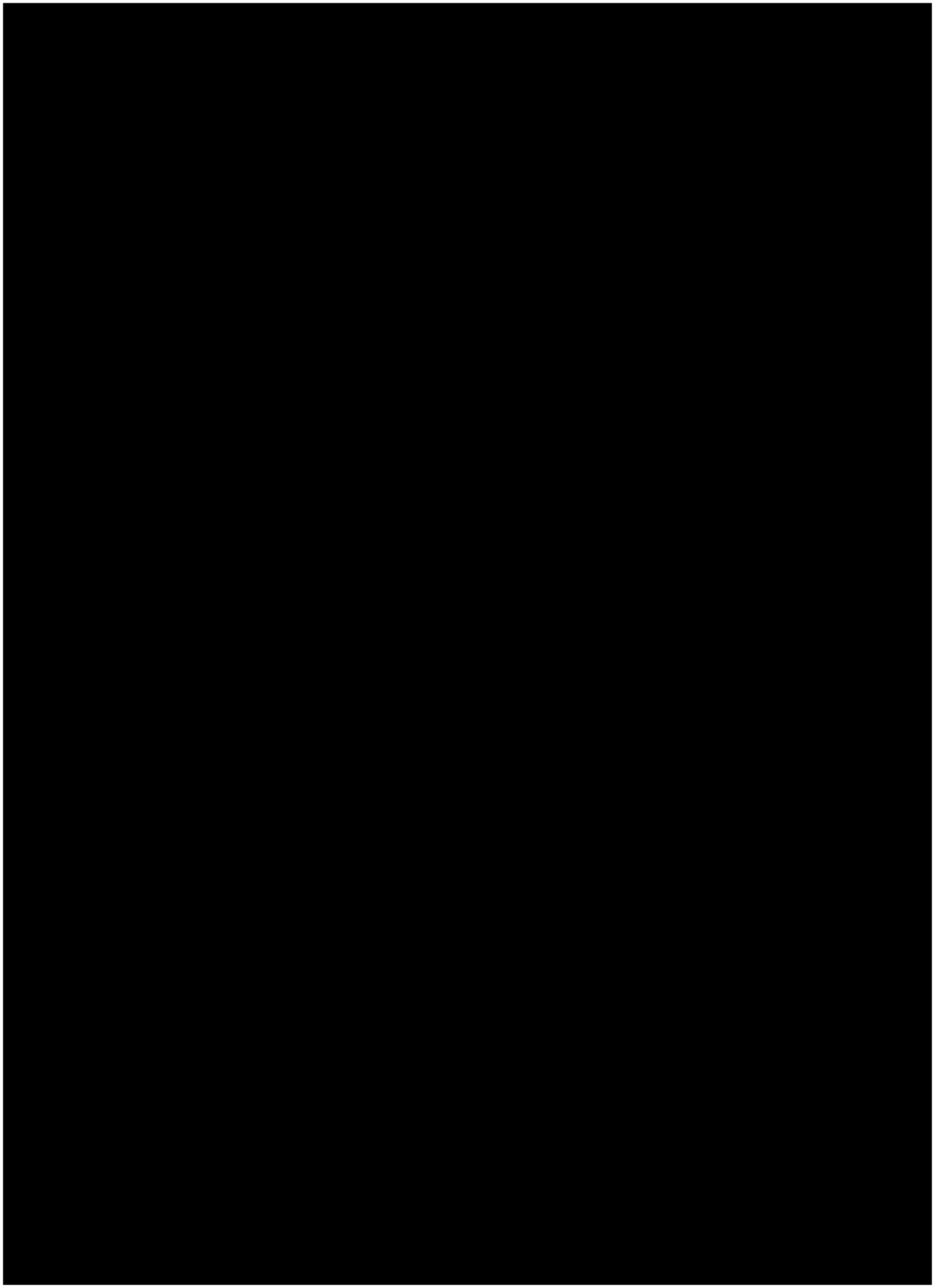
Location (easting/northing)
195770/55370

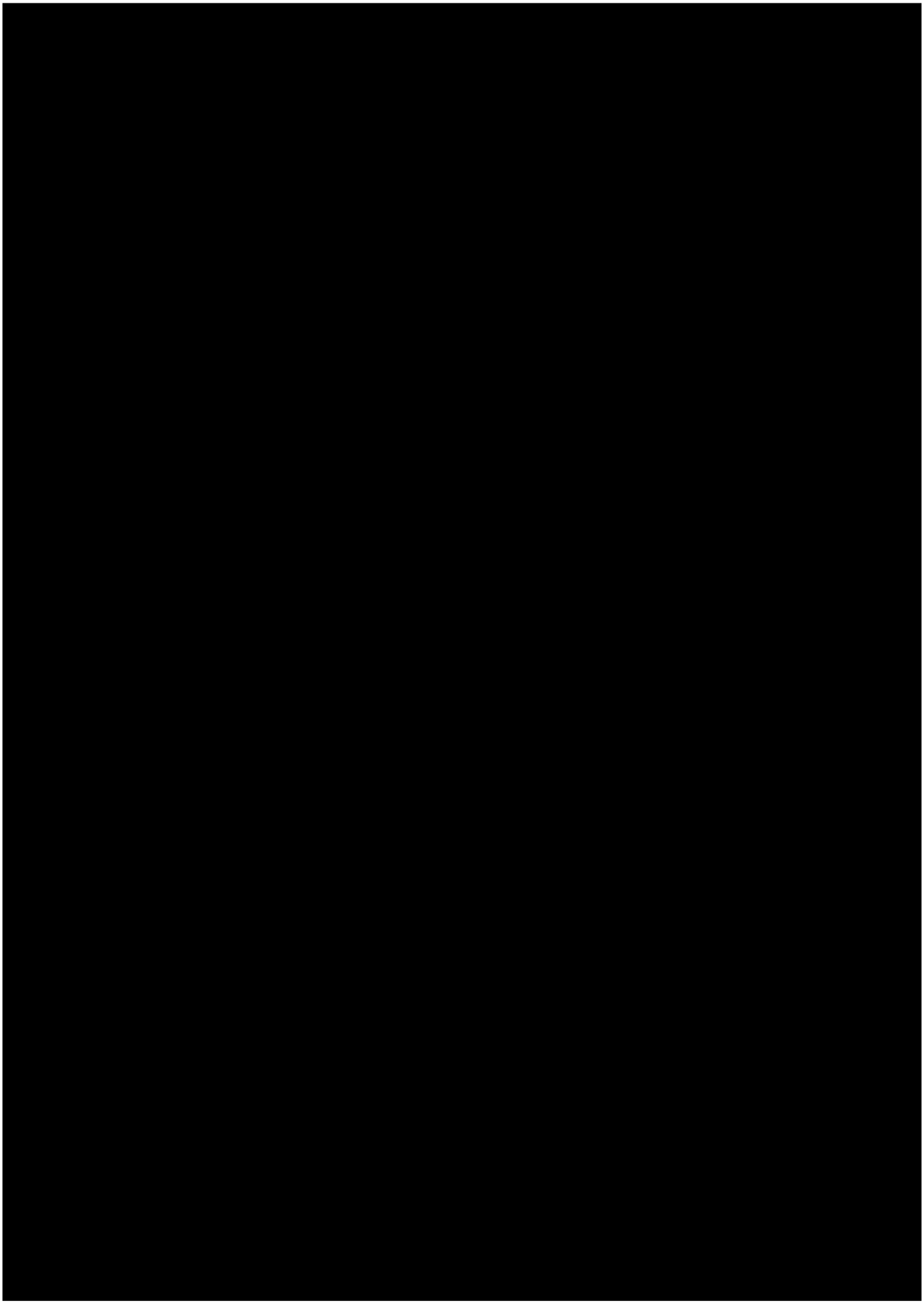
Scale
1:2500

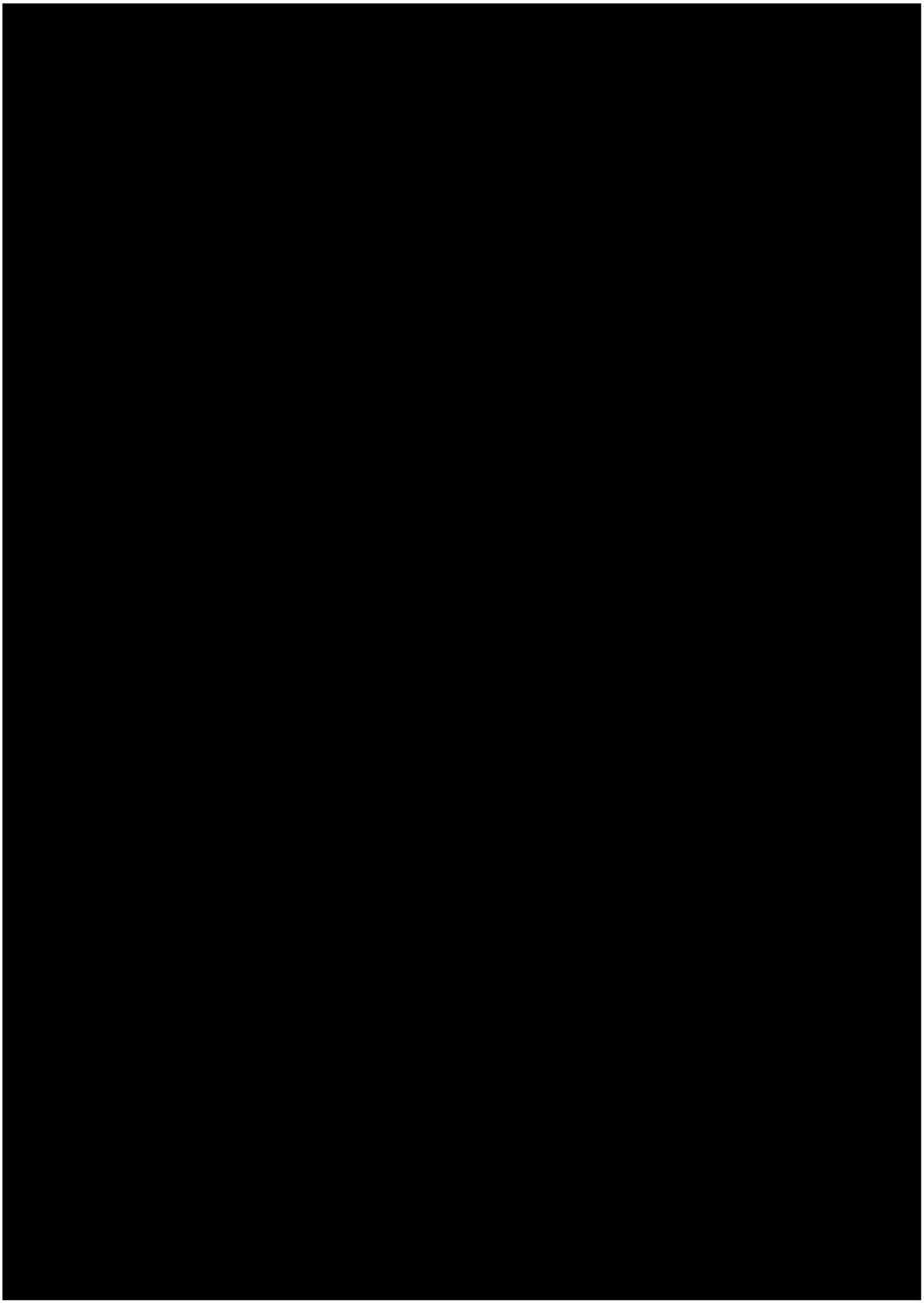
Created
16 Sep 2022 11:20

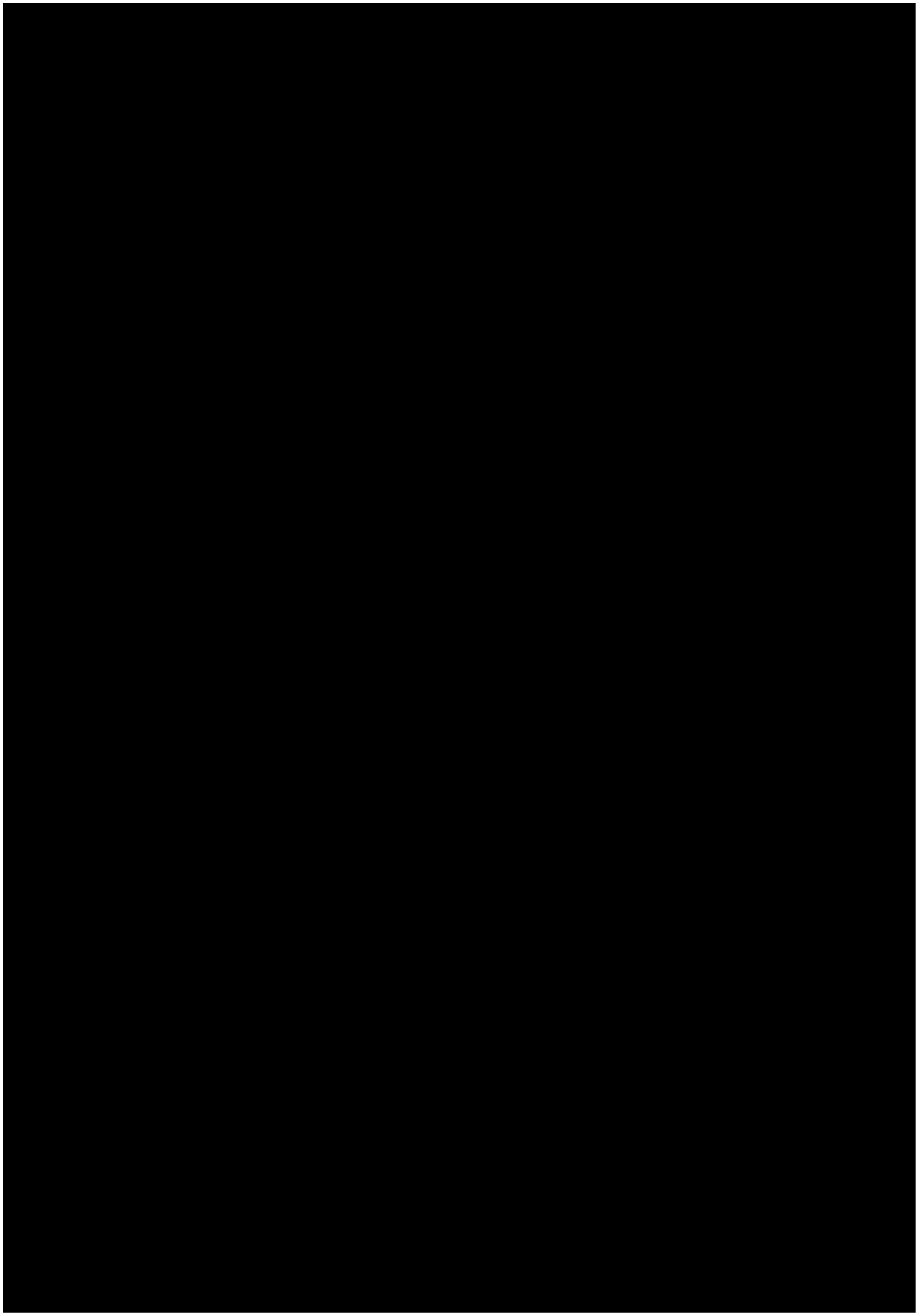
- Selected point
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

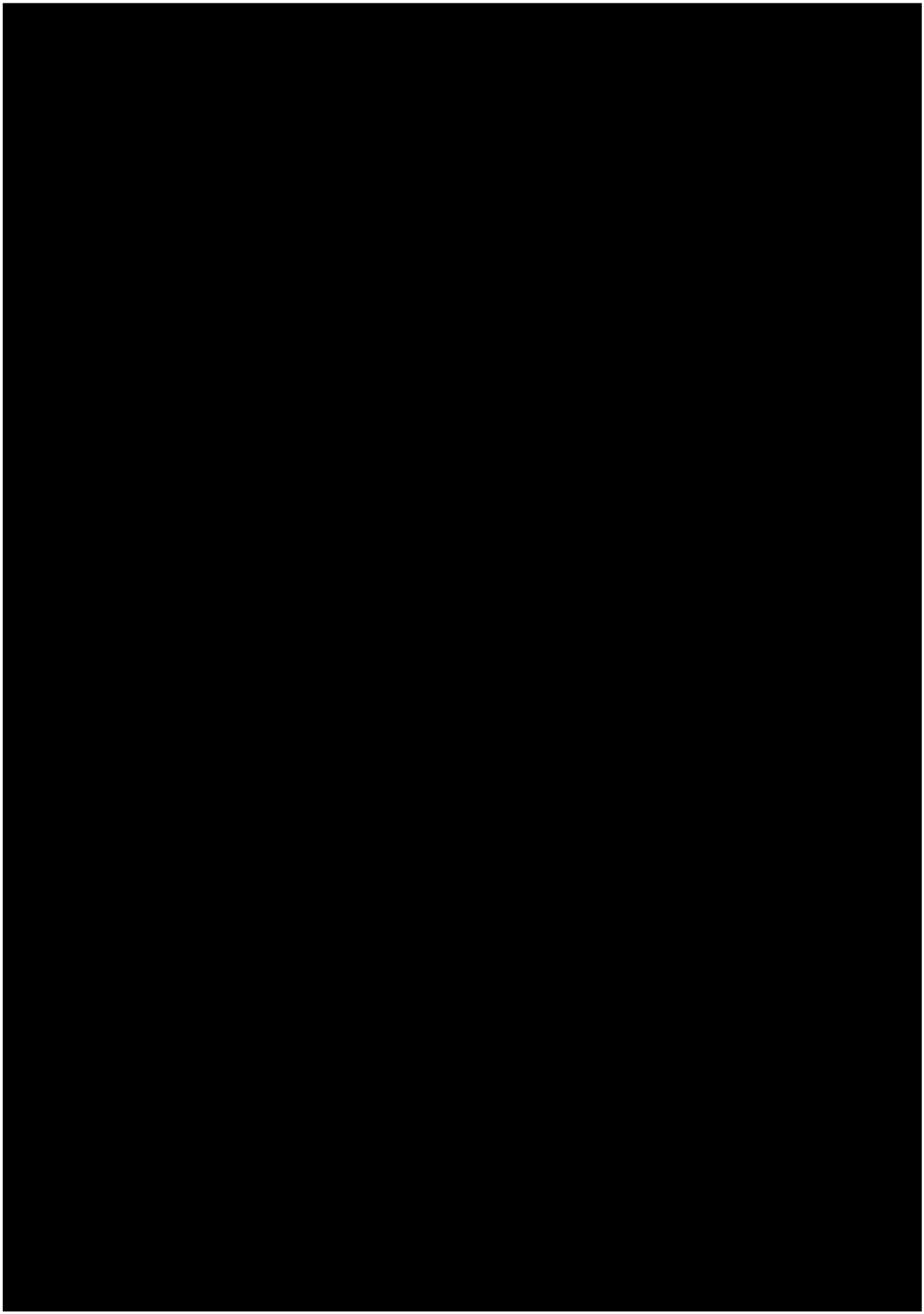
0 20 40 60m

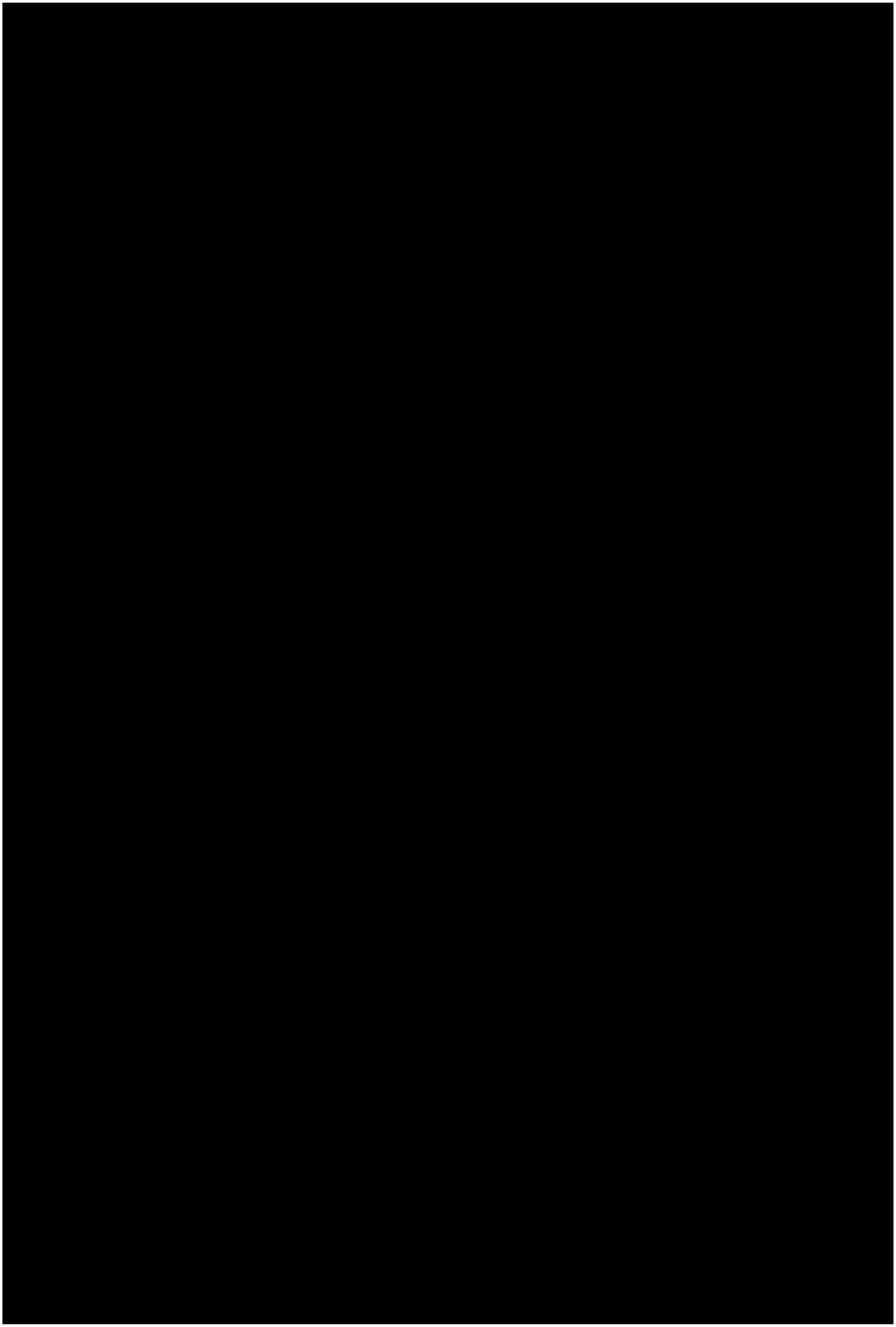


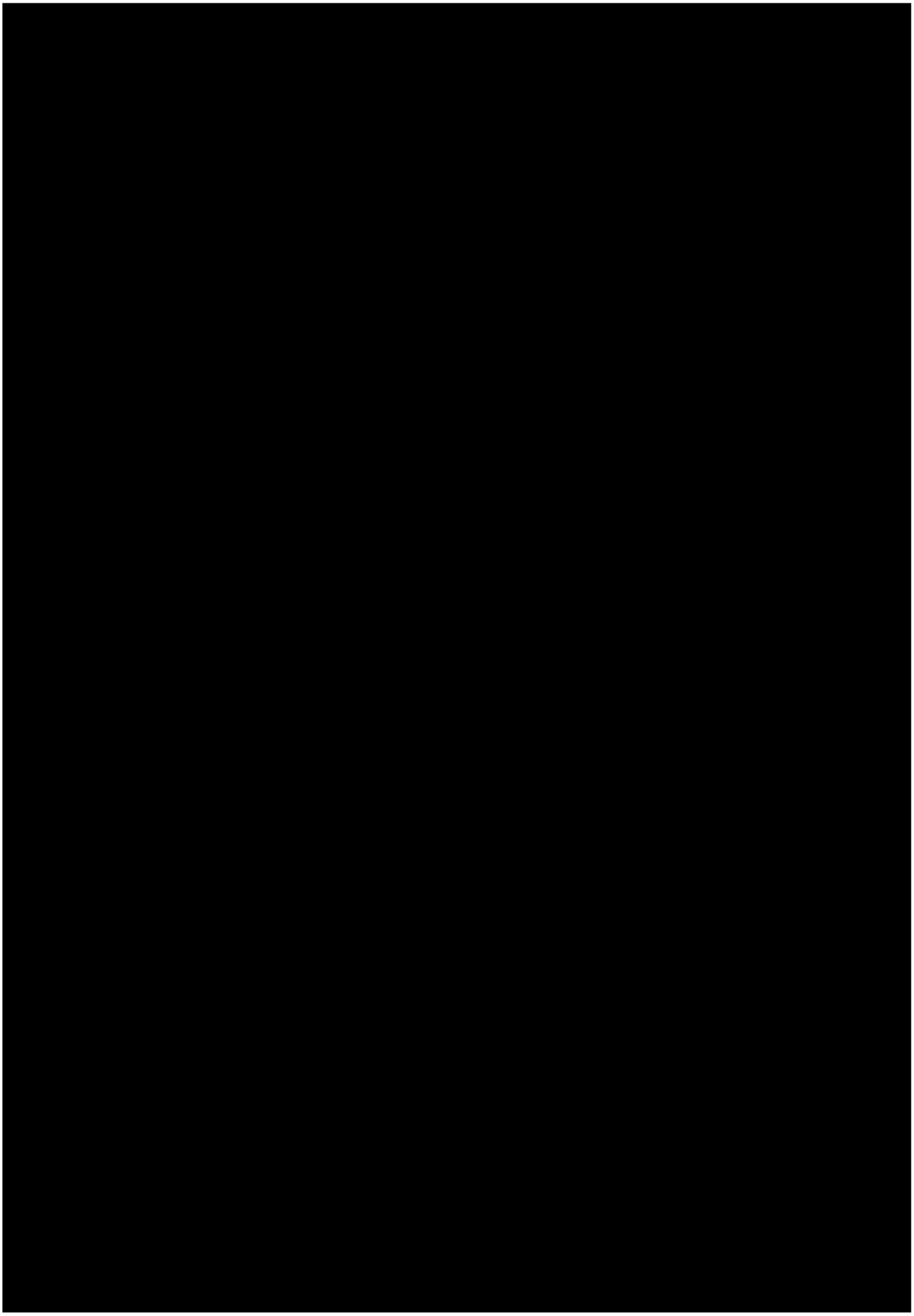


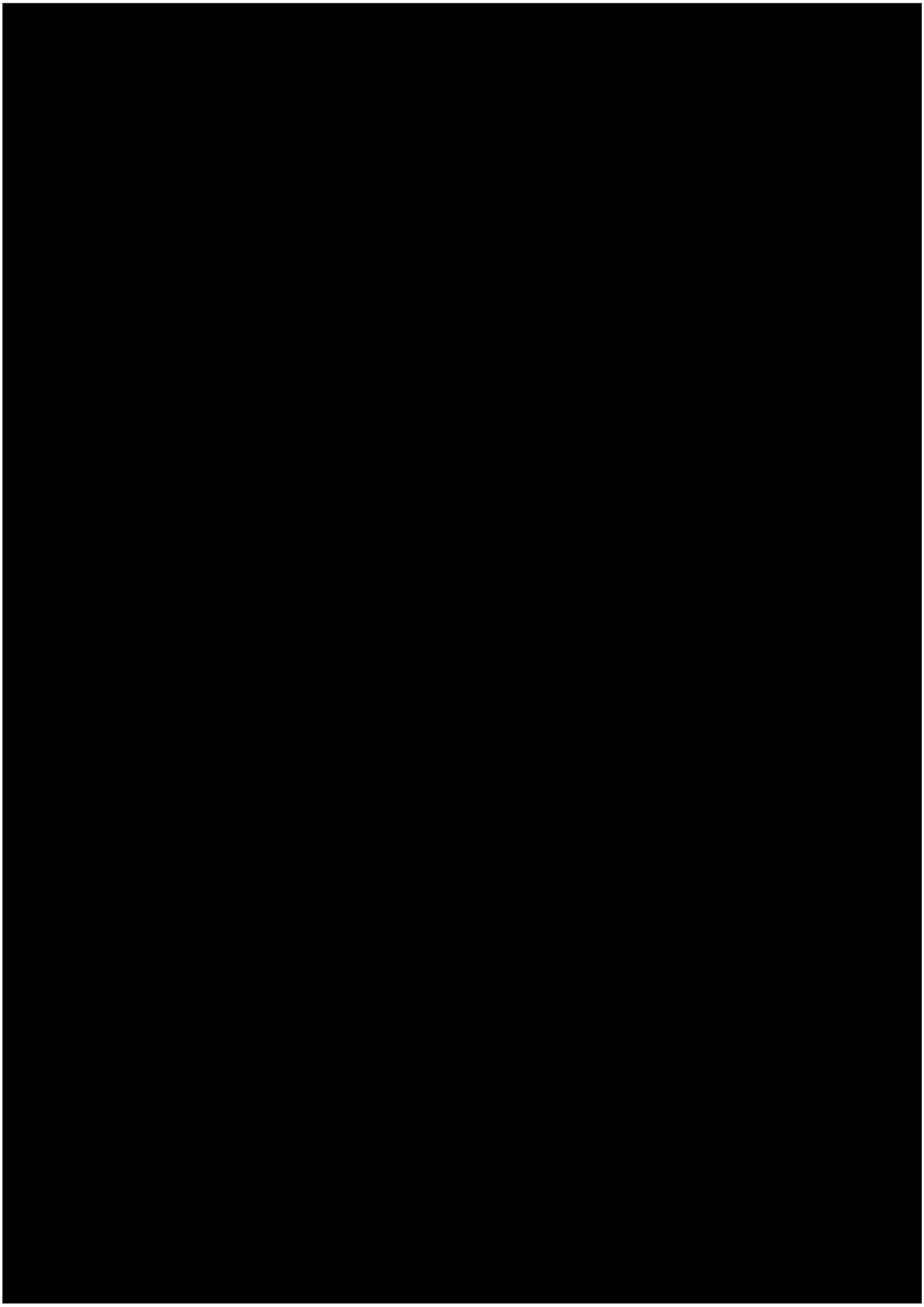


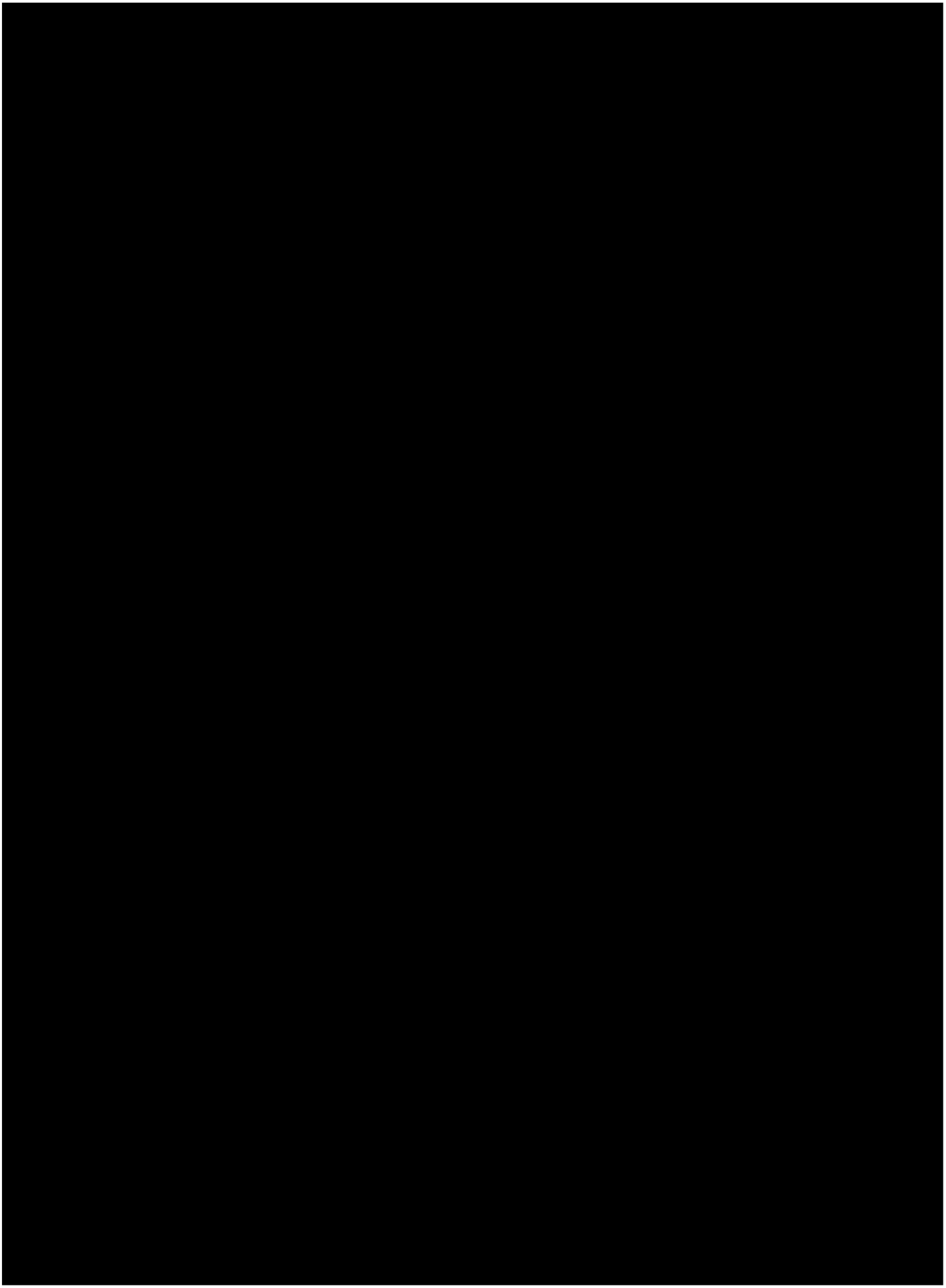


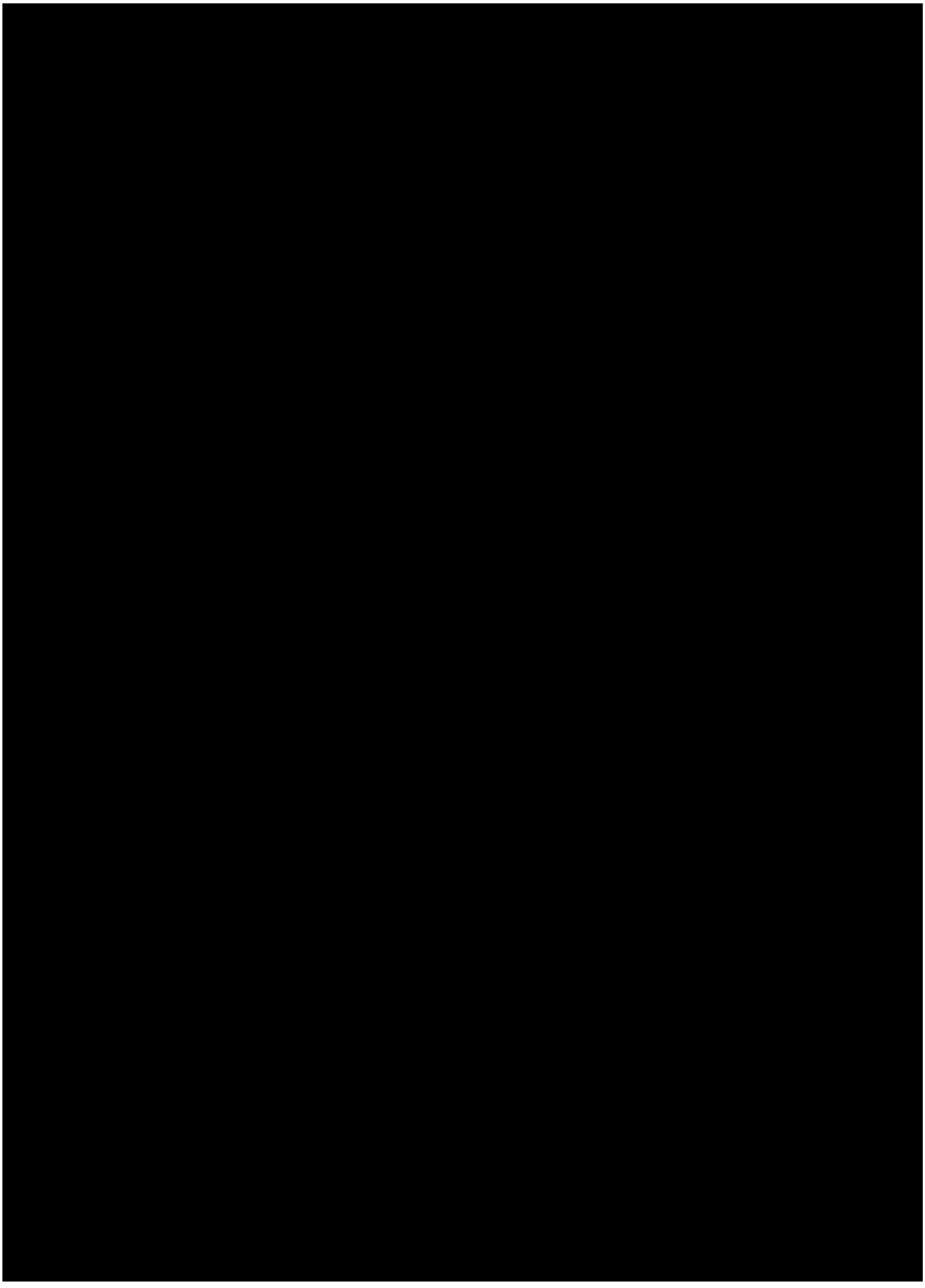












APPENDIX C

Date: 16/09/2022 11:24:22 User: Scale: 1:1250 at A3

55589

196027

N

tone

Tanks

Issues

Tank

157.5m

Workings
(dis)

Fernleigh
Terrace

FB

Drain

MP 0.5

Path (um)

Bloomdale
Cottage

Bloomdale
House

Cooling
Pool

Heap
(dis)

Mineral Railway

Electricity Distribution Site

156.0m

Tanks

158.3m

FB

Path (um)

FB

Path (um)

FB

Bloomdale
Villa

195528

55243

0 40 80 m

South West Water

Map data

Date: 16/09/2022 11:23:28 User: Scale: 1:500 at A3

55471

195867

N

oomdale

House

Path (um)

7

13

Cooling

Pool

156.0m

C / 250 / C

South West Water

South West Water

South West Water

South West Water

South West Water

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THE INFORMATION CONTAINED WITHIN THIS MAP SHOULD NOT BE USED FOR ANY PURPOSE OTHER THAN AS A GENERAL GUIDE TO THE LOCATION OF EXISTING SERVICES.
PLEASE REFER TO WATER AND SEWER LEGENDS FOR CONFIRMATION OF ASSET DETAILS.
THIS PLAN MUST NOT BE USED AS PART OF A CONVEYANCING DOCUMENT FOR PROPERTY PURCHASES.
The position & depth of apparatus and other information indicated on this map is provided as a general guide only and no assurance or warranty as to its correctness or accuracy is given or should be inferred.
Exact positions & depths should be obtained by excavation trial holes and the map must not be relied on in the event of excavation or other works undertaken or planned in the vicinity of the Company's apparatus
Please note that not all mains, service pipes and other apparatus of the Company in the area of the plan are shown.

South West Water

Map data

195667

55333

0 20 m

APPENDIX D

FLOOD WARNING AND EVACUATION PLAN TEMPLATE

[Document title]

Document Control

This plan has been prepared by [insert company details] and [responsible officer] to inform employees on the joint responsibilities of the company and the employees to prepare for and respond promptly to flood warnings.

A copy of this plan will be made available to all employees:

- On induction; and
- In response to lessons learnt.

Plan Produced by:_____ Approved by:_____

Version Control

Version No:	Comment	Checked by:	Approved by:	Date:

Disclaimer

This Flood Warning & Evacuation Plan (FWEP) template is suitable for the purposes set out within the national Planning Policy Framework. This plan is however the sole responsibility of the signatories and/or their representatives.

Any subsequent approval does not does not impute any approval of the plans from the Environment Agency or any of the emergency services.

1. Introduction

This Flood Warning & Evacuation Plan (FWEP) has been produced by [name of organisation] in respect of [enter site name]. [Name of organisation] own the FWEP, are responsible for its implementation, dissemination and annual review.

The FWEP captures a summary of the site's flood risk, taking into account flood mitigation measures incorporated in the design of the site and properties, and provides all relevant information, contact details and procedures to prepare for, respond to and recover from a flood event.

A Flood Warning and Evacuation Plan does not remove the risk of flooding from a site. The objective of a Flood Warning and Evacuation Plan is to provide a means by which those living/working at a development shall be made aware of the flood hazard, and to identify any procedures that will enable them to avoid being directly exposed to the hazard in any future flood events that may affect the site.

Preparedness for future floods can help reduce the impact on people and property.

[Name of organisation] have given due regard to the safety of employees, responding organisations, available best practice, relevant legislation and advice provided by the emergency services, and the Emergency Planning Service, Devon.

Consider:

- *You may wish to make an emergency plan for your organisation.*

2. Objectives

In the production of this FWEP [name of organisation] have identified the following key objectives:

- The sign up to Flood Warnings Direct and Weather Warnings;
- To provide for and signpost clear evacuation routes for employees;
- To ensure adequate ingress and egress for the emergency services; and
- Reduce the risk to life and damage to property.

3. Flood Risk

Current and Historic Flood risk is described in the approved **Flood Risk Assessment (Ref: 1856, Rev. XX Dated XX)** as attached in Appendix A.

4. Flood Warnings

The Environment Agency Flood Warning system contacts [Insert Name] as designated number either at the Company or on a designated number for an out of hours event.

Should [Insert Name] being unavailable [Insert Name] is contacted.

The company has signed up the Environment Agency Flood Warning Scheme
https://www.fws.environment-agency.gov.uk/app/olr/register

Telephone No. 0345 988 1188.

Consider:

- *Creating a flood kit to include; a copy of the flood plan, staff contact info, important documents for continuity including data back-up, two-way radios, first aid kit etc.*
- *Teignbridge District Council and the emergency services encourage you to sign up to Flood Warnings Direct (FWD) from the Environment Agency and to Weather Alerts from the Meteorological Office and to act upon the guidance provided.*

The action to be taken for each flood warning is presented within **Table 1**.

Key locations of supply cut offs and chemical/dangerous substance are provided within **Appendix B**.

Consider:

- *Know the location of cut-off points for gas, electricity and water. Ideally, these should be marked on a map that is stored with your flood plan;*
- *Know the location of chemicals, oils or other materials that could be dangerous or contaminate flood water. These should be stored safe from floods and other damage.*
- *Basic strategies for protecting property, preventing business disruption and assisting recovery.*
- *Racking / shelving to raise important items such as computers / servers and stock etc.*

Protective actions which need to be actioned are within **Appendix B**.

Consider:

- *Identifying key locations for the installation of PLP (including map of the site and installation instructions).*
- *Note key stock, equipment and possessions that may need special protection from flood water;*
- *Consider things you may need during or after a flood (for example, sandbags, plastic sheeting, loudspeaker);*
- *See if it's possible to move key operations, such as shipping or customer services, to another building.*
- *Protection of any hazardous materials.*

5. Evacuation

The decision to evacuate or take shelter ultimately rests with the employer/employee, but must be made to allow sufficient time to conduct the evacuation before flooding occurs. Flood waters contains hidden dangers and will impede, if not prevent, a safe evacuation.

The preference is always (in circumstances where a Flood Warning and Evacuation Plan would be required) to evacuate occupants before a flood event occurs, not during an event. Safe refuge (staying within the building - above the design flood event levels) should only be considered where dry access and egress from the building to an area/community building not at risk of flooding cannot be achieved.

Evacuation during a flood event should only occur in exceptional circumstances where a Flood Warning has not reached either the occupants or relevant management responsible for triggering the Flood Warning and Evacuation Plan; and it is deemed safe to do so by the Emergency Services. It should not be left to the discretion of the occupants as to whether it is safe to evacuate during a flood event. The preference in this exceptional circumstance would be for the occupants to remain indoors and seek safe refuge at the upper level of the building and call the emergency services.

A safe place of refuge has been identified:

[Insert Name, Post Code & small map showing venue and evacuation route]

Consider:

- *Consider flood risk within the attached Flood Risk Assessment. State when the evacuation procedure should be implemented i.e. the circumstances that will trigger an evacuation.*
- *State whether there is an alarm which will signal evacuation, signposts to follow or if there are any assembly points.*
- *Plan showing route to safe area and assembly points. It should also include written step-by-step instructions detailing where to go. The safe route should avoid flood hazards and lead to a location outside of the Flood Zone.*
- *Identification of a venue suitable for the numbers and vulnerabilities of your residents; and*
- *24/7 Access to venue.*
- *Updating the evacuation procedure to include a flooding event (different assembly points may be required).*

You are advised not to assume that the emergency services will be able to assist you with the evacuation; their focus will be directed to those in greatest need.

Where evacuation is not a feasible option, or has been delayed, you should move to the upper floor of the building; taking with you any important documents, bottled water, essential medicines and food sufficient to support you until rescue (see information related to Grab Bags).

Stand-down - Following confirmation from the Environment Agency, the decision can be taken to stand down. In this eventuality, the building should return to normal lessons following the agreed reoccupation procedure.

Consider:

- *If flooding happens out of hours*
- *Potential inform Emergency Management Team, if safe to do so turn off keey service (e.g. water, gas electricity)*
- *Mover critical/sensitive equipment*

In case of injury, contact Emergency Services (999).

This Flood Warning and Evacuation Plan will be overridden by any advice given by competent authorised staff including the Emergency Services or Local Authority responders on the ground in the event of a serious flood event.

The response to a major flood event will involve a number of organisations working together at a local level, including the emergency services, local authority (the council), the Environment Agency and utility companies. The Devon, Cornwall and Isles of Scilly LRF have produced the Multi Agency Flood Plan to provide relevant information and outline the response arrangements in place for a coordinated multi agency response - https://www.dcisprepared.org.uk/documents/82823/0/Multi+Agency+Flood+Framework+LRFDCIOS+2016.06.15+v2.4.pdf/34589fd4-c435-4081-ae75-1d5660b51333

6. Reoccupation and Recovery

If the building has been subject to flooding, and you have evacuated, you may not be allowed to return until it has been declared safe to do so. Your insurance company will provide further guidance and support.

In the event that you did not evacuate it is possible that you will now be encouraged to do so, insurance companies may insist upon it in order to ensure your protection and to effect necessary repairs.

Consider:

- *If the site is to be re-occupied following a flood warning account for members of staff.*
- *Is the site safe?*

7. Communications

Make a list of employees' contact details in the event of an evacuation. This might include mobile telephone numbers, or numbers for their home or the home of a friend or relative;

Think about staff who may need special assistance in the event of a flood (for example, elderly, deaf, blind etc.)

Name	Address	Telephone	Emergency Contact Name	Emergency Contact telephone	Special Assistance	Key Holder

Consider:

- *Emergency Contact List*
  - *The Environment Agency Floodline number and relevant quick-dial code.*
  - *The landlord/site management.*
  - *The local authority including daytime and out of hours numbers.*
  - *Non-emergency police*
  - *Non-emergency fire*
  - *Electricity, gas, water and telephone service providers for the site.*
  - *Insurance company or provider.*
  - *Local public transport e.g. bus and train companies, local travel news provider.*
  - *Local radio and television stations.*

8. Monitoring and review of the Plan

It is important that the Flood Warning and Evacuation Plan is kept up-to-date and accurate. It is the responsibility of the Plan owner to maintain and update the Plan at least every three years, when new information becomes available or a change in circumstances that may affect it occurs.

Consider:

- *Detail who is responsible for monitoring and the review of the plan e.g. the landlord, Company or site manager.*
- *Provide contact details of the plan owner (address, email and telephone number) where the user can send changes that may affect the Plan.*
- *Include a table that can be filled in to record any changes made to the plan, the date and by whom.*
- *Identify how often the plan should be reviewed.*

9. Roles and Responsibilities

See DCIoS LRF for up to date list of organisations and relevant responsibilities - https://devoncc.sharepoint.com/sites/PublicDocs/Corporate/_layouts/15/guestaccess.aspx?guestaccesstoken=PaTxrSlKLF4sdEsQd20KtBkDJR2%2fEgvuyM1iW8DsDtA%3d&docid=081b90cdc124048e0acfe6d6220cad0a8

Annex A – Roles and Responsibilities

Table 1 –Flood Warning Activation Procedures

Warnings		EA Recommended Actions	Actions	
			Actions [Detail the actions you will take at each stage of the activation]	Resources [Record the flood resources available and when you will deploy/utilise them]
	What it means: Flooding is possible. Be prepared. When it's used: Two hours to two days in advance of flooding.	Be prepared to act on your FWEP. Prepare a flood kit of essential items. Monitor local water levels and the flood forecast on our website.	[e.g. Be prepared for flooding.] [e.g. Prepare a flood kit]	
	What it means: Flooding is expected. Immediate action required. When it's used: ½ an hour to one day in advance of flooding.	Move people, property and valuables to a safe place. Turn off gas, electricity and water supplies if safe to do so. Put flood protection equipment in place.	[e.g. Act now to protect property] [e.g. Flood boards, sandbags etc.] [e.g. Keep flood kit ready] [e.g. Move critical equipment and information to a safe location]	
	What it means: Severe flooding. Danger to life. When it's used: When flooding poses a significant threat to life.	Stay in a safe place with a means of escape. Be ready should you need to evacuate from your building. Co-operate with the emergency services. Call 999 if you are in immediate danger.	[e.g. Be ready to evacuated] [e.g. Cooperate with 999]	

EA Flood Warnings No longer in force	What it means: No further flooding is currently expected in your area. When it's used: When river or sea conditions begin to return to normal.	Be careful. Flood water may still be around for several days. If you've been flooded, ring your insurance company as soon as possible.	[e.g Consider contamination] [e.g. Contact relevant insurance company]	
Meteorological Office Weather Warnings	Warnings of heavy rainfall. Warnings of severe winter weather e.g. hail, snow, freezing rain.	Consider the impact of this type of weather – e.g. this could lead to surface water flooding, ground water flooding, increased river and sea levels.	[e.g. be prepared for flooding in low lying areas from SW]	

Additional Guidance

General advice

- Business Flood Plan advice - https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/410606/LIT_5284.pdf
- Find out if your property is at risk of flooding - http://www.environmentagency.gov.uk/homeandleisure/floods/31650.aspx
- Sign up to receive flood warnings - https://www.gov.uk/sign-up-for-flood-warnings
- Monitoring flood warnings and river levels- https://www.gov.uk/check-if-youre-at-risk-offlooding
- Make a personal flood plan https://www.gov.uk/prepare-for-a-flood/make-a-flood-plan
- Preparing your property for flooding - https://www.gov.uk/government/publications/prepareyour-property-for-flooding
- What to do before, during and after a flood- https://www.gov.uk/government/publications/flooding-what-to-do-before-during-and-after-aflood
- Using sandbags to reduce flooding - https://www.gov.uk/government/publications/sandbagshow-to-use-them-to-prepare-for-a-flood
- Advice on obtaining home insurance - https://www.gov.uk/prepare-for-a-flood/get-insurance
- Cornwall Community Flood Forum - BeFloodReady: Understanding Property Flood Resilience (cornwallcommunityfloodforum.org.uk)

Improving the resistance and resilience of your property

- Improving your property's flood protection - https://www.gov.uk/prepare-for-a-flood/improveyour-propertys-flood-protection
- Blue Pages - directory of businesses providing flood resistance and resilience products - http://www.bluepages.org.uk/

Business/commercial premises specific advice

- Prepare your business for flooding - https://www.gov.uk/government/publications/preparingyour-business-for-flooding

Emergency Planning Advice

- Direct Government Preparing for Emergencies - https://www.gov.uk/government/policies/reducing-the-threats-of-flooding-and-coastalchange/supporting-pages/planning-for-and-dealing-with-flood-emergencies

Appendix A. Flood Risk Assessment

Appendix B. Key Locations and Protective Actions

Service Cut-Off	Description of Location
Electricity	
Gas	
Water	

	Description of Location	How to protect from a flood
First Aid Kit		
Oil based products (fuel, oil)		
Chemicals (including cleansing)		

Valuable Item	Protective Action	New Location
Identify stock, equipment and possessions that may need special protective measures, and describe the actions you will take to prevent damage in the event of a flood. We have suggested items and ways to protect them, but make sure you follow through on your plans.		

APPENDIX E

PRELIMINARY

ISO 9001 REGISTERED FIRM

NOTES

1 THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION UNLESS MARKED ABOVE "FOR CONSTRUCTION"

2 THE COPYRIGHT ON THIS DRAWING IS RETAINED BY MICHAEL BEARDSALL ASSOCIATES LTD

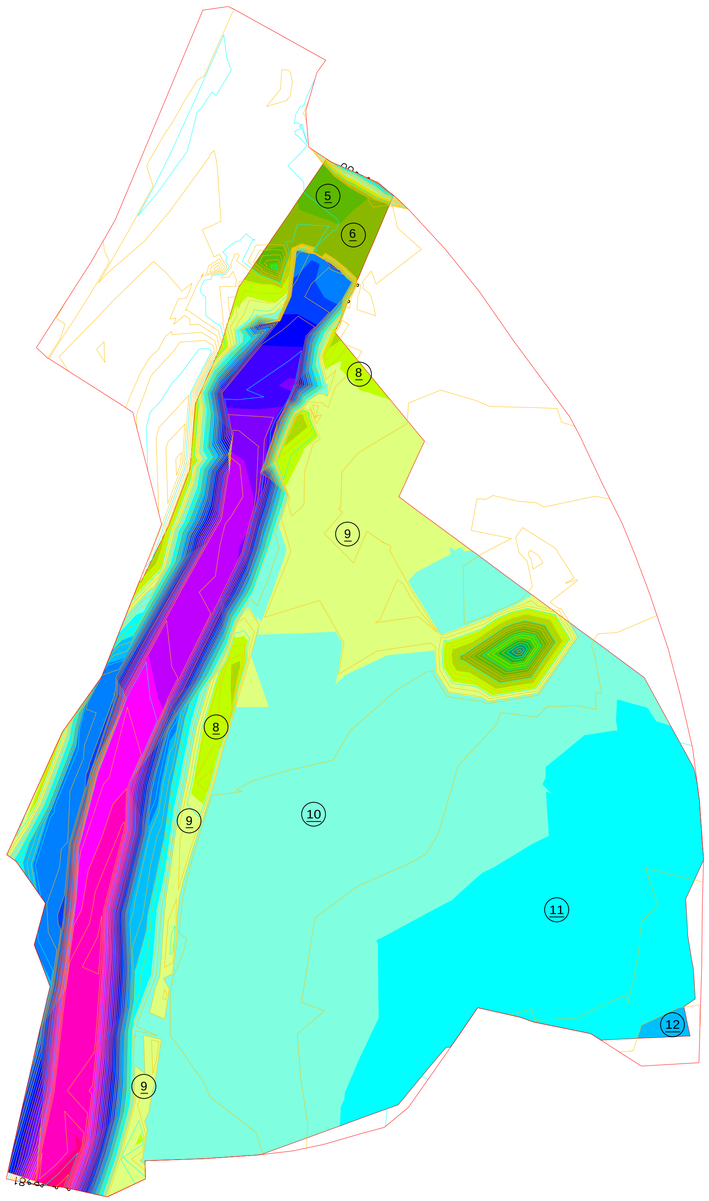
3 THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS

4 THE CONTRACTOR IS RESPONSIBLE FOR ALL DIMENSIONS AND THE CORRECT SETTING OUT ON SITE. ONLY FIGURED DIMENSIONS ARE TO BE USED

DO NOT SCALE FOR CONSTRUCTION PURPOSES : IF IN DOUBT ASK

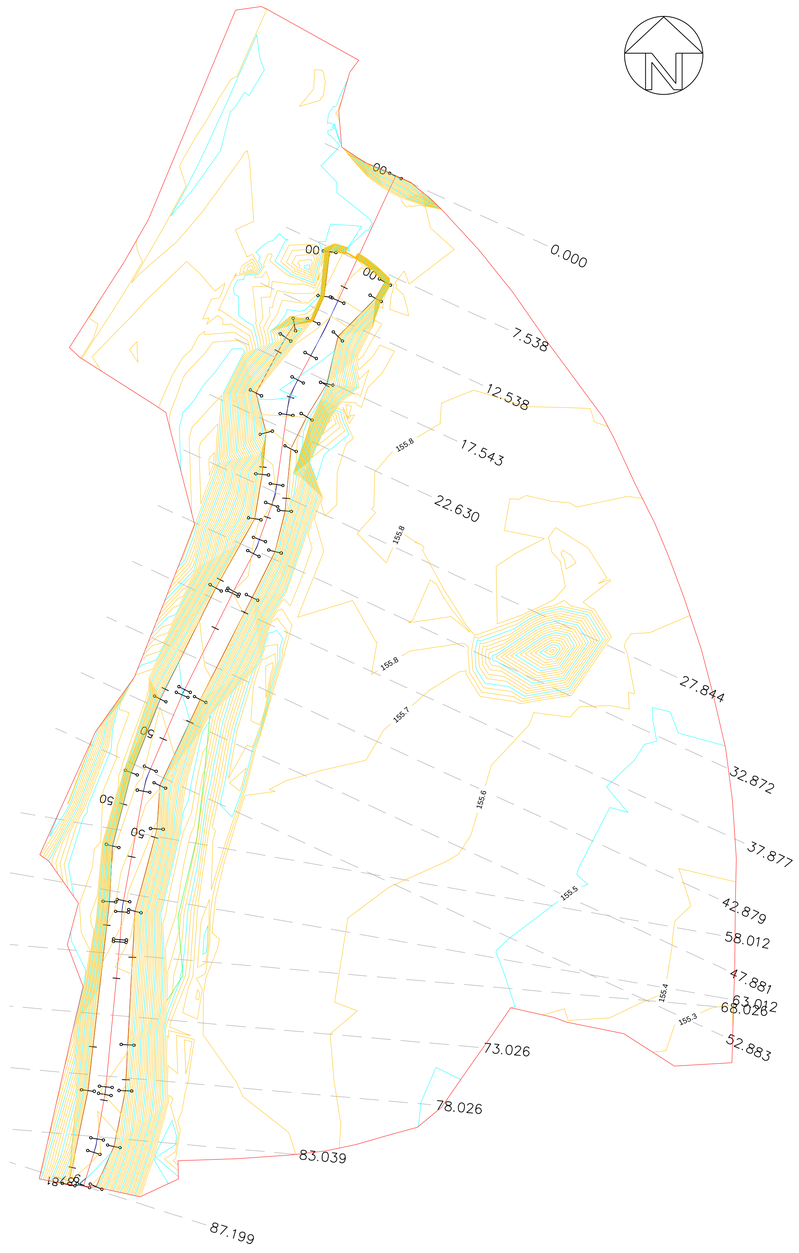
DIMENSIONS SHOULD NOT BE TAKEN ELECTRONICALLY

5 ALL MATERIALS AND WORKMANSHIP TO COMPLY WITH THE CURRENT BRITISH STANDARDS AND CODES OF PRACTICE



CUT & FILL - EXISTING GROUND LEVEL AGAINST 1 IN 100 YEAR STORM +50% CC FLOOD LEVEL

SCALE 1:250



HECRAS MODELLING SECTIONS

SCALE 1:250

Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
Flood Area 1 in 100 yr 50%cc	**1.000**	**1.000**	2620.531sq.m	42.888 Cu. M.	2478.374 Cu. M.	2435.486 Cu. M.<Fill>
Totals			2620.531sq.m	42.888 Cu. M.	2478.374 Cu. M.	2435.486 Cu. M.<Fill>

FLOOD LEVEL RELATED TO EXISTING GROUND LEVEL

NUMBER	MINIMUM LEVEL	MAXIMUM LEVEL	COLOUR	AREA
1	−1.750	−1.500		0.000m²
2	−1.500	−1.250		0.969m²
3	−1.250	−1.000		2.894m²
4	−1.000	−0.750		5.141m²
5	−0.750	−0.500		24.948m²
6	−0.500	−0.250		41.955m²
7	−0.250	0.000		20.945m²
8	0.000	0.250		68.894m²
9	0.250	0.500		340.035m²
10	0.500	0.750		995.452m²
11	0.750	1.000		529.744m²
12	1.000	1.250		65.785m²
13	1.250	1.500		93.579m²
14	1.500	1.750		53.073m²
15	1.750	2.000		46.870m²
16	2.000	2.250		61.000m²
17	2.250	2.500		50.314m²
18	2.500	2.750		76.811m²
19	2.750	3.000		56.829m²
20	3.000	3.250		81.194m²
21	3.250	3.500		4.101m²
22	3.500	3.750		0.000m²

EXISTING LEVELS KEY

90.000 EXISTING MAJOR CONTOUR (m) - 1.0m INTERVALS

90.100 EXISTING MINOR CONTOUR (m) - 0.1m INTERVALS

P1	01.06.23	ISSUED FOR INFORMATION	TT	MP
	DATE	REVISION SUMMARY	BY	CHK

JOB TITLE:
PROPOSED MIXED DEVELOPMENT
FERNLEIGH TERRACE
NANPEAN
CORNWALL

CLIENT:
CORNWALL COUNCIL

DETAIL:
RIVER ADJACENT TO FERNLEIGH TERRACE
HECRAS SECTIONS CUT & FILL

DRN. BY: T.TOOGOOD

DATE: MAY 2023 SCALE: AS SHOWN @ A1

JOB NO:	DRAWING No:	REV:
22228	220	P1

MBA CONSULTING
Boscawen House · Chapel Hill · Truro · Cornwall
TR1 3BN
Tel. 01872 260962 Fax. 01872 260963

APPENDIX F

UK Design Flood Estimation

Generated on Tuesday, May 23, 2023 1:11:55 PM by Mark
Printed from the ReFH2 Flood Modelling software package, version 3.3.8355.27598

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details Checksum: 73AD-0B5E

Site name: FEH_Catchment_Descriptors_195750_55350_v5_0_1 (1)

Easting: 195750

Northing: 55350

Country: England, Wales or Northern Ireland

Catchment Area (km²): 5.06

Using plot scale calculations: No

Model: 2.3

Site description: None

Model run: 100 year

Summary of results

Rainfall - FEH 2013 model (mm):	78.23	Total runoff (ML):	136.49
Total Rainfall (mm):	63.05	Total flow (ML):	318.93
Peak Rainfall (mm):	14.33	Peak flow (m³/s):	9.93

Parameters

Where the user has overriden a system-generated value, this original value is shown in square brackets after the value used.
** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	05:30:00 [04:15:00]	Yes
Timestep (hh:mm:ss)	00:30:00 [00:15:00]	Yes
SCF (Seasonal correction factor)	0.84	No
ARF (Areal reduction factor)	0.96	No
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	101.78	No
Cmax (mm)	320.18	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	1.85	No
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	0.31	No
BL (hr)	31.56	No
BR	1.4	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km^2)	0.37	No
Urbext 2000	0.05	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km^2)	0.00	Yes
Sewer capacity (m^3/s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
00:00:00	1.384	0.000	0.461	0.000	0.301	0.301
00:30:00	2.319	0.000	0.788	0.034	0.297	0.330
01:00:00	3.866	0.000	1.350	0.158	0.294	0.452
01:30:00	6.392	0.000	2.333	0.438	0.295	0.733
02:00:00	10.402	0.000	4.063	0.967	0.304	1.272
02:30:00	14.329	0.000	6.139	1.862	0.328	2.189
03:00:00	10.402	0.000	4.850	3.305	0.375	3.679
03:30:00	6.392	0.000	3.144	5.220	0.455	5.676
04:00:00	3.866	0.000	1.962	7.166	0.575	7.741
04:30:00	2.319	0.000	1.183	8.586	0.730	9.316
05:00:00	1.384	0.000	0.714	9.027	0.904	9.932
05:30:00	0.000	0.000	0.000	8.594	1.078	9.672
06:00:00	0.000	0.000	0.000	7.609	1.233	8.842
06:30:00	0.000	0.000	0.000	6.363	1.362	7.725
07:00:00	0.000	0.000	0.000	5.094	1.462	6.556
07:30:00	0.000	0.000	0.000	3.899	1.535	5.434
08:00:00	0.000	0.000	0.000	2.862	1.583	4.445
08:30:00	0.000	0.000	0.000	1.988	1.611	3.599
09:00:00	0.000	0.000	0.000	1.269	1.621	2.890
09:30:00	0.000	0.000	0.000	0.731	1.617	2.347
10:00:00	0.000	0.000	0.000	0.383	1.603	1.986
10:30:00	0.000	0.000	0.000	0.180	1.583	1.763
11:00:00	0.000	0.000	0.000	0.071	1.560	1.632
11:30:00	0.000	0.000	0.000	0.019	1.537	1.555
12:00:00	0.000	0.000	0.000	0.001	1.513	1.513
12:30:00	0.000	0.000	0.000	0.000	1.489	1.489
13:00:00	0.000	0.000	0.000	0.000	1.465	1.465
13:30:00	0.000	0.000	0.000	0.000	1.442	1.442
14:00:00	0.000	0.000	0.000	0.000	1.420	1.420
14:30:00	0.000	0.000	0.000	0.000	1.397	1.397
15:00:00	0.000	0.000	0.000	0.000	1.375	1.375
15:30:00	0.000	0.000	0.000	0.000	1.354	1.354
16:00:00	0.000	0.000	0.000	0.000	1.333	1.333
16:30:00	0.000	0.000	0.000	0.000	1.312	1.312
17:00:00	0.000	0.000	0.000	0.000	1.291	1.291

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
17:30:00	0.000	0.000	0.000	0.000	1.271	1.271
18:00:00	0.000	0.000	0.000	0.000	1.251	1.251
18:30:00	0.000	0.000	0.000	0.000	1.231	1.231
19:00:00	0.000	0.000	0.000	0.000	1.212	1.212
19:30:00	0.000	0.000	0.000	0.000	1.193	1.193
20:00:00	0.000	0.000	0.000	0.000	1.174	1.174
20:30:00	0.000	0.000	0.000	0.000	1.156	1.156
21:00:00	0.000	0.000	0.000	0.000	1.137	1.137
21:30:00	0.000	0.000	0.000	0.000	1.119	1.119
22:00:00	0.000	0.000	0.000	0.000	1.102	1.102
22:30:00	0.000	0.000	0.000	0.000	1.085	1.085
23:00:00	0.000	0.000	0.000	0.000	1.068	1.068
23:30:00	0.000	0.000	0.000	0.000	1.051	1.051
24:00:00	0.000	0.000	0.000	0.000	1.034	1.034
24:30:00	0.000	0.000	0.000	0.000	1.018	1.018
25:00:00	0.000	0.000	0.000	0.000	1.002	1.002
25:30:00	0.000	0.000	0.000	0.000	0.986	0.986
26:00:00	0.000	0.000	0.000	0.000	0.971	0.971
26:30:00	0.000	0.000	0.000	0.000	0.955	0.955
27:00:00	0.000	0.000	0.000	0.000	0.940	0.940
27:30:00	0.000	0.000	0.000	0.000	0.926	0.926
28:00:00	0.000	0.000	0.000	0.000	0.911	0.911
28:30:00	0.000	0.000	0.000	0.000	0.897	0.897
29:00:00	0.000	0.000	0.000	0.000	0.883	0.883
29:30:00	0.000	0.000	0.000	0.000	0.869	0.869
30:00:00	0.000	0.000	0.000	0.000	0.855	0.855
30:30:00	0.000	0.000	0.000	0.000	0.842	0.842
31:00:00	0.000	0.000	0.000	0.000	0.828	0.828
31:30:00	0.000	0.000	0.000	0.000	0.815	0.815
32:00:00	0.000	0.000	0.000	0.000	0.803	0.803
32:30:00	0.000	0.000	0.000	0.000	0.790	0.790
33:00:00	0.000	0.000	0.000	0.000	0.778	0.778
33:30:00	0.000	0.000	0.000	0.000	0.765	0.765
34:00:00	0.000	0.000	0.000	0.000	0.753	0.753
34:30:00	0.000	0.000	0.000	0.000	0.742	0.742
35:00:00	0.000	0.000	0.000	0.000	0.730	0.730

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
35:30:00	0.000	0.000	0.000	0.000	0.718	0.718
36:00:00	0.000	0.000	0.000	0.000	0.707	0.707
36:30:00	0.000	0.000	0.000	0.000	0.696	0.696
37:00:00	0.000	0.000	0.000	0.000	0.685	0.685
37:30:00	0.000	0.000	0.000	0.000	0.674	0.674
38:00:00	0.000	0.000	0.000	0.000	0.664	0.664
38:30:00	0.000	0.000	0.000	0.000	0.653	0.653
39:00:00	0.000	0.000	0.000	0.000	0.643	0.643
39:30:00	0.000	0.000	0.000	0.000	0.633	0.633
40:00:00	0.000	0.000	0.000	0.000	0.623	0.623
40:30:00	0.000	0.000	0.000	0.000	0.613	0.613
41:00:00	0.000	0.000	0.000	0.000	0.604	0.604
41:30:00	0.000	0.000	0.000	0.000	0.594	0.594
42:00:00	0.000	0.000	0.000	0.000	0.585	0.585
42:30:00	0.000	0.000	0.000	0.000	0.575	0.575
43:00:00	0.000	0.000	0.000	0.000	0.566	0.566
43:30:00	0.000	0.000	0.000	0.000	0.558	0.558
44:00:00	0.000	0.000	0.000	0.000	0.549	0.549
44:30:00	0.000	0.000	0.000	0.000	0.540	0.540
45:00:00	0.000	0.000	0.000	0.000	0.532	0.532
45:30:00	0.000	0.000	0.000	0.000	0.523	0.523
46:00:00	0.000	0.000	0.000	0.000	0.515	0.515
46:30:00	0.000	0.000	0.000	0.000	0.507	0.507
47:00:00	0.000	0.000	0.000	0.000	0.499	0.499
47:30:00	0.000	0.000	0.000	0.000	0.491	0.491
48:00:00	0.000	0.000	0.000	0.000	0.483	0.483
48:30:00	0.000	0.000	0.000	0.000	0.476	0.476
49:00:00	0.000	0.000	0.000	0.000	0.468	0.468
49:30:00	0.000	0.000	0.000	0.000	0.461	0.461
50:00:00	0.000	0.000	0.000	0.000	0.454	0.454
50:30:00	0.000	0.000	0.000	0.000	0.447	0.447
51:00:00	0.000	0.000	0.000	0.000	0.440	0.440
51:30:00	0.000	0.000	0.000	0.000	0.433	0.433
52:00:00	0.000	0.000	0.000	0.000	0.426	0.426
52:30:00	0.000	0.000	0.000	0.000	0.419	0.419
53:00:00	0.000	0.000	0.000	0.000	0.413	0.413

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
53:30:00	0.000	0.000	0.000	0.000	0.406	0.406
54:00:00	0.000	0.000	0.000	0.000	0.400	0.400
54:30:00	0.000	0.000	0.000	0.000	0.393	0.393
55:00:00	0.000	0.000	0.000	0.000	0.387	0.387
55:30:00	0.000	0.000	0.000	0.000	0.381	0.381
56:00:00	0.000	0.000	0.000	0.000	0.375	0.375
56:30:00	0.000	0.000	0.000	0.000	0.369	0.369
57:00:00	0.000	0.000	0.000	0.000	0.364	0.364
57:30:00	0.000	0.000	0.000	0.000	0.358	0.358
58:00:00	0.000	0.000	0.000	0.000	0.352	0.352
58:30:00	0.000	0.000	0.000	0.000	0.347	0.347
59:00:00	0.000	0.000	0.000	0.000	0.341	0.341
59:30:00	0.000	0.000	0.000	0.000	0.336	0.336
60:00:00	0.000	0.000	0.000	0.000	0.331	0.331
60:30:00	0.000	0.000	0.000	0.000	0.325	0.325
61:00:00	0.000	0.000	0.000	0.000	0.320	0.320
61:30:00	0.000	0.000	0.000	0.000	0.315	0.315
62:00:00	0.000	0.000	0.000	0.000	0.310	0.310
62:30:00	0.000	0.000	0.000	0.000	0.305	0.305

Appendix

Catchment descriptors

Name	Value	User-defined value used?
Area (km²)	5.06	No
ALTBAR	217	No
ASPBAR	253	No
ASPVAR	0.38	No
BFIHOST	0.54	No
BFIHOST19	0.43	No
DPLBAR (km)	2.13	No
DPSBAR (mkm-¹)	77.5	No
FARL	1	No
LDP	3.83	No
PROPWET	0.45	No
RMED1H	11.9	No
RMED1D	44.4	No
RMED2D	59.8	No
SAAR (mm)	1326	No
SAAR4170 (mm)	1364	No
SPRHOST	35.15	No
Urbext2000	0.05	No
Urbext1990	0.05	No
URBCONC	0.74	No
URBLOC	0.68	No
DDF parameter C	-0.03	No
DDF parameter D1	0.46	No
DDF parameter D2	0.35	No
DDF parameter D3	0.34	No
DDF parameter E	0.29	No
DDF parameter F	2.51	No
DDF parameter C (1km grid value)	-0.03	No
DDF parameter D1 (1km grid value)	0.45	No
DDF parameter D2 (1km grid value)	0.35	No
DDF parameter D3 (1km grid value)	0.33	No
DDF parameter E (1km grid value)	0.29	No
DDF parameter F (1km grid value)	2.5	No

UK Design Flood Estimation

Generated on Tuesday, May 23, 2023 1:12:30 PM by Mark
Printed from the ReFH2 Flood Modelling software package, version 3.3.8355.27598

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details Checksum: 73AD-0B5E

Site name: FEH_Catchment_Descriptors_195750_55350_v5_0_1 (1)

Easting: 195750

Northing: 55350

Country: England, Wales or Northern Ireland

Catchment Area (km²): 5.06

Using plot scale calculations: No

Model: 2.3

Site description: None

Model run: 100 year 1.5 CC

Summary of results

Rainfall - FEH 2013 model (mm):	117.34	Total runoff (ML):	227.74
Total Rainfall (mm):	94.58	Total flow (ML):	478.53
Peak Rainfall (mm):	21.49	Peak flow (m³/s):	16.22

Parameters

Where the user has overriden a system-generated value, this original value is shown in square brackets after the value used.
** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	05:30:00 [04:15:00]	Yes
Timestep (hh:mm:ss)	00:30:00 [00:15:00]	Yes
SCF (Seasonal correction factor)	0.84	No
ARF (Areal reduction factor)	0.96	No
Seasonality	Winter	No
Climate change factor	1.50	Yes

Loss model parameters

Name	Value	User-defined?
Cini (mm)	101.78	No
Cmax (mm)	320.18	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	1.85	No
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	0.31	No
BL (hr)	31.56	No
BR	1.15	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km^2)	0.37	No
Urbext 2000	0.05	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km^2)	0.00	Yes
Sewer capacity (m^3/s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
00:00:00	2.077	0.000	0.695	0.000	0.301	0.301
00:30:00	3.479	0.000	1.196	0.051	0.297	0.347
01:00:00	5.798	0.000	2.075	0.239	0.294	0.533
01:30:00	9.587	0.000	3.657	0.664	0.297	0.961
02:00:00	15.603	0.000	6.552	1.479	0.310	1.789
02:30:00	21.493	0.000	10.245	2.883	0.341	3.224
03:00:00	15.603	0.000	8.322	5.211	0.404	5.614
03:30:00	9.587	0.000	5.483	8.381	0.512	8.893
04:00:00	5.798	0.000	3.452	11.685	0.675	12.360
04:30:00	3.479	0.000	2.089	14.190	0.889	15.079
05:00:00	2.077	0.000	1.265	15.085	1.132	16.217
05:30:00	0.000	0.000	0.000	14.483	1.375	15.858
06:00:00	0.000	0.000	0.000	12.903	1.594	14.496
06:30:00	0.000	0.000	0.000	10.837	1.775	12.612
07:00:00	0.000	0.000	0.000	8.706	1.916	10.622
07:30:00	0.000	0.000	0.000	6.687	2.019	8.706
08:00:00	0.000	0.000	0.000	4.931	2.088	7.018
08:30:00	0.000	0.000	0.000	3.445	2.128	5.573
09:00:00	0.000	0.000	0.000	2.216	2.144	4.359
09:30:00	0.000	0.000	0.000	1.286	2.140	3.426
10:00:00	0.000	0.000	0.000	0.678	2.122	2.800
10:30:00	0.000	0.000	0.000	0.321	2.096	2.417
11:00:00	0.000	0.000	0.000	0.127	2.066	2.193
11:30:00	0.000	0.000	0.000	0.034	2.035	2.068
12:00:00	0.000	0.000	0.000	0.001	2.003	2.004
12:30:00	0.000	0.000	0.000	0.000	1.971	1.971
13:00:00	0.000	0.000	0.000	0.000	1.940	1.940
13:30:00	0.000	0.000	0.000	0.000	1.910	1.910
14:00:00	0.000	0.000	0.000	0.000	1.880	1.880
14:30:00	0.000	0.000	0.000	0.000	1.850	1.850
15:00:00	0.000	0.000	0.000	0.000	1.821	1.821
15:30:00	0.000	0.000	0.000	0.000	1.793	1.793
16:00:00	0.000	0.000	0.000	0.000	1.764	1.764
16:30:00	0.000	0.000	0.000	0.000	1.737	1.737
17:00:00	0.000	0.000	0.000	0.000	1.709	1.709

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
17:30:00	0.000	0.000	0.000	0.000	1.682	1.682
18:00:00	0.000	0.000	0.000	0.000	1.656	1.656
18:30:00	0.000	0.000	0.000	0.000	1.630	1.630
19:00:00	0.000	0.000	0.000	0.000	1.604	1.604
19:30:00	0.000	0.000	0.000	0.000	1.579	1.579
20:00:00	0.000	0.000	0.000	0.000	1.554	1.554
20:30:00	0.000	0.000	0.000	0.000	1.530	1.530
21:00:00	0.000	0.000	0.000	0.000	1.506	1.506
21:30:00	0.000	0.000	0.000	0.000	1.482	1.482
22:00:00	0.000	0.000	0.000	0.000	1.459	1.459
22:30:00	0.000	0.000	0.000	0.000	1.436	1.436
23:00:00	0.000	0.000	0.000	0.000	1.413	1.413
23:30:00	0.000	0.000	0.000	0.000	1.391	1.391
24:00:00	0.000	0.000	0.000	0.000	1.369	1.369
24:30:00	0.000	0.000	0.000	0.000	1.348	1.348
25:00:00	0.000	0.000	0.000	0.000	1.327	1.327
25:30:00	0.000	0.000	0.000	0.000	1.306	1.306
26:00:00	0.000	0.000	0.000	0.000	1.285	1.285
26:30:00	0.000	0.000	0.000	0.000	1.265	1.265
27:00:00	0.000	0.000	0.000	0.000	1.245	1.245
27:30:00	0.000	0.000	0.000	0.000	1.226	1.226
28:00:00	0.000	0.000	0.000	0.000	1.206	1.206
28:30:00	0.000	0.000	0.000	0.000	1.187	1.187
29:00:00	0.000	0.000	0.000	0.000	1.169	1.169
29:30:00	0.000	0.000	0.000	0.000	1.150	1.150
30:00:00	0.000	0.000	0.000	0.000	1.132	1.132
30:30:00	0.000	0.000	0.000	0.000	1.114	1.114
31:00:00	0.000	0.000	0.000	0.000	1.097	1.097
31:30:00	0.000	0.000	0.000	0.000	1.080	1.080
32:00:00	0.000	0.000	0.000	0.000	1.063	1.063
32:30:00	0.000	0.000	0.000	0.000	1.046	1.046
33:00:00	0.000	0.000	0.000	0.000	1.030	1.030
33:30:00	0.000	0.000	0.000	0.000	1.013	1.013
34:00:00	0.000	0.000	0.000	0.000	0.997	0.997
34:30:00	0.000	0.000	0.000	0.000	0.982	0.982
35:00:00	0.000	0.000	0.000	0.000	0.966	0.966

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
35:30:00	0.000	0.000	0.000	0.000	0.951	0.951
36:00:00	0.000	0.000	0.000	0.000	0.936	0.936
36:30:00	0.000	0.000	0.000	0.000	0.922	0.922
37:00:00	0.000	0.000	0.000	0.000	0.907	0.907
37:30:00	0.000	0.000	0.000	0.000	0.893	0.893
38:00:00	0.000	0.000	0.000	0.000	0.879	0.879
38:30:00	0.000	0.000	0.000	0.000	0.865	0.865
39:00:00	0.000	0.000	0.000	0.000	0.851	0.851
39:30:00	0.000	0.000	0.000	0.000	0.838	0.838
40:00:00	0.000	0.000	0.000	0.000	0.825	0.825
40:30:00	0.000	0.000	0.000	0.000	0.812	0.812
41:00:00	0.000	0.000	0.000	0.000	0.799	0.799
41:30:00	0.000	0.000	0.000	0.000	0.786	0.786
42:00:00	0.000	0.000	0.000	0.000	0.774	0.774
42:30:00	0.000	0.000	0.000	0.000	0.762	0.762
43:00:00	0.000	0.000	0.000	0.000	0.750	0.750
43:30:00	0.000	0.000	0.000	0.000	0.738	0.738
44:00:00	0.000	0.000	0.000	0.000	0.727	0.727
44:30:00	0.000	0.000	0.000	0.000	0.715	0.715
45:00:00	0.000	0.000	0.000	0.000	0.704	0.704
45:30:00	0.000	0.000	0.000	0.000	0.693	0.693
46:00:00	0.000	0.000	0.000	0.000	0.682	0.682
46:30:00	0.000	0.000	0.000	0.000	0.671	0.671
47:00:00	0.000	0.000	0.000	0.000	0.661	0.661
47:30:00	0.000	0.000	0.000	0.000	0.650	0.650
48:00:00	0.000	0.000	0.000	0.000	0.640	0.640
48:30:00	0.000	0.000	0.000	0.000	0.630	0.630
49:00:00	0.000	0.000	0.000	0.000	0.620	0.620
49:30:00	0.000	0.000	0.000	0.000	0.610	0.610
50:00:00	0.000	0.000	0.000	0.000	0.601	0.601
50:30:00	0.000	0.000	0.000	0.000	0.591	0.591
51:00:00	0.000	0.000	0.000	0.000	0.582	0.582
51:30:00	0.000	0.000	0.000	0.000	0.573	0.573
52:00:00	0.000	0.000	0.000	0.000	0.564	0.564
52:30:00	0.000	0.000	0.000	0.000	0.555	0.555
53:00:00	0.000	0.000	0.000	0.000	0.546	0.546

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
53:30:00	0.000	0.000	0.000	0.000	0.538	0.538
54:00:00	0.000	0.000	0.000	0.000	0.529	0.529
54:30:00	0.000	0.000	0.000	0.000	0.521	0.521
55:00:00	0.000	0.000	0.000	0.000	0.513	0.513
55:30:00	0.000	0.000	0.000	0.000	0.505	0.505
56:00:00	0.000	0.000	0.000	0.000	0.497	0.497
56:30:00	0.000	0.000	0.000	0.000	0.489	0.489
57:00:00	0.000	0.000	0.000	0.000	0.481	0.481
57:30:00	0.000	0.000	0.000	0.000	0.474	0.474
58:00:00	0.000	0.000	0.000	0.000	0.466	0.466
58:30:00	0.000	0.000	0.000	0.000	0.459	0.459
59:00:00	0.000	0.000	0.000	0.000	0.452	0.452
59:30:00	0.000	0.000	0.000	0.000	0.445	0.445
60:00:00	0.000	0.000	0.000	0.000	0.438	0.438
60:30:00	0.000	0.000	0.000	0.000	0.431	0.431
61:00:00	0.000	0.000	0.000	0.000	0.424	0.424
61:30:00	0.000	0.000	0.000	0.000	0.417	0.417
62:00:00	0.000	0.000	0.000	0.000	0.411	0.411
62:30:00	0.000	0.000	0.000	0.000	0.404	0.404
63:00:00	0.000	0.000	0.000	0.000	0.398	0.398
63:30:00	0.000	0.000	0.000	0.000	0.392	0.392
64:00:00	0.000	0.000	0.000	0.000	0.386	0.386
64:30:00	0.000	0.000	0.000	0.000	0.379	0.379
65:00:00	0.000	0.000	0.000	0.000	0.374	0.374
65:30:00	0.000	0.000	0.000	0.000	0.368	0.368
66:00:00	0.000	0.000	0.000	0.000	0.362	0.362
66:30:00	0.000	0.000	0.000	0.000	0.356	0.356
67:00:00	0.000	0.000	0.000	0.000	0.351	0.351
67:30:00	0.000	0.000	0.000	0.000	0.345	0.345
68:00:00	0.000	0.000	0.000	0.000	0.340	0.340
68:30:00	0.000	0.000	0.000	0.000	0.334	0.334
69:00:00	0.000	0.000	0.000	0.000	0.329	0.329
69:30:00	0.000	0.000	0.000	0.000	0.324	0.324
70:00:00	0.000	0.000	0.000	0.000	0.319	0.319
70:30:00	0.000	0.000	0.000	0.000	0.314	0.314
71:00:00	0.000	0.000	0.000	0.000	0.309	0.309

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
71:30:00	0.000	0.000	0.000	0.000	0.304	0.304

Appendix

Catchment descriptors

Name	Value	User-defined value used?
Area (km²)	5.06	No
ALTBAR	217	No
ASPBAR	253	No
ASPVAR	0.38	No
BFIHOST	0.54	No
BFIHOST19	0.43	No
DPLBAR (km)	2.13	No
DPSBAR (mkm-¹)	77.5	No
FARL	1	No
LDP	3.83	No
PROPWET	0.45	No
RMED1H	11.9	No
RMED1D	44.4	No
RMED2D	59.8	No
SAAR (mm)	1326	No
SAAR4170 (mm)	1364	No
SPRHOST	35.15	No
Urbext2000	0.05	No
Urbext1990	0.05	No
URBCONC	0.74	No
URBLOC	0.68	No
DDF parameter C	-0.03	No
DDF parameter D1	0.46	No
DDF parameter D2	0.35	No
DDF parameter D3	0.34	No
DDF parameter E	0.29	No
DDF parameter F	2.51	No
DDF parameter C (1km grid value)	-0.03	No
DDF parameter D1 (1km grid value)	0.45	No
DDF parameter D2 (1km grid value)	0.35	No
DDF parameter D3 (1km grid value)	0.33	No
DDF parameter E (1km grid value)	0.29	No
DDF parameter F (1km grid value)	2.5	No

UK Design Flood Estimation

Generated on Tuesday, May 23, 2023 1:13:06 PM by Mark
Printed from the ReFH2 Flood Modelling software package, version 3.3.8355.27598

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details Checksum: 73AD-0B5E

Site name: FEH_Catchment_Descriptors_195750_55350_v5_0_1 (1)

Easting: 195750

Northing: 55350

Country: England, Wales or Northern Ireland

Catchment Area (km²): 5.06

Using plot scale calculations: No

Model: 2.3

Site description: None

Model run: 1000 year

Summary of results

Rainfall - FEH 2013 model (mm):	137.21	Total runoff (ML):	279.95
Total Rainfall (mm):	110.60	Total flow (ML):	559.42
Peak Rainfall (mm):	25.13	Peak flow (m³/s):	19.78

Parameters

Where the user has overriden a system-generated value, this original value is shown in square brackets after the value used.
** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	05:30:00 [04:15:00]	Yes
Timestep (hh:mm:ss)	00:30:00 [00:15:00]	Yes
SCF (Seasonal correction factor)	0.84	No
ARF (Areal reduction factor)	0.96	No
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	101.78	No
Cmax (mm)	320.18	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	1.85	No
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	0.31	No
BL (hr)	31.56	No
BR	1.04	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km^2)	0.37	No
Urbext 2000	0.05	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km^2)	0.00	Yes
Sewer capacity (m^3/s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
00:00:00	2.428	0.000	0.814	0.000	0.301	0.301
00:30:00	4.068	0.000	1.406	0.059	0.297	0.356
01:00:00	6.780	0.000	2.456	0.280	0.295	0.575
01:30:00	11.211	0.000	4.370	0.781	0.298	1.079
02:00:00	18.245	0.000	7.933	1.745	0.312	2.057
02:30:00	25.133	0.000	12.595	3.424	0.346	3.770
03:00:00	18.245	0.000	10.353	6.243	0.414	6.658
03:30:00	11.211	0.000	6.867	10.127	0.534	10.661
04:00:00	6.780	0.000	4.339	14.220	0.715	14.935
04:30:00	4.068	0.000	2.628	17.372	0.953	18.325
05:00:00	2.428	0.000	1.593	18.556	1.225	19.782
05:30:00	0.000	0.000	0.000	17.881	1.499	19.380
06:00:00	0.000	0.000	0.000	15.971	1.746	17.717
06:30:00	0.000	0.000	0.000	13.439	1.950	15.389
07:00:00	0.000	0.000	0.000	10.812	2.108	12.920
07:30:00	0.000	0.000	0.000	8.316	2.223	10.540
08:00:00	0.000	0.000	0.000	6.143	2.301	8.444
08:30:00	0.000	0.000	0.000	4.303	2.346	6.649
09:00:00	0.000	0.000	0.000	2.776	2.365	5.141
09:30:00	0.000	0.000	0.000	1.617	2.361	3.978
10:00:00	0.000	0.000	0.000	0.854	2.342	3.196
10:30:00	0.000	0.000	0.000	0.404	2.313	2.717
11:00:00	0.000	0.000	0.000	0.160	2.280	2.440
11:30:00	0.000	0.000	0.000	0.042	2.245	2.287
12:00:00	0.000	0.000	0.000	0.002	2.210	2.212
12:30:00	0.000	0.000	0.000	0.000	2.175	2.175
13:00:00	0.000	0.000	0.000	0.000	2.141	2.141
13:30:00	0.000	0.000	0.000	0.000	2.107	2.107
14:00:00	0.000	0.000	0.000	0.000	2.074	2.074
14:30:00	0.000	0.000	0.000	0.000	2.041	2.041
15:00:00	0.000	0.000	0.000	0.000	2.009	2.009
15:30:00	0.000	0.000	0.000	0.000	1.978	1.978
16:00:00	0.000	0.000	0.000	0.000	1.947	1.947
16:30:00	0.000	0.000	0.000	0.000	1.916	1.916
17:00:00	0.000	0.000	0.000	0.000	1.886	1.886

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
17:30:00	0.000	0.000	0.000	0.000	1.856	1.856
18:00:00	0.000	0.000	0.000	0.000	1.827	1.827
18:30:00	0.000	0.000	0.000	0.000	1.798	1.798
19:00:00	0.000	0.000	0.000	0.000	1.770	1.770
19:30:00	0.000	0.000	0.000	0.000	1.742	1.742
20:00:00	0.000	0.000	0.000	0.000	1.715	1.715
20:30:00	0.000	0.000	0.000	0.000	1.688	1.688
21:00:00	0.000	0.000	0.000	0.000	1.662	1.662
21:30:00	0.000	0.000	0.000	0.000	1.635	1.635
22:00:00	0.000	0.000	0.000	0.000	1.610	1.610
22:30:00	0.000	0.000	0.000	0.000	1.584	1.584
23:00:00	0.000	0.000	0.000	0.000	1.559	1.559
23:30:00	0.000	0.000	0.000	0.000	1.535	1.535
24:00:00	0.000	0.000	0.000	0.000	1.511	1.511
24:30:00	0.000	0.000	0.000	0.000	1.487	1.487
25:00:00	0.000	0.000	0.000	0.000	1.464	1.464
25:30:00	0.000	0.000	0.000	0.000	1.441	1.441
26:00:00	0.000	0.000	0.000	0.000	1.418	1.418
26:30:00	0.000	0.000	0.000	0.000	1.396	1.396
27:00:00	0.000	0.000	0.000	0.000	1.374	1.374
27:30:00	0.000	0.000	0.000	0.000	1.352	1.352
28:00:00	0.000	0.000	0.000	0.000	1.331	1.331
28:30:00	0.000	0.000	0.000	0.000	1.310	1.310
29:00:00	0.000	0.000	0.000	0.000	1.289	1.289
29:30:00	0.000	0.000	0.000	0.000	1.269	1.269
30:00:00	0.000	0.000	0.000	0.000	1.249	1.249
30:30:00	0.000	0.000	0.000	0.000	1.230	1.230
31:00:00	0.000	0.000	0.000	0.000	1.210	1.210
31:30:00	0.000	0.000	0.000	0.000	1.191	1.191
32:00:00	0.000	0.000	0.000	0.000	1.173	1.173
32:30:00	0.000	0.000	0.000	0.000	1.154	1.154
33:00:00	0.000	0.000	0.000	0.000	1.136	1.136
33:30:00	0.000	0.000	0.000	0.000	1.118	1.118
34:00:00	0.000	0.000	0.000	0.000	1.101	1.101
34:30:00	0.000	0.000	0.000	0.000	1.083	1.083
35:00:00	0.000	0.000	0.000	0.000	1.066	1.066

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
35:30:00	0.000	0.000	0.000	0.000	1.049	1.049
36:00:00	0.000	0.000	0.000	0.000	1.033	1.033
36:30:00	0.000	0.000	0.000	0.000	1.017	1.017
37:00:00	0.000	0.000	0.000	0.000	1.001	1.001
37:30:00	0.000	0.000	0.000	0.000	0.985	0.985
38:00:00	0.000	0.000	0.000	0.000	0.970	0.970
38:30:00	0.000	0.000	0.000	0.000	0.954	0.954
39:00:00	0.000	0.000	0.000	0.000	0.939	0.939
39:30:00	0.000	0.000	0.000	0.000	0.925	0.925
40:00:00	0.000	0.000	0.000	0.000	0.910	0.910
40:30:00	0.000	0.000	0.000	0.000	0.896	0.896
41:00:00	0.000	0.000	0.000	0.000	0.882	0.882
41:30:00	0.000	0.000	0.000	0.000	0.868	0.868
42:00:00	0.000	0.000	0.000	0.000	0.854	0.854
42:30:00	0.000	0.000	0.000	0.000	0.841	0.841
43:00:00	0.000	0.000	0.000	0.000	0.828	0.828
43:30:00	0.000	0.000	0.000	0.000	0.814	0.814
44:00:00	0.000	0.000	0.000	0.000	0.802	0.802
44:30:00	0.000	0.000	0.000	0.000	0.789	0.789
45:00:00	0.000	0.000	0.000	0.000	0.777	0.777
45:30:00	0.000	0.000	0.000	0.000	0.764	0.764
46:00:00	0.000	0.000	0.000	0.000	0.752	0.752
46:30:00	0.000	0.000	0.000	0.000	0.741	0.741
47:00:00	0.000	0.000	0.000	0.000	0.729	0.729
47:30:00	0.000	0.000	0.000	0.000	0.718	0.718
48:00:00	0.000	0.000	0.000	0.000	0.706	0.706
48:30:00	0.000	0.000	0.000	0.000	0.695	0.695
49:00:00	0.000	0.000	0.000	0.000	0.684	0.684
49:30:00	0.000	0.000	0.000	0.000	0.673	0.673
50:00:00	0.000	0.000	0.000	0.000	0.663	0.663
50:30:00	0.000	0.000	0.000	0.000	0.652	0.652
51:00:00	0.000	0.000	0.000	0.000	0.642	0.642
51:30:00	0.000	0.000	0.000	0.000	0.632	0.632
52:00:00	0.000	0.000	0.000	0.000	0.622	0.622
52:30:00	0.000	0.000	0.000	0.000	0.612	0.612
53:00:00	0.000	0.000	0.000	0.000	0.603	0.603

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
53:30:00	0.000	0.000	0.000	0.000	0.593	0.593
54:00:00	0.000	0.000	0.000	0.000	0.584	0.584
54:30:00	0.000	0.000	0.000	0.000	0.575	0.575
55:00:00	0.000	0.000	0.000	0.000	0.566	0.566
55:30:00	0.000	0.000	0.000	0.000	0.557	0.557
56:00:00	0.000	0.000	0.000	0.000	0.548	0.548
56:30:00	0.000	0.000	0.000	0.000	0.540	0.540
57:00:00	0.000	0.000	0.000	0.000	0.531	0.531
57:30:00	0.000	0.000	0.000	0.000	0.523	0.523
58:00:00	0.000	0.000	0.000	0.000	0.514	0.514
58:30:00	0.000	0.000	0.000	0.000	0.506	0.506
59:00:00	0.000	0.000	0.000	0.000	0.498	0.498
59:30:00	0.000	0.000	0.000	0.000	0.491	0.491
60:00:00	0.000	0.000	0.000	0.000	0.483	0.483
60:30:00	0.000	0.000	0.000	0.000	0.475	0.475
61:00:00	0.000	0.000	0.000	0.000	0.468	0.468
61:30:00	0.000	0.000	0.000	0.000	0.460	0.460
62:00:00	0.000	0.000	0.000	0.000	0.453	0.453
62:30:00	0.000	0.000	0.000	0.000	0.446	0.446
63:00:00	0.000	0.000	0.000	0.000	0.439	0.439
63:30:00	0.000	0.000	0.000	0.000	0.432	0.432
64:00:00	0.000	0.000	0.000	0.000	0.425	0.425
64:30:00	0.000	0.000	0.000	0.000	0.419	0.419
65:00:00	0.000	0.000	0.000	0.000	0.412	0.412
65:30:00	0.000	0.000	0.000	0.000	0.406	0.406
66:00:00	0.000	0.000	0.000	0.000	0.399	0.399
66:30:00	0.000	0.000	0.000	0.000	0.393	0.393
67:00:00	0.000	0.000	0.000	0.000	0.387	0.387
67:30:00	0.000	0.000	0.000	0.000	0.381	0.381
68:00:00	0.000	0.000	0.000	0.000	0.375	0.375
68:30:00	0.000	0.000	0.000	0.000	0.369	0.369
69:00:00	0.000	0.000	0.000	0.000	0.363	0.363
69:30:00	0.000	0.000	0.000	0.000	0.357	0.357
70:00:00	0.000	0.000	0.000	0.000	0.352	0.352
70:30:00	0.000	0.000	0.000	0.000	0.346	0.346
71:00:00	0.000	0.000	0.000	0.000	0.341	0.341

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
71:30:00	0.000	0.000	0.000	0.000	0.335	0.335
72:00:00	0.000	0.000	0.000	0.000	0.330	0.330
72:30:00	0.000	0.000	0.000	0.000	0.325	0.325
73:00:00	0.000	0.000	0.000	0.000	0.320	0.320
73:30:00	0.000	0.000	0.000	0.000	0.315	0.315
74:00:00	0.000	0.000	0.000	0.000	0.310	0.310
74:30:00	0.000	0.000	0.000	0.000	0.305	0.305

Appendix

Catchment descriptors

Name	Value	User-defined value used?
Area (km²)	5.06	No
ALTBAR	217	No
ASPBAR	253	No
ASPVAR	0.38	No
BFIHOST	0.54	No
BFIHOST19	0.43	No
DPLBAR (km)	2.13	No
DPSBAR (mkm-¹)	77.5	No
FARL	1	No
LDP	3.83	No
PROPWET	0.45	No
RMED1H	11.9	No
RMED1D	44.4	No
RMED2D	59.8	No
SAAR (mm)	1326	No
SAAR4170 (mm)	1364	No
SPRHOST	35.15	No
Urbext2000	0.05	No
Urbext1990	0.05	No
URBCONC	0.74	No
URBLOC	0.68	No
DDF parameter C	-0.03	No
DDF parameter D1	0.46	No
DDF parameter D2	0.35	No
DDF parameter D3	0.34	No
DDF parameter E	0.29	No
DDF parameter F	2.51	No
DDF parameter C (1km grid value)	-0.03	No
DDF parameter D1 (1km grid value)	0.45	No
DDF parameter D2 (1km grid value)	0.35	No
DDF parameter D3 (1km grid value)	0.33	No
DDF parameter E (1km grid value)	0.29	No
DDF parameter F (1km grid value)	2.5	No

APPENDIX G

Reach	River Station	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
RIVER CENTERLINE	0	100 YEAR	9.93	154.13	155.07	155.07	155.42	0.01844	2.62	3.98	6.19	0.99
RIVER CENTERLINE	0	100 YEAR + 50% C	16.22	154.13	155.35	155.35	155.81	0.01632	3.05	5.73	6.66	0.98
RIVER CENTERLINE	0	1000 YEAR	19.78	154.13	155.48	155.48	156	0.015833	3.27	6.62	6.89	0.98
RIVER CENTERLINE	7.54	100 YEAR	9.93	154.09	155.27	155.27	155.69	0.024499	2.86	3.48	4.18	1
RIVER CENTERLINE	7.54	100 YEAR + 50% C	16.22	154.09	155.61	155.61	156.16	0.023378	3.28	4.94	4.54	1
RIVER CENTERLINE	7.54	1000 YEAR	19.78	154.09	155.77	155.77	156.39	0.023008	3.48	5.69	4.76	1.01
RIVER CENTERLINE	12.54	100 YEAR	9.93	154.1	155.5		155.76	0.005664	2.33	5.05	4.87	0.63
RIVER CENTERLINE	12.54	100 YEAR + 50% C	16.22	154.1	155.86	155.55	156.23	0.006339	2.88	7.89	18.25	0.7
RIVER CENTERLINE	12.54	1000 YEAR	19.78	154.1	156.27	155.92	156.46	0.003	2.28	16.09	20	0.5
RIVER CENTERLINE	17.54	100 YEAR	9.93	153.93	155.73		155.79	0.001101	1.13	10.72	9.02	0.28
RIVER CENTERLINE	17.54	100 YEAR + 50% C	16.22	153.93	156.2		156.27	0.001057	1.3	18.49	18.42	0.28
RIVER CENTERLINE	17.54	1000 YEAR	19.78	153.93	156.41		156.48	0.00102	1.36	22.44	20	0.28
RIVER CENTERLINE	22.63	100 YEAR	9.93	153.82	155.72		155.8	0.001259	1.35	10	7.11	0.31
RIVER CENTERLINE	22.63	100 YEAR + 50% C	16.22	153.82	156.19		156.29	0.001306	1.6	17.11	18.17	0.33
RIVER CENTERLINE	22.63	1000 YEAR	19.78	153.82	156.4		156.5	0.001295	1.68	20.94	18.61	0.34
RIVER CENTERLINE	27.84	100 YEAR	9.93	153.65	155.73		155.81	0.001256	1.42	11.69	20.71	0.32
RIVER CENTERLINE	27.84	100 YEAR + 50% C	16.22	153.65	156.25		156.3	0.000839	1.35	28.69	36.61	0.27
RIVER CENTERLINE	27.84	1000 YEAR	19.78	153.65	156.47		156.51	0.000682	1.29	37.07	38.48	0.25
RIVER CENTERLINE	32.87	100 YEAR	9.93	153.66	155.75		155.81	0.000992	1.26	14.04	23.28	0.28
RIVER CENTERLINE	32.87	100 YEAR + 50% C	16.22	153.66	156.27		156.3	0.000607	1.15	33.08	41.44	0.23
RIVER CENTERLINE	32.87	1000 YEAR	19.78	153.66	156.48		156.51	0.000503	1.11	42.33	43.18	0.21
RIVER CENTERLINE	37.88	100 YEAR	9.93	153.66	155.77		155.82	0.000765	1.13	17.68	42.87	0.25
RIVER CENTERLINE	37.88	100 YEAR + 50% C	16.22	153.66	156.29		156.31	0.000373	0.91	44.34	54.76	0.18
RIVER CENTERLINE	37.88	1000 YEAR	19.78	153.66	156.5		156.52	0.000302	0.87	56.19	55	0.16
RIVER CENTERLINE	42.88	100 YEAR	9.93	153.52	155.79		155.82	0.000543	0.99	22.4	52.43	0.21
RIVER CENTERLINE	42.88	100 YEAR + 50% C	16.22	153.52	156.29		156.31	0.000285	0.82	49.18	54.82	0.16
RIVER CENTERLINE	42.88	1000 YEAR	19.78	153.52	156.51		156.52	0.000239	0.79	60.93	55	0.15
RIVER CENTERLINE	47.88	100 YEAR	9.93	153.4	155.79		155.83	0.000483	0.97	23.41	53.35	0.2
RIVER CENTERLINE	47.88	100 YEAR + 50% C	16.22	153.4	156.29		156.31	0.000262	0.81	51.28	58	0.15
RIVER CENTERLINE	47.88	1000 YEAR	19.78	153.4	156.51		156.52	0.000218	0.78	63.68	58	0.14
RIVER CENTERLINE	52.88	100 YEAR	9.93	153.32	155.8		155.83	0.000436	0.94	25.99	54.33	0.19
RIVER CENTERLINE	52.88	100 YEAR + 50% C	16.22	153.32	156.3		156.31	0.000241	0.79	54.5	60	0.15
RIVER CENTERLINE	52.88	1000 YEAR	19.78	153.32	156.51		156.52	0.0002	0.76	67.28	60	0.14
RIVER CENTERLINE	58.01	100 YEAR	9.93	153.17	155.81		155.83	0.000325	0.82	26.6	52.79	0.17
RIVER CENTERLINE	58.01	100 YEAR + 50% C	16.22	153.17	156.3		156.31	0.000211	0.75	54.31	58	0.14
RIVER CENTERLINE	58.01	1000 YEAR	19.78	153.17	156.51		156.52	0.000182	0.73	66.64	58	0.13
RIVER CENTERLINE	63.01	100 YEAR	9.93	153.12	155.81		155.83	0.000366	0.89	28.26	55.69	0.18
RIVER CENTERLINE	63.01	100 YEAR + 50% C	16.22	153.12	156.3		156.31	0.000209	0.76	57.33	59.51	0.14
RIVER CENTERLINE	63.01	1000 YEAR	19.78	153.12	156.51		156.52	0.000178	0.73	69.96	59.51	0.13
RIVER CENTERLINE	68.03	100 YEAR	9.93	153.08	155.81		155.83	0.00035	0.9	28.84	57.84	0.18
RIVER CENTERLINE	68.03	100 YEAR + 50% C	16.22	153.08	156.3		156.31	0.0002	0.76	57.73	58.87	0.14
RIVER CENTERLINE	68.03	1000 YEAR	19.78	153.08	156.51		156.52	0.000172	0.74	70.22	58.87	0.13
RIVER CENTERLINE	73.03	100 YEAR	9.93	153.13	155.81		155.84	0.000398	0.96	23.1	39.83	0.19
RIVER CENTERLINE	73.03	100 YEAR + 50% C	16.22	153.13	156.3		156.32	0.000281	0.9	42.66	39.83	0.16
RIVER CENTERLINE	73.03	1000 YEAR	19.78	153.13	156.51		156.53	0.000262	0.91	51.09	39.83	0.16
RIVER CENTERLINE	78.03	100 YEAR	9.93	153.14	155.82		155.84	0.000282	0.8	24.37	34.8	0.16
RIVER CENTERLINE	78.03	100 YEAR + 50% C	16.22	153.14	156.3		156.32	0.000262	0.86	41.76	36.36	0.16
RIVER CENTERLINE	78.03	1000 YEAR	19.78	153.14	156.51		156.53	0.000253	0.88	49.41	36.36	0.15
RIVER CENTERLINE	83.04	100 YEAR	9.93	153.05	155.82		155.84	0.000236	0.75	23.48	23.9	0.14
RIVER CENTERLINE	83.04	100 YEAR + 50% C	16.22	153.05	156.3		156.32	0.000285	0.91	35.3	25.63	0.16
RIVER CENTERLINE	83.04	1000 YEAR	19.78	153.05	156.51		156.53	0.000297	0.97	40.65	25.63	0.17
RIVER CENTERLINE	87.2	100 YEAR	9.93	152.95	155.83		155.85	0.00046	0.85	19.46	16.02	0.17
RIVER CENTERLINE	87.2	100 YEAR + 50% C	16.22	152.95	156.3		156.33	0.000514	1.01	28.84	20	0.19
RIVER CENTERLINE	87.2	1000 YEAR	19.78	152.95	156.51		156.54	0.000535	1.08	33.03	20	0.19

Existing levels model tabular results 1 in 100 year, 1 in 100 year + 50%CC, 1 in 1000 year

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
RIVER CENTERLINE	0	100 YEAR + 50%CC	16.22	154.13	155.1	155.33	155.88	0.049543	3.92	4.14	6.23	1.54
RIVER CENTERLINE	7.54	100 YEAR + 50%CC	16.22	154.09	155.61	155.61	156.16	0.023864	3.27	4.95	4.54	1
RIVER CENTERLINE	12.54	100 YEAR + 50%CC	16.22	154.1	155.97	155.55	156.24	0.004558	2.55	11.97	31	0.6
RIVER CENTERLINE	17.54	100 YEAR + 50%CC	16.22	153.93	156.23		156.27	0.000715	1.08	27.67	35.52	0.23
RIVER CENTERLINE	22.63	100 YEAR + 50%CC	16.22	153.82	156.23		156.28	0.00075	1.22	29.69	40.37	0.25
RIVER CENTERLINE	27.84	100 YEAR + 50%CC	16.22	153.65	156.24		156.29	0.000845	1.35	28.7	37.15	0.27
RIVER CENTERLINE	32.87	100 YEAR + 50%CC	16.22	153.66	156.25		156.29	0.000628	1.16	32.57	41.17	0.23
RIVER CENTERLINE	37.88	100 YEAR + 50%CC	16.22	153.66	156.26		156.29	0.000551	1.1	32.8	36.08	0.22
RIVER CENTERLINE	42.88	100 YEAR + 50%CC	16.22	153.52	156.27		156.3	0.000407	0.97	37.09	36.22	0.19
RIVER CENTERLINE	47.88	100 YEAR + 50%CC	16.22	153.4	156.27		156.3	0.000383	0.98	38.66	39.52	0.19
RIVER CENTERLINE	52.88	100 YEAR + 50%CC	16.22	153.32	156.28		156.3	0.000358	0.96	41.27	41.51	0.18
RIVER CENTERLINE	58.01	100 YEAR + 50%CC	16.22	153.17	156.28		156.3	0.000302	0.89	41.26	39.68	0.16
RIVER CENTERLINE	63.01	100 YEAR + 50%CC	16.22	153.12	156.28		156.3	0.000305	0.91	43.78	41.18	0.17
RIVER CENTERLINE	68.03	100 YEAR + 50%CC	16.22	153.08	156.29		156.31	0.000287	0.91	44.21	40.31	0.16
RIVER CENTERLINE	73.03	100 YEAR + 50%CC	16.22	153.13	156.28		156.31	0.000401	1.07	31.62	24.8	0.19
RIVER CENTERLINE	78.03	100 YEAR + 50%CC	16.22	153.14	156.29		156.31	0.000264	0.86	41.6	36.36	0.16
RIVER CENTERLINE	83.04	100 YEAR + 50%CC	16.22	153.05	156.29		156.32	0.000286	0.91	35.24	25.72	0.16
RIVER CENTERLINE	87.2	100 YEAR + 50%CC	16.22	152.95	156.31	154.6	156.32	0.000559	0.61	28.96	20	0.18

Proposed levels model tabular results 1 in 100 year + 50%CC

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