

Penstrowed Quarry, Caersws

Drainage Strategy

November 2023

Project Information	
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Approval Record	
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02	29/10/2021	Second issue – Updated with revised site layout
03	11/05/2022	Third issue – Updated with revised site layout
04	19/05/2022	Fourth issue – Updated following Client review
05	07/11/2023	Fifth Issue- Updated with revised site layout

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This report will remain valid for a period of twelve months (from the date of last issue) after which the source data should be reviewed in order to reassess the findings and conclusions on the basis of latest available information.

Contents

Introduction.....	1
Existing Conditions	1
Development Proposals	3
Consultation.....	5
Surface Water Management	6
Construction, Operation and Maintenance.....	10
Foul Drainage.....	10
Other Considerations	11
Conclusions.....	12
Recommendations.....	12

Appendices

Appendix A	Location Plan and Aerial Image
Appendix B	Topographical Information
Appendix C	Site Fill Plan and Percolation Testing Results
Appendix D	Hafren Dyfrdwy Sewer Plan
Appendix E	Photo Log and Watercourse Plan
Appendix F	Proposed Site Layout Plan
Appendix G	Powys County Council Pre-Application Report
Appendix H	NRW Correspondence
Appendix I	Pipeflow Calculations
Appendix J	Greenfield Runoff Rate
Appendix K	MicroDrainage Storage Estimate
Appendix L	Concept Drainage Sketch
Appendix M	SuDS Maintenance Schedules
Appendix N	Concept Designer's Risk Assessment

Tables

Table 1 – Infiltration Test Summary	2
Table 2 – Pollution Hazard Indices	9
Table 3 – SuDS Mitigation Indices	9

Introduction

Waterco has been instructed to prepare a Drainage Strategy in respect of a proposed holiday park development at Penstrowed Quarry, Penstrowed, Caersws, Powys, SY17 5SG.

The aim of the Sustainable Drainage Strategy is to identify water management measures, including Sustainable Drainage Systems (SuDS), to provide surface water runoff reduction and treatment. This report has been prepared in accordance with the Welsh Government 'Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems' (2018) – herein referred to as 'the Statutory Standards for SuDS'.

Existing Conditions

The site covers an area of approximately 6.77 hectares (ha) and is located at National Grid Reference (NGR) 306766, 291007. A location plan and an aerial image are included in Appendix A.

Online mapping (including Google Maps / Google Streetview imagery, accessed November 2023) shows that the site comprises a former quarry now utilised as a recycling centre for inert materials, with associated operational buildings. Operational buildings occupy approximately 3,250m² of the existing quarry site. The site is bordered by agricultural land to the north and west, agricultural land, farm buildings and the A489 beyond to the east, and agricultural land and an unnamed access road to the south. Access to the site is provided from the A489.

Local Topography

Topographical levels are provided on the 'Proposed Earthworks' plan (Drawing No: CG01) provided by Lambe Planning & Design Ltd. The Proposed Earthworks plan shows that the site slopes from 250 metres Above Ordnance Datum (m AOD) in the south-west to 138.5m AOD in the north-east.

Topographic levels to m AOD have also been derived from a 2m resolution Natural Resources Wales (NRW) composite 'Light Detecting and Ranging' (LiDAR) Digital Terrain Model (DTM). A review of LiDAR data shows that site levels generally fall from west to east and reflect those identified on the Proposed Earthworks plan.

Topographical information is provided as Appendix B.

Ground Conditions

Published Geology

The British Geological Survey (BGS) online mapping (1:50,000 scale) indicates that the site is underlain by bedrock of the Penstrowed Grits Formation consisting of sandstone and mudstone. No superficial deposits are recorded on the BGS mapping. The quarry is no longer operational and is now a recycling centre for inert materials.

The geological mapping is available at a scale of 1:50,000 and as such may not be accurate on a site-specific basis.

A site plan identifying areas in the quarry which have been filled with a cohesive fill material has been provided by Lambe Planning & Design Ltd and is included in Appendix C. The plan identifies that the majority of the site has been infilled and also identifies areas which are proposed to be filled within the northern extent of the site. The nature of the proposed fill is unknown.

Ground Investigations

Percolation Tests have been undertaken by GroundSolve Ltd in February 2021.

Percolation test results together with a trial pit location plan, provided by Lambe Planning & Design Ltd, are included in Appendix C. The trial pit was advanced in an area outside of the infilled areas.

A single trial pit was excavated to 3m (length) x 1.5m (width) x 1m (depth). A summary of the percolation test is included in Table 1.

Table 1 – Infiltration Test Summary

Test	Infiltration Rate (m/s)
1	9.179×10^{-4}
2	8.038×10^{-4}
3	8.656×10^{-4}

Given the current and historical status of the site, and that a large proportion of the site has been infilled with cohesive fill material, infiltration techniques are unlikely to be viable across the majority of the site.

Hydrogeology

According to NRW's Aquifer Designation data, obtained from the BGS GeoIndex online mapping [accessed November 2023], the Penstrowed Grits Formation is classified as a Secondary B Aquifer.

Secondary B Aquifers are 'predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers'.

Statutory Designations

Two statutory designated sites are identified within 500m of the proposed development:

Penstrowed Quarry Site of Special Scientific Interest (SSSI) - lies within the proposed development site. The SSSI is known to be associated with the geology, rather than habitat.

Gweunydd Penstrowed (SSSI) located approximately 100m from the proposed development.

Existing Drainage

The site is situated within the Hafren Dyfrdwy sewerage catchment area. The Hafren Dyfrdwy sewer plan, included in Appendix D, identifies no assets within the vicinity of the site. Dwr Cymru Welsh Water (DCWW)

also operate within the vicinity of the site. The nearest DCWW sewerage asset is located over 2.6km from the site.

Site Visit

A site visit was undertaken by Waterco representatives in April 2022 to review the existing drainage arrangements and inspect nearby watercourses which may be suitable for the discharge of surface water and treated foul flows from the proposed development. A 'Photographic Record' and a plan showing the location of the proposed photographs are included in Appendix E.

An ephemeral stream was identified along the site boundary in the north-western extent of the site. The stream conveys flow from upland areas west of the site and is conveyed along the site boundary in a 300mm pipe. The pipe upsizes to 450mm and discharges to an open watercourse in agricultural land north of the site. The ephemeral stream becomes piped within agricultural land north-east of the site and eventually discharges to the River Severn. The route of the watercourse is shown on the 'Watercourse Plan' in Appendix E.

A watercourse was also identified to the east of the site. The watercourse is fed by a 450mm pipe which orientates towards the quarry. The watercourse becomes piped east of the site and orientates towards the River Severn.

A surface water chamber / silt trap and road gully are present on the existing site access road in the eastern extent of the site. The gully collects runoff from the access road and discharges into the surface water chamber. A 150mm pipe flows north-east from the surface water chamber and discharges to the River Severn.

Surface water from the quarry currently discharges to all of the aforementioned watercourses. Informal runoff from the quarry also discharges onto agricultural land south of the site. Only a limited area of the quarry (limited to the site office buildings) discharges to the ephemeral stream north of the site.

Development Proposals

The proposed development is for a holiday park comprising 89No. holiday lodges with associated managers accommodation, reception and shop. A proposed development plan is included in Appendix F.

The proposed development will introduce hardstanding areas in the form of holiday lodges and access roads. Hardstanding will comprise 14,110m² (1.411ha).

The proposed hardstanding areas have been measured from a .pdf copy of the Proposed Site Layout provided by Lambe Planning & Design Ltd (Drawing Number: GG/MP1/1.4G) and are approximate only.

Policy Context

The Powys County Council Local Development Plan (LDP) (April 2018) sets out the principles for developments in Powys. The LDP contains the following policies in relation to drainage:

Policy DM2:

6. Satisfactory provision shall be made for land drainage and [SuDS]. In addition to the requirements set out in national guidance, proposals must comply with the following;
 - i) The post development runoff volumes and peak flow rates are maintained at either the greenfield rate for greenfield sites or deliver a 50% reduction to surface water runoff rates for brownfield sites (up to and including the 1 in 100 year event inclusive of an appropriate allowance for climate change for both development scenarios).
 - ii) SuDS are included for all new development; space should be specifically set aside for SuDS and used to inform the overall site layout.
 - iii) Hardstanding areas are kept to a minimum and infiltration techniques and the re-use of water are considered before attenuation devices.
 - iv) SuDS have a maintenance strategy to ensure they are maintained and working efficiently.

If SuDS cannot be implemented, a full written justification should be submitted explaining why this is the case.'

Policy DM6 – Flood Prevention Measures and Land Drainage

... Satisfactory provision shall be made for land drainage in all developments and this should include consideration of the use of Sustainable Drainage Systems (SuDS).

The Powys County Council Local Flood Risk Management Strategy (April 2014) states:

The guiding principles for SuDS in Powys will be:- ...

Wherever possible, the use of multifunctional, above ground SuDS that deliver drainage, enhancement of biodiversity, improvements in water quality and amenity benefits...

Ensuring no increase in flood risk from new development wherever possible and contributing to reducing existing risk if feasible'.

Consultation

A planning pre-application enquiry was received from Powys County Council in September 2020 and is included in Appendix G. The following comments were raised in relation to drainage.

3.1.5 Clarification required on foul water drainage strategy

It is intended that foul water will be taken to a receptacle on site, and then treated locally before being directed to an existing water course. Full details of capacity and calculation of usage will be submitted with a planning application. - Environmental Health'

A consultation request was submitted to NRW in April 2021. NRW have provided the following initial comments through their preliminary advice service, included in Appendix H.

'Regarding foul drainage, we would remind the Local Planning Authority of Planning Policy Wales and Welsh Government Circular 008/2018 and that enough information is submitted in support of the planning application to justify the need to build a private system. Where a development falls well outside of the public sewer network we would need to be implemented using paragraph 2.6 of the Circular. The following bullet points can be used as a checklist to inform your planning documents to justify not being possible to connect to the mains (note you won't need all of this, but perhaps clarification from the statutory undertaker would help):

- Formally approach the sewerage undertaker regarding a connection under Section 106 or a requisition under Section 98 of the Water Industry Act (WIA) 1991.

- Serve notice for connection under Section 106 of the WIA 1991 if the sewerage undertaker has refused connection.

- Provide details of the reasons given by the sewerage undertaker if it has refused connection under section 98 or section 106 of the WIA 1991 and confirmation that they have appealed against this decision.

- Demonstrate that it is not reasonable to connect to the public foul sewer.

- Where it is not reasonable to connect to the public foul sewer, demonstrate that they have considered requesting that the sewerage undertaker adopt their proposed system

You should also be aware that should a connection to the mains sewer not be feasible, you will also need to demonstrate that the proposal would not pose an unacceptable risk to the water environment. Welsh Government Circular 008/2018 advises that a full and detailed consideration be given to the environmental criteria listed under paragraph 2.6 of the Circular, in order to justify the use of private sewerage. You should also be aware that should a connection to the mains sewer not be feasible, you will need to apply for an environmental permit or register an exemption with us. As stated above, we expect developers discharging domestic sewage to connect to the public foul sewer where it is reasonable to do so. We will not normally grant a discharge permit for a private sewage treatment system where it is reasonable to connect to the public foul sewer. We also expect discharges of trade effluent to connect to the public foul sewer where it is reasonable to do so and subject to the sewerage undertaker granting a trade effluent consent or entering into

a trade effluent agreement.’

NRW have reviewed an earlier version of this Drainage Strategy (version 01) and have provided a response dated 28th February 2022 (Appendix H). The NRW response states:

‘Foul Drainage

Page 12 of the document titled ‘Drainage Strategy’, referenced 13758-Drainage Strategy-02 dated October 2021 by Waterco states a treatment plant will be installed to treat the foul sewage and ‘Treated effluent should be discharged to the watercourse in the northern extent of the site.’

However, currently there is insufficient information to determine if the watercourse has the capacity to accept effluent from multiple residential buildings (i.e. holiday lodges) at the density of this proposal. Should a planning application be submitted, we would advise additional information is required to understand flow and loads of the development and whether the receiving watercourse is large enough to accept the flows.’

Surface Water Management

The proposal will include new holiday lodges and an access road.

In accordance with TAN15, for re-development, runoff should be reduced where possible.

The introduction of hardstanding areas will result in an increase in surface water runoff rates and volumes. In order to ensure the proposed development will not increase flood risk elsewhere, surface water discharge from the site will be controlled.

Discharge Method

Standard S1 of the Statutory Standards for SuDS sets out the following hierarchy of drainage options:

Priority Level 1: Surface water runoff is collected for use;

Priority Level 2: Surface water runoff is infiltrated to ground;

Priority Level 3: Surface water runoff is discharged to a surface water body;

Priority Level 4: Surface water runoff is discharged to a surface water sewer, highway drain, or another drainage system;

Priority Level 5: Surface water runoff is discharged to a combined sewer.

Priority Level 1: Surface water runoff collected for use

In line with section G1.4 of the Statutory Standards for SuDS, rainwater harvesting is not proposed for this site as the use of rainwater harvesting is not a viable/ cost-effective part of the solution for managing surface water runoff on the site.

Opportunities for rainwater re-use are limited, with the only impermeable surface, from which rainwater could be collected for re-use, being restricted to the roof of the proposed holiday lodges. Given the temporary holiday nature of the accommodation, non-potable water demand will be very low.

The costs associated with rainwater harvesting systems (unit costs, installation costs, running costs and maintenance costs) outweigh the water saving costs. Furthermore, section G1.6 of the Statutory Standards for SuDS states that; 'in most cases, rainwater harvesting alone will not be adequate to deal with the site drainage and provision will be required for an overflow to a Level 2 or lower priority runoff destination.' As such, rainwater harvesting systems are not considered a cost-effective solution for managing surface water and a lower priority runoff destination is required.

Priority Level 2: Surface water runoff is infiltrated to ground

Percolation tests have been carried out by GroundSolve Ltd in February 2021. Whilst percolation testing found that the soil permeability is sufficient to support infiltration drainage techniques such as permeable surfaces in one location, large areas of the site have been filled with cohesive fill material and would not be suitable for infiltration techniques. Further infill will also take place in the northern extent of the site.

Based on the cohesive nature of the existing fill material and that additional fill material is proposed, it is considered that infiltration techniques will not be viable.

Priority Level 3: Discharge to a surface water body

An ephemeral stream is located along the northern boundary of the site and an unnamed watercourse is located immediately east of the site (which receives inflow from a 450mm pipe serving the quarry). Both watercourses were inspected during the site visit. The ephemeral stream flows through agricultural land north of the site and becomes culverted. The culvert in agricultural land north of the site is minimal in diameter and was blocked with flows witnessed to be spilling overland. Discharge to the ephemeral stream is therefore not proposed as to not increase flood risk downstream.

The watercourse east of the site is not located within land in Client ownership, as such a connection is not proposed.

A surface water inspection chamber was identified in the eastern extent of the site which accommodates flow from a road gully. A 150mm pipe discharges from this chamber flowing east and to the River Severn. Discharge to the existing surface water chamber is proposed. Discharge to the surface water chamber would require laying a new piped drain within the access road. The chamber is situated at approximately 136m AOD and significantly below developable areas of the site. As such, a gravity connection can be achieved.

A pipe-flow calculation based on the Colebrook White equation (Appendix I) estimates that the existing 150mm pipe has a full-bore discharge capacity of 44.84 l/s. The discharge capacity is based on a pipe gradient of 1 in 12 (estimated using LiDAR data).

Proposed Discharge Rate

In order to establish the proposed limited discharge rate, greenfield runoff rates have been estimated using the Revitalised Flood Hydrograph Model (ReFH2) method. A summary of the greenfield runoff rates for a

range of events is provided as Appendix J. The existing 1 in 1 year greenfield runoff rate for the development site is 13 l/s. A discharge rate of 13 l/s is therefore proposed.

The proposed discharge rate and location will provide betterment over the existing drainage system and will prevent uncontrolled runoff from the quarry flowing onto agricultural land south of the site.

Attenuation Storage

In order to achieve a discharge rate of 13 l/s, attenuation storage will be required. An attenuation storage estimate has been provided using MicroDrainage and is included in Appendix K. An estimated storage volume of 877m³ will be required to accommodate the 1 in 100 year plus 40% climate change (CC) event. The storage estimate is based on a discharge rate of 13 l/s, storage within a tank or pond structure, an impermeable drainage area of 14,110m², a design head of 1m and hydro-brake flow control.

As shown on the proposed development plan (Appendix F), provision has been made for attenuation ponds in the northern extent of the site. The ponds in the southern extent of the site are required for fire water purposes and are not proposed for attenuation storage purposes.

Concept Surface Water Drainage Scheme

Surface water runoff will be discharged to an existing surface water inspection chamber in the eastern extent of the site. An existing 150mm pipe connects the chamber to the River Severn. Discharge will be made at the existing 1 in 1 year runoff rate of 13 l/s.

Surface water runoff up to the 1 in 100 year plus 40% CC event will be attenuated on site. A total attenuation volume of 877m³ will be required to achieve the discharge rate and will be provided in the form of attenuation ponds.

Permeable surfacing could be utilised for the proposed access roads. Where the access roads are constructed on cohesive fill material, the sub-grade material should be lined and positively drained to an attenuation pond.

A Concept Drainage Sketch is included in Appendix L.

Exceedance Event

Surface water runoff will be accommodated for all events up to and including the 1 in 100 year plus 40% CC event. There is no requirement to design for storms in excess of the 1 in 100 year + 40% CC event.

Nevertheless, storm events in excess of the 1 in 100 year plus 40% CC event will be permitted to produce temporary shallow depth flooding within the access road and landscaped areas. Finished floor levels of the lodges should be set a minimum of 150mm above surrounding ground levels, reducing the risk of flooding from a drainage exceedance event.

Surface Water Treatment

The Statutory Standards for SuDS sets out the following guidance for surface water treatment:

S3 - Surface water quality management

Treatment for surface water runoff should be provided to prevent negative impacts on the receiving water quality and/or protect downstream drainage systems, including sewers.

In accordance with the CIRIA C753 publication ‘The SuDS Manual’ (2015), residential roofs (applicable to holiday lodges) have a ‘very low’ pollution hazard level, with roads with greater than 300 traffic movements per day classified as having a ‘medium’ pollution hazard level. Table 2 shows the pollution hazard indices for each land use.

Table 2 – Pollution Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential Roofs	Very Low	0.2	0.2	0.05
Traffic Roads (>300 traffic movements per day)	Medium	0.7	0.6	0.7

Table extract taken from the CIRIA C753 publication ‘The SuDS Manual’ – Table 26.2

* Indices values range from 0-1.

All access roads could be formed from permeable surfacing and will be appropriately under-drained in areas of infill. Surface water from all hard-surfaces will be attenuated within ponds. Table 3 shows that permeable surfacing and a pond will provide sufficient treatment.

Table 3 – SuDS Mitigation Indices

Type of SuDS	Mitigation Indices		
	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Permeable Paving	0.7	0.6	0.7
Pond	0.7	0.7	0.5

Table extract taken from the CIRIA C753 publication ‘The SuDS Manual’ – Table 26.3

Amenity and Biodiversity

The Statutory Standards for SuDS sets out the following standards for amenity and biodiversity:

Standard S4 – Amenity

The design of the surface water management system should maximise amenity benefits.

Standard S5 – Biodiversity

The design of the surface water management system should maximise biodiversity benefits.'

The site layout makes provision for attenuation ponds which will maximise the amenity and biodiversity value of the proposed drainage system.

Construction, Operation and Maintenance

Standard S6 of the Statutory Standards for SuDS states:

S6 – Design of drainage for Construction, Operation and Maintenance

- 1) All elements of the surface water drainage system should be designed so that they can be constructed easily, safely, cost-effectively, in a timely manner, and with the aim of minimising the use of scarce resources and embedded carbon (energy).
- 2) All elements of the surface water drainage system should be designed to ensure maintenance and operation can be undertaken (by the relevant responsible body) easily, safely, cost-effectively, in a timely manner, and with the aim of minimising the use of scarce resources and embedded carbon (energy).
- 3) The surface water drainage system should be designed to ensure structural integrity of all elements under anticipated loading conditions over the design life of the development site, taking into account the requirement for reasonable levels of maintenance.

All drainage systems will be readily accessible for maintenance. Maintenance of the drainage system including ponds and permeable surfaces will be the responsibility of the site owner.

Maintenance schedules for a pond and permeable paving (applicable to permeable surfacing) are included in Appendix L.

Foul Drainage

The site is within the Hafren Dyfrdwy sewerage catchment area. The Hafren Dyfrdwy sewer plan, included in Appendix D, identifies no assets within the vicinity of the site. Dwr Cymru Welsh Water (DCWW) also operate within the vicinity of the site. The nearest DCWW sewerage asset is located over 2.6km from the site. Due to the significant engineering constraints and costs associated with connecting to a public foul sewer network (2.6km length of rising main and 2 river crossings), a connection to the public foul sewer is not proposed. It is intended to utilise a private sewage treatment plant to accommodate development foul flows.

A Klargest treatment plant (or similar) would be a suitable option and would provide sufficient treatment for foul flows. Treated effluent will be discharged to the surface water chamber in the access road in the eastern extent of the site. The existing 150mm pipe outfall from the surface water chamber has a full-bore

discharge capacity of 44.84 l/s.

Peak foul flow rates have been estimated to ensure the existing 150mm pipe has capacity to accommodate foul flows and surface water flows (13 l/s) from the proposed development.

Appendix C of the Sewer Sector Guidance advises a peak foul flow of 0.05 litres per second per dwelling should be used in the design of foul sewers. Whilst a conservative peak flow used for design (and also considered conservative for holiday lodges), this flow rate has been used to provide an estimate of the foul flows generated from the site. Based on 89 lodges, a peak foul flow of 4.45 l/s is estimated. The existing 150mm pipe capacity of 44.84 l/s is therefore sufficient to accommodate the combined surface water and foul flow rate generated by the development (17.45 l/s).

The sewerage treatment plant should be placed a minimum of 7m from habitable buildings and a minimum of 10m from watercourses.

An Environmental Permit for the discharge from the proposed package treatment plant has been submitted to NRW and is currently being reviewed.

Other Considerations

An ephemeral stream flows along a limited extent of the north-western boundary of the site (see watercourse plan in Appendix E). The watercourse is conveyed within a culvert (300mm pipe upsizing to 450mm) along the site boundary. The culvert will be retained as part of the development, and where possible will be daylighted, as to maintain the flow of the ephemeral stream.

Conclusions

The proposed development is for a holiday park comprising 89No. holiday lodges with associated managers accommodation, reception and shop at Penstrowed Quarry, Caersws, Powys, SY17 5SG.

Infiltration drainage techniques will not be feasible across large areas of the site which have been infilled with cohesive material.

Surface water will be discharged to an existing surface water chamber located in the access road in the eastern extent of the site at a limited 1 in 1-year greenfield discharge rate of 13 l/s. Surface water runoff up to the 1 in 100 year plus 40% climate change allowance event will be attenuated on site. A total attenuation volume of 877m³ will be required to achieve the discharge rate and will be provided in the form of attenuation ponds located in the northern extent of the site.

Permeable surfacing could be utilised for the proposed access roads. Where the access roads are constructed on cohesive fill material, the sub-grade material should be lined and positively drained to an attenuation pond.

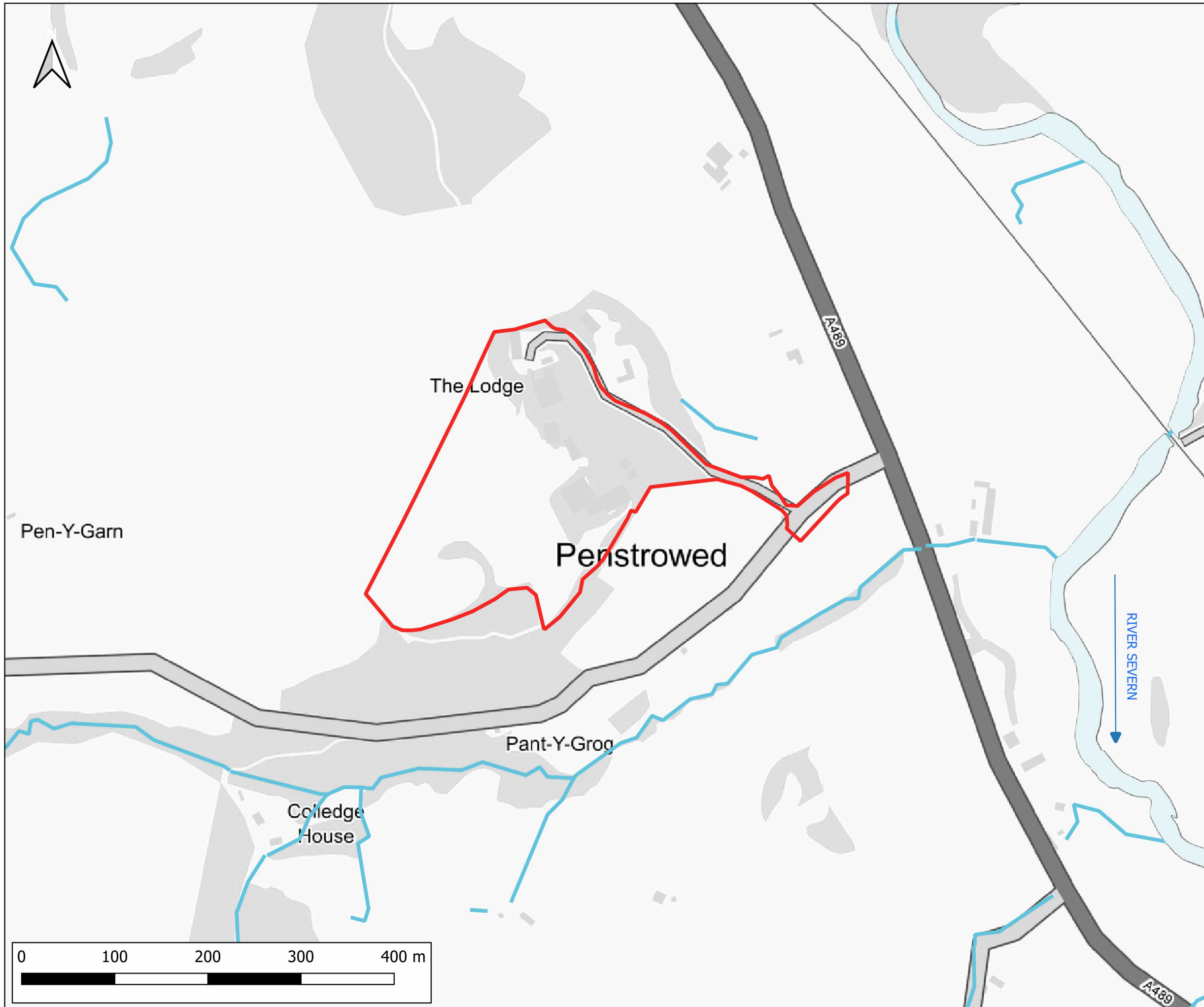
There are no readily accessible public sewers within the vicinity of the site. Therefore, foul flows will discharge to a private sewage treatment plant. A Klargest treatment plant (or similar) would be a suitable option and would provide sufficient treatment for foul flows. Treated effluent will be discharged to the existing surface water chamber located in the access road in the eastern extent of the site.

A Concept Designer's Risk Assessment (CDRA) has been prepared to inform future designers of any identified hazards associated with the scheme. The CDRA is included in Appendix M.

Recommendations

1. Submit this Drainage Strategy to the Planning Authority in support of the Planning Application.
2. Set the finished floor levels of holiday lodges at 150mm above surrounding ground levels.

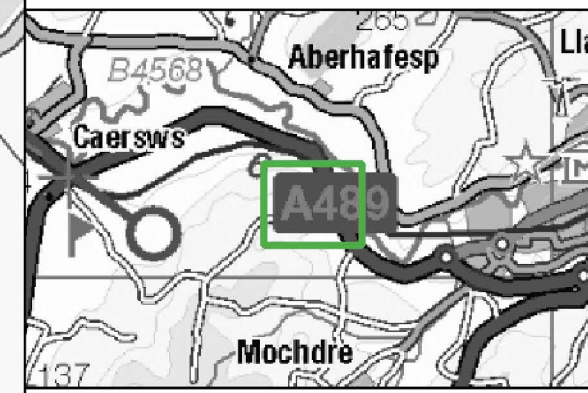
Appendix A Location Plan and Aerial Image




Notes:
 1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- ▭ Site Boundary Old
- Watercourses
- ▭ Waterbodies



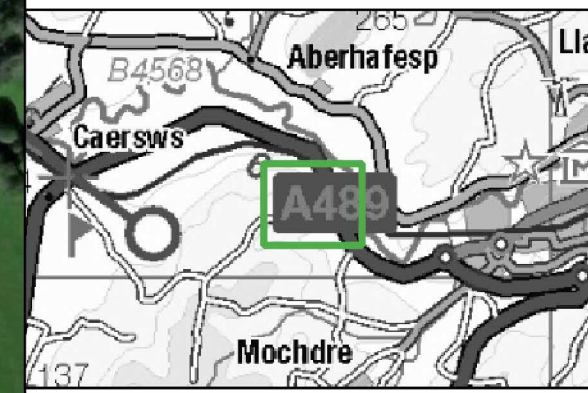
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		www.waterco.co.uk	
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DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
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13758_Location_Plan		-	



Notes:
 1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

 Site Boundary Old



CLIENT:
 G F Grigg Ltd



SCHEME:
 Penstrowed Quarry, Caersws

PLOT TITLE:
 Aerial Plan

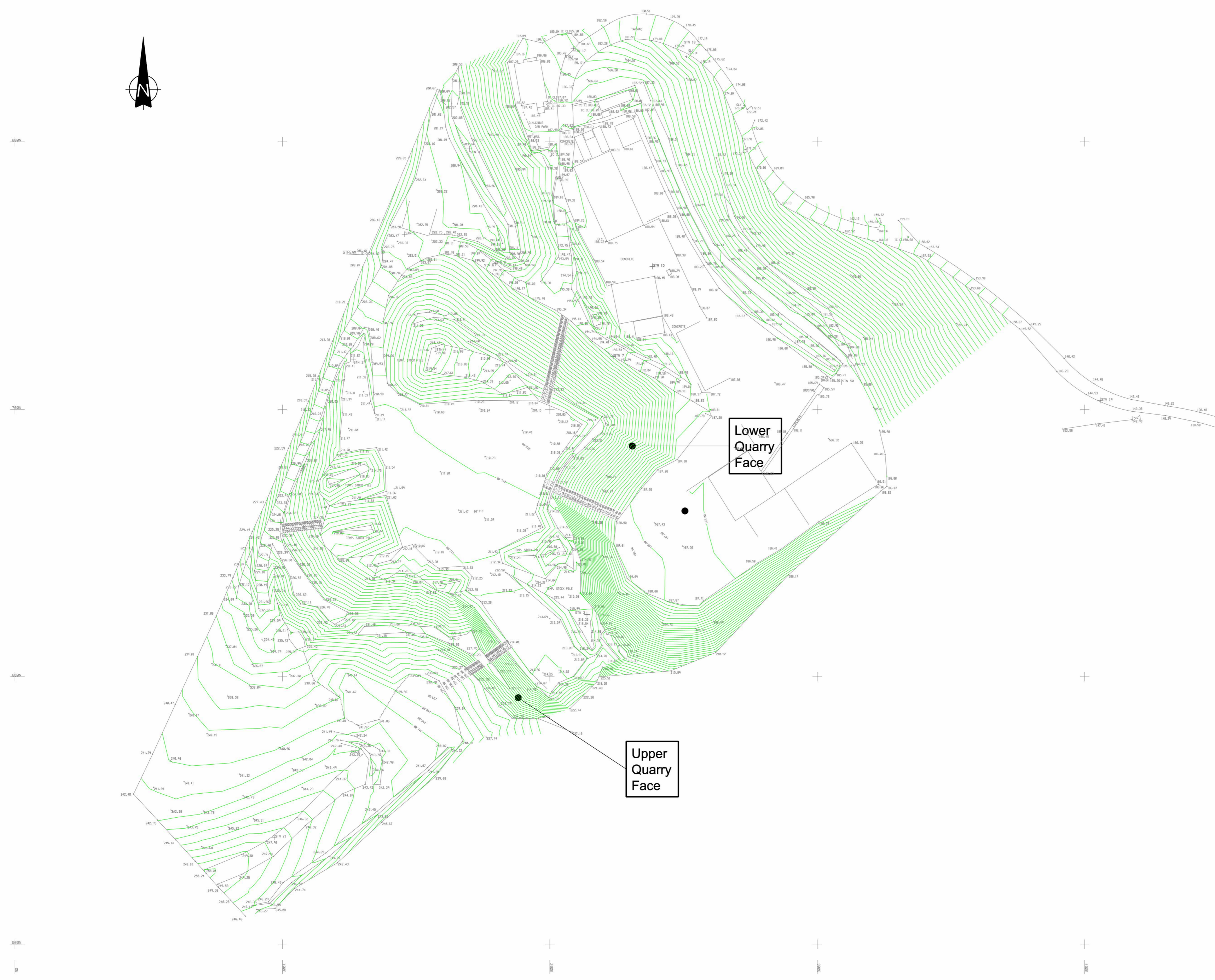
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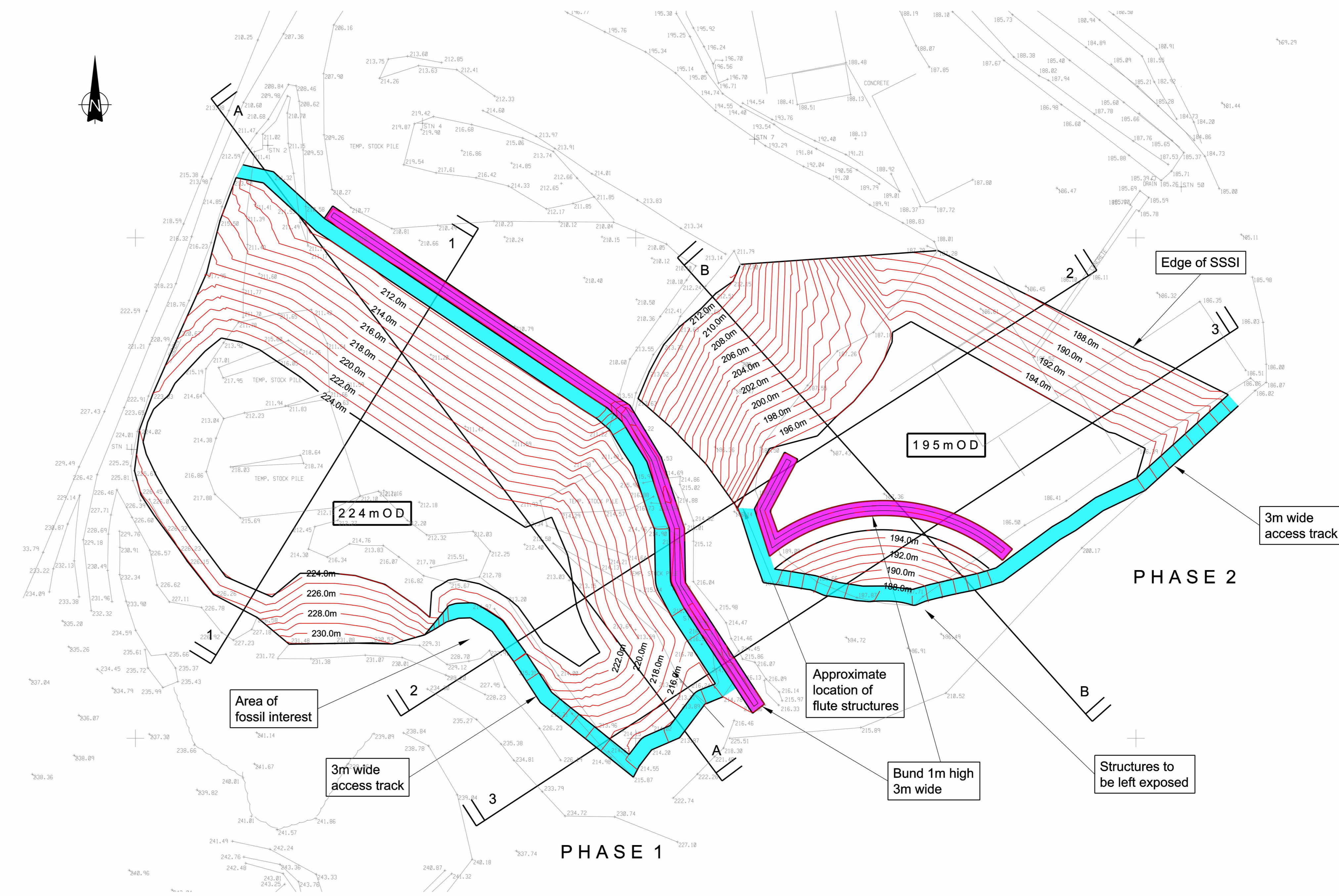
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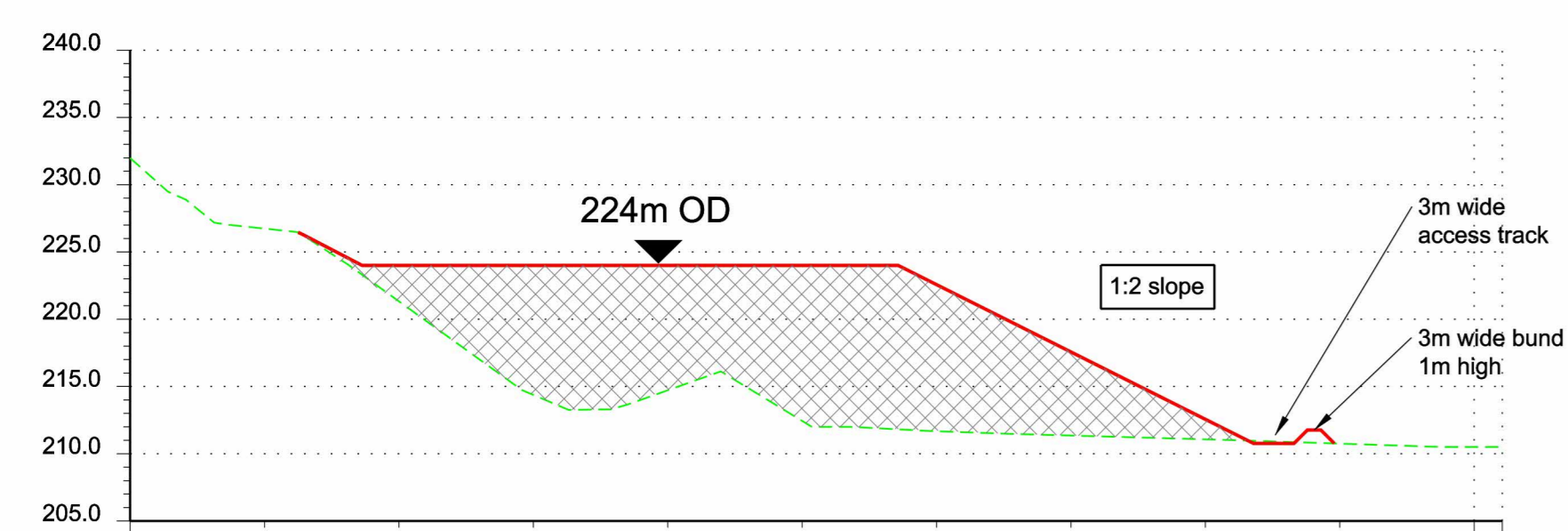
Appendix B Topographical Information



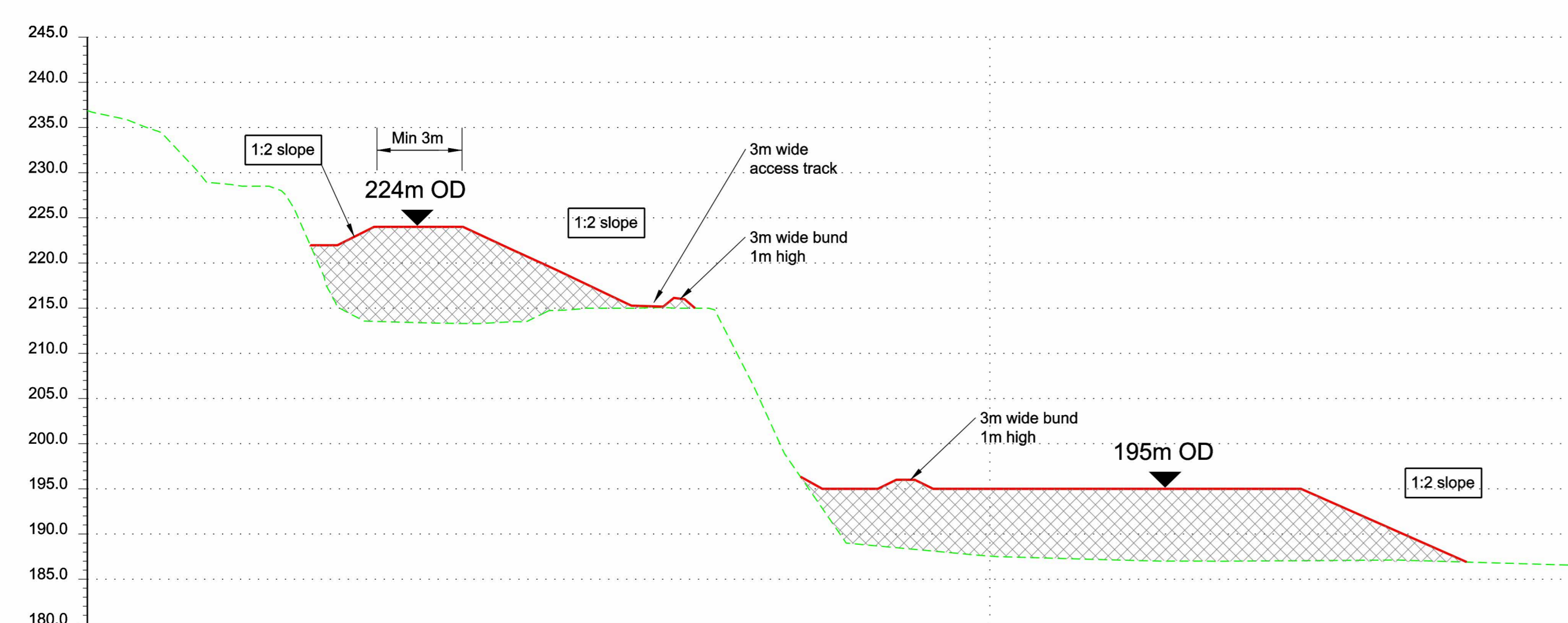
Existing Site Layout
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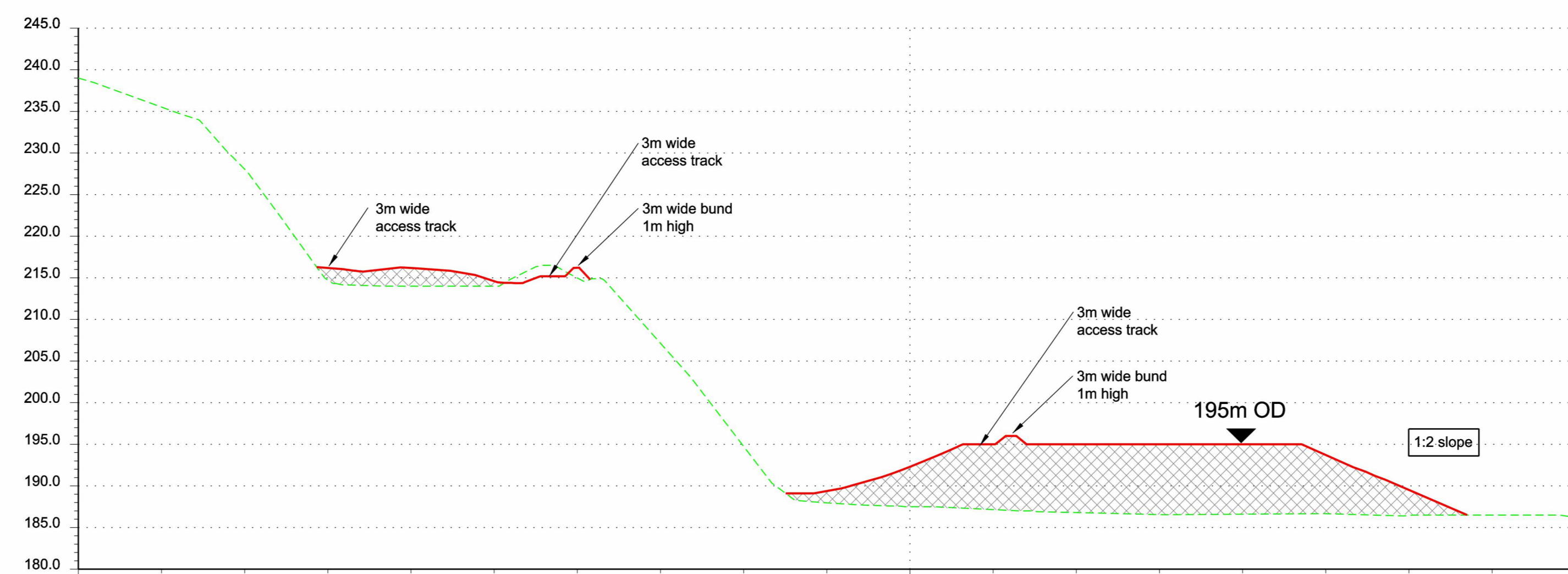
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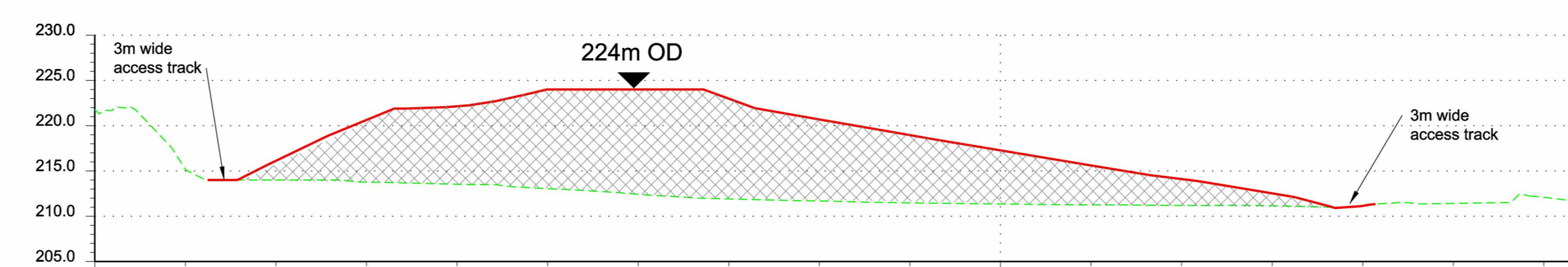
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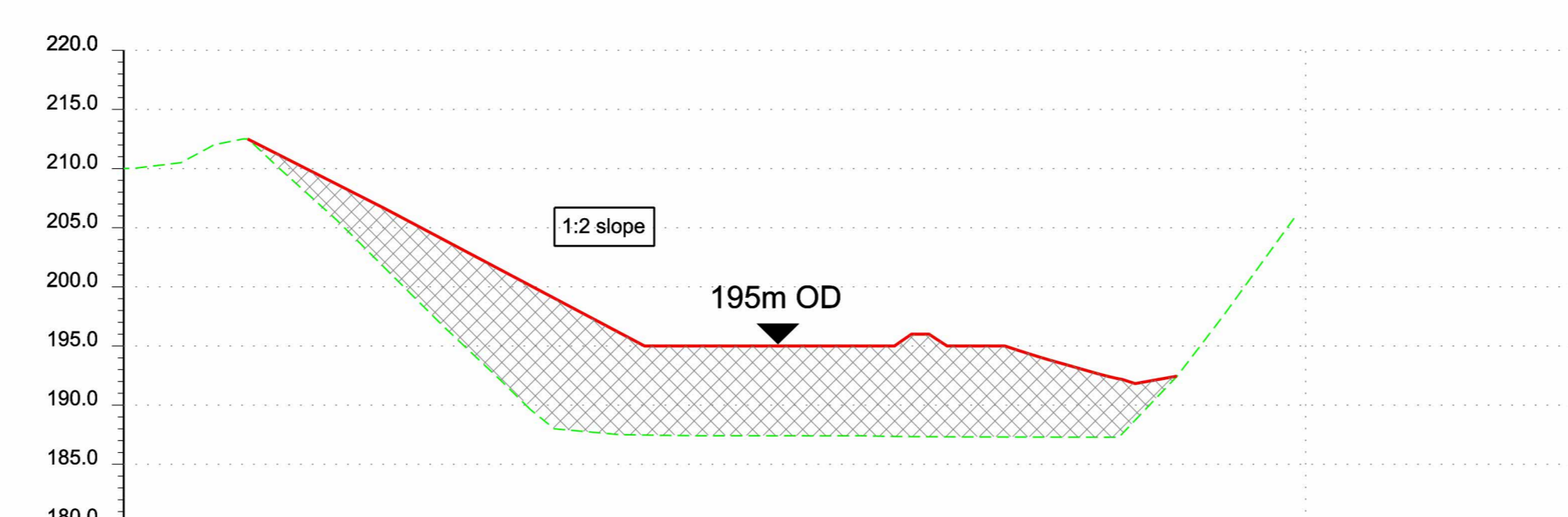
Section 2 - 2
Scale 1:500



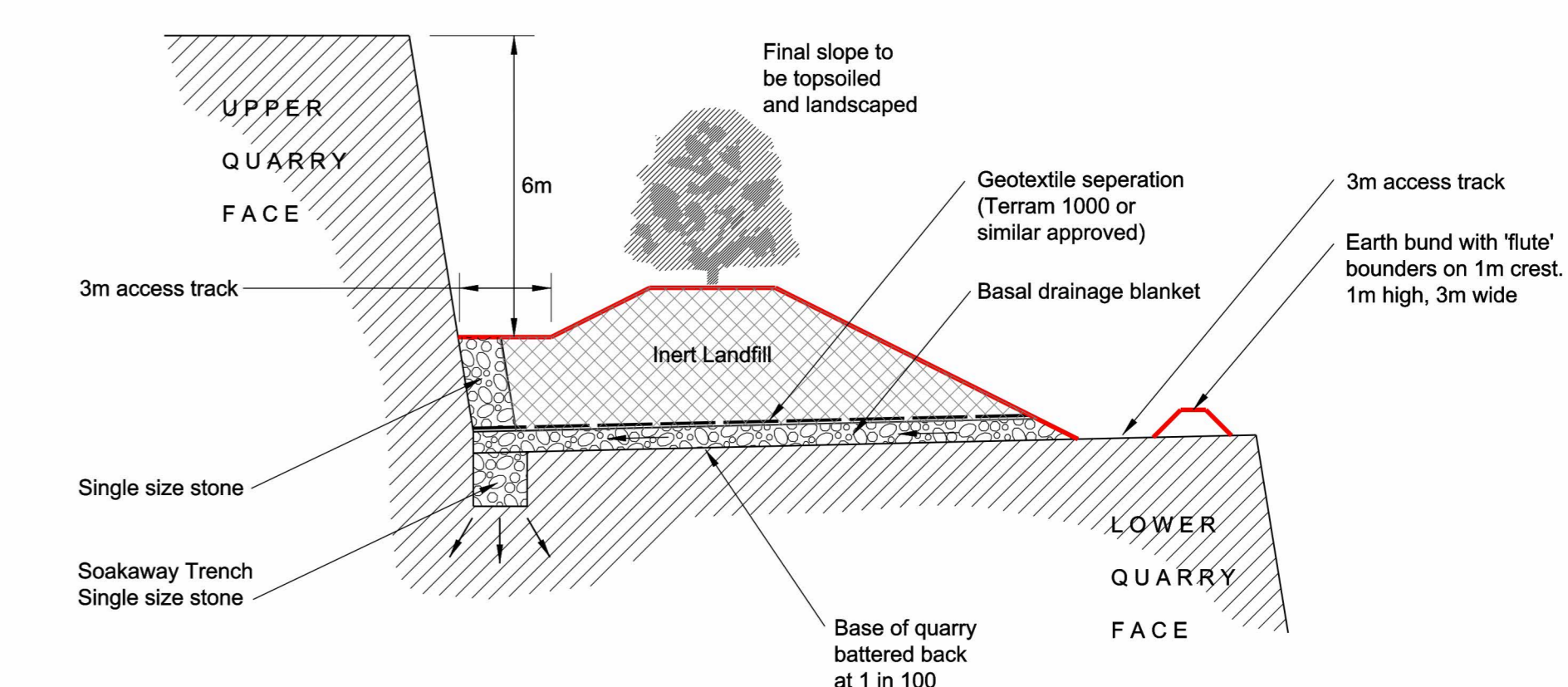
Section 3 - 3
Scale 1:500



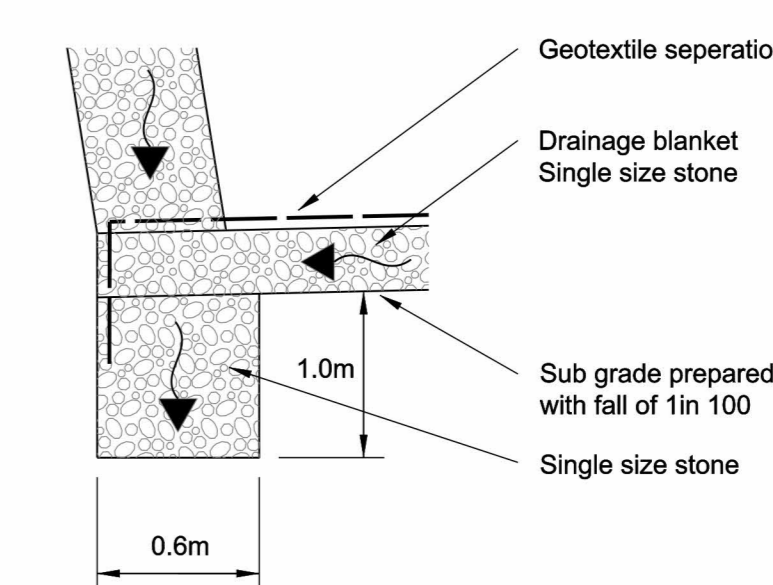
Section A - A
Scale 1:500



Section B - B
Scale 1:500



Proposed Construction Detail
N.T.S.



Drainage Detail
Scale 1:100

GroundSolve Ltd
Consulting Geotechnical, Engineering Geology and Environmental Engineers

Unit 7, West House Farm
Creeker Road Station
Frimley, Cam 1204
Tel: 01244 681361
Fax: 01244 681289

Client: **Penstrowed Quarry**

Job Title: **Proposed Earthworks**

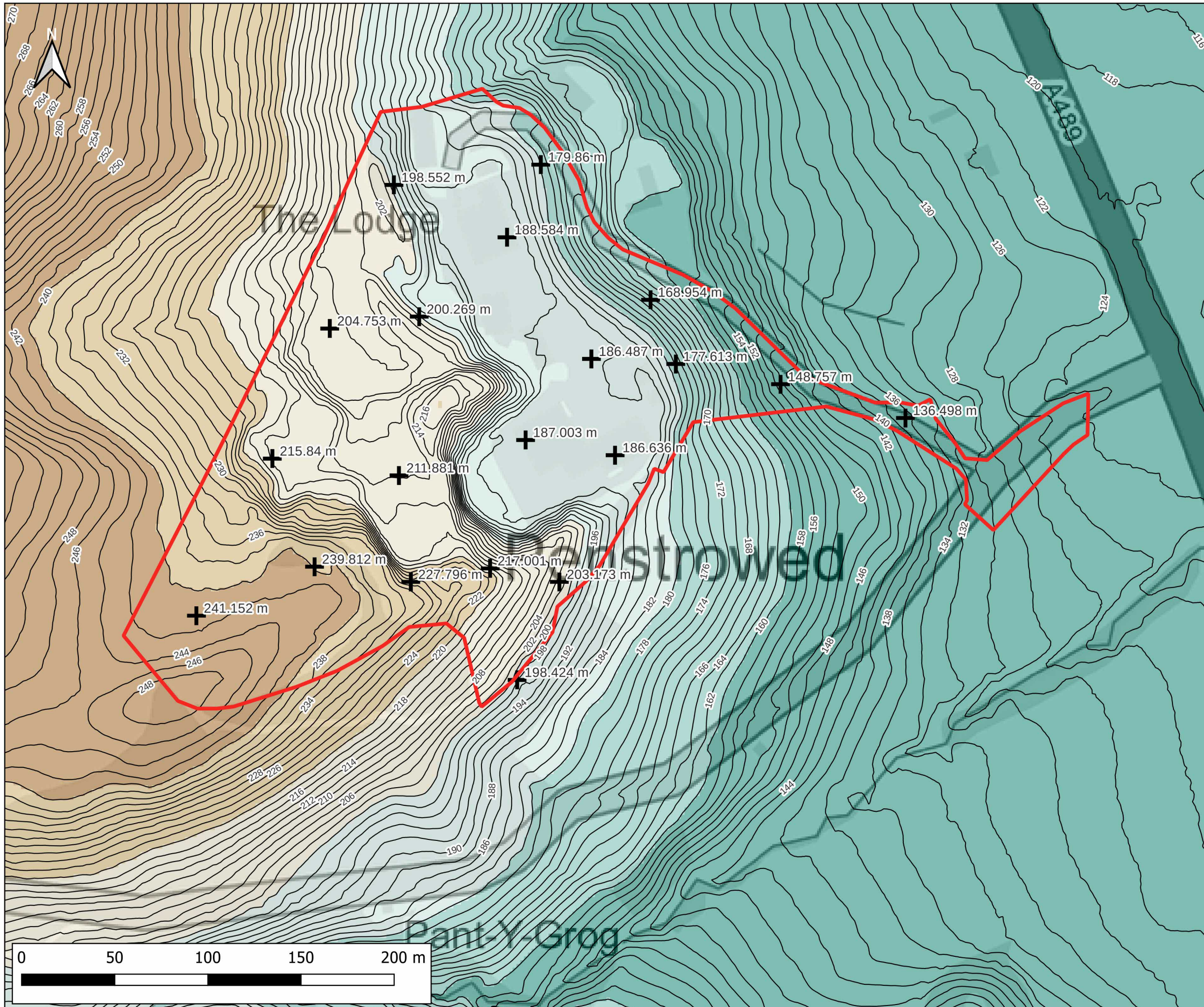
Drawing Title: **Proposed Earthworks**

Scale @ A0: **As Shown**

Drawing Status: **Planning**

Drawing No: **CG01**

Issue: **A**



Notes:
 1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Site Boundary Old
- + Site Levels (m AOD)

Ground Elevations (m AOD)

- <= 160
- 160 - 180
- 180 - 200
- 200 - 220
- 220 - 240
- > 240

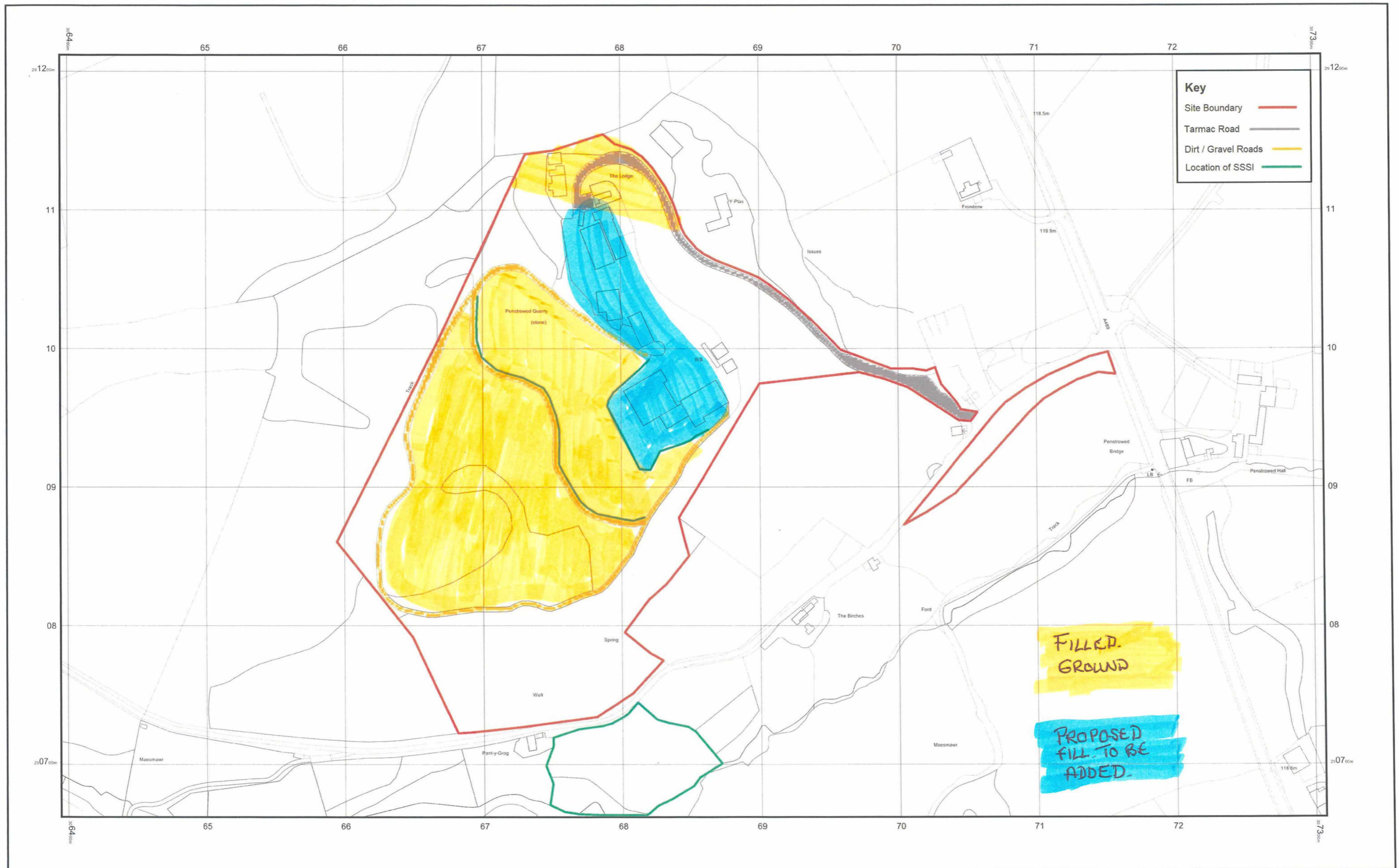


CLIENT:			
G F Grigg Ltd			
 www.waterco.co.uk			
SCHEME:			
Penstrowed Quarry, Caersws			
PLOT TITLE:			
LiDAR Plan 2m Resolution Data from Natural Resources Wales			
PLOT STATUS:		DATE:	
FINAL		02-11-2023	
DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
IT	AW	AW	1:2000
PLOT NAME:			REVISION:
13758_LiDAR_Plan			-

Appendix C Site Fill Plan and Percolation Testing Results

0m 1cm = 25m 125m

Scale 1:2500

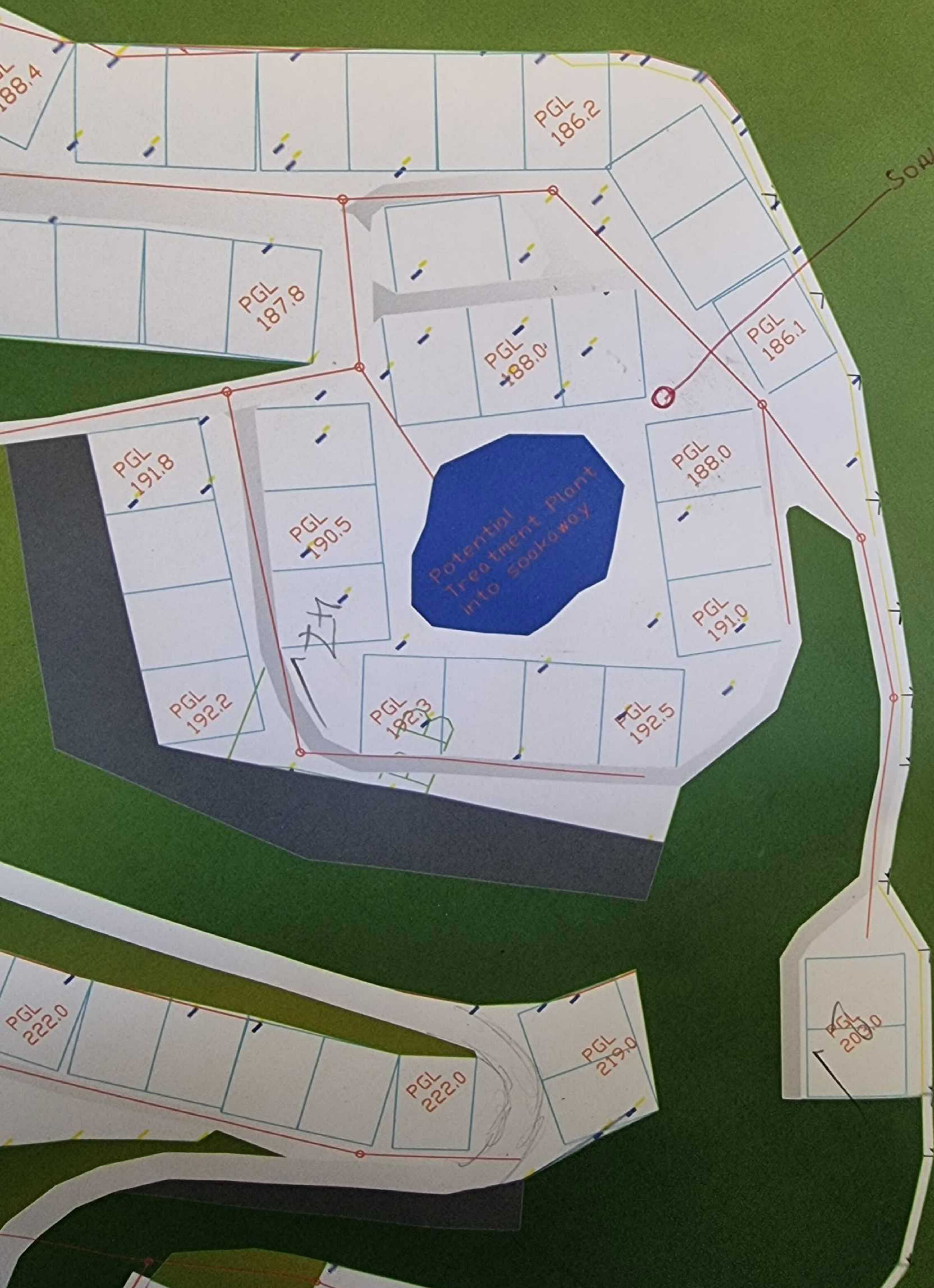


Key

- Site Boundary
- Tarmac Road
- Dirt / Gravel Roads
- Location of SSSI

© Crown copyright and database rights 2021 Ordnance Survey 100048957. The representation of road, track or path is no evidence of a boundary or right of way. The representation of features as lines is no evidence of a property boundary.



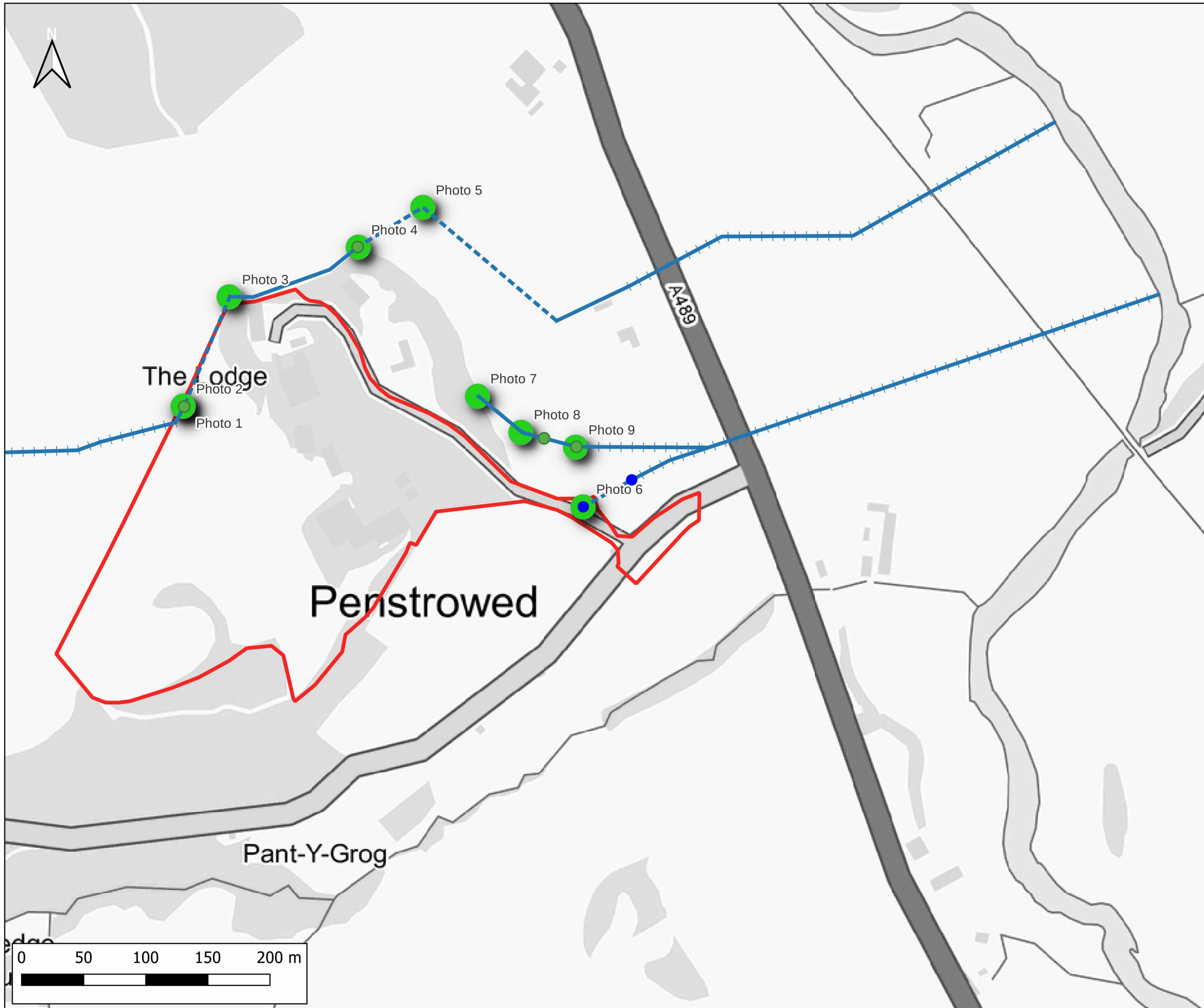


SOAK AWAY POSITION



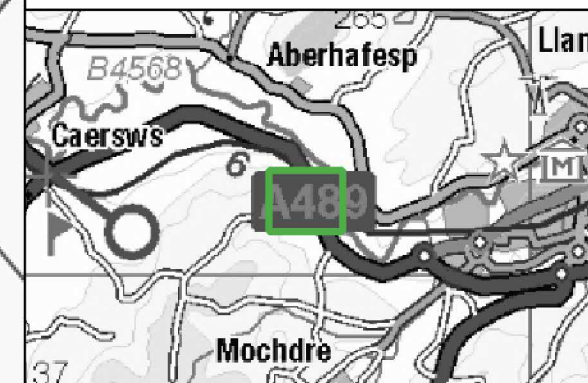
Appendix D Hafren Dyfrdwy Sewer Plan


Appendix E Photo Log and Watercourse Plan



Notes:
 1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

- LEGEND**
- ▭ Site Boundary Old
 - Culvert Inlet
 - Surface Water Inspection Chamber
- Penstrowed- measurements
- - - Piped Watercourse
 - Open Watercourse
 - · - · - Assumed Route



CLIENT:		G F Grigg Ltd	
 www.waterco.co.uk			
SCHEME:			
Penstrowed Quarry, Caersws			
PLOT TITLE:			
Watercourse Plan and Photolog			
PLOT STATUS:		DATE:	
FINAL		02-11-2023	
DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
IH	AJ	AW	1:3000
PLOT NAME:			REVISION:
13758_Watercourse_Plan			-

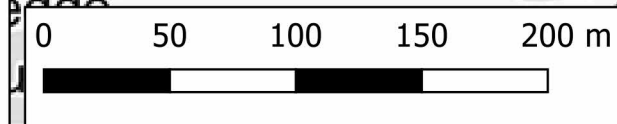


Photo No.1

13758 – Penstrowed Quarry, Caersws

Date: 21st April 2022

Description:

Watercourse entering the site from the north

Approximate NGR:
306695, 291058



Photo No. 2

13758 – Penstrowed Quarry, Caersws

Date: 21st April 2022

Description:
Catchpit with culvert
entrance.

Approximate NGR:
306695, 291058



Photo No.3

13758 – Penstrowed Quarry, Caersws

Date: 21st April 2022

Description:
Culvert outlet directing
flows into the
watercourse.

Approximate NGR:
306732, 291146



Photo No. 4

13758 – Penstrowed Quarry, Caersws

Date: 21st April 2022

Description:

Blocked culvert inlet in agricultural land north-east of the site.

Approximate NGR:
306836, 291186



Photo No.5

13758 – Penstrowed Quarry, Caersws

Date: 21st April 2022

Description:

Culvert outlet and inlet in agricultural land north-east of the site. Culvert blocked downstream resulting in water spilling out of the catchpit.

Approximate NGR:
306888, 291218



Photo No.6

13758 – Penstrowed Quarry, Caersws

Date: 21st April 2022

Description:

Surface water chamber / silt trap in site access road. 150mm pipe outlet.

Approximate NGR:
307017, 290977



Photo No.7

13758 – Penstrowed Quarry, Caersws

Date: 21st April 2022

Description:

Culvert outlet into watercourse to the east of the site.

Approximate NGR:
307017, 290977



Photo No.8

13758 – Penstrowed Quarry, Caersws

Date: 21st April 2022

Description:
Watercourse to the east
of the site.

Approximate NGR:
307017, 290977



Photo No. 9

13758 – Penstrowed Quarry, Caersws

Date: 21st April 2022

Description:

Watercourse to the east
of the site sinks,
onward route unknown.

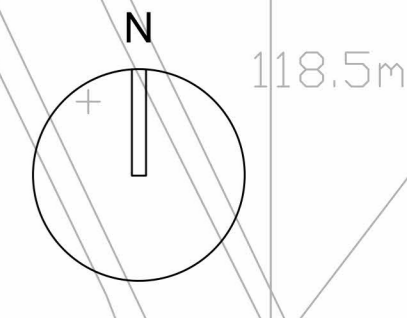
Approximate NGR:
307017, 290977



Appendix F Proposed Site Layout Plan

Proposed Holiday Lodge Park Development at Penstrowed Quarry, SY17 5SG
 Client: Mr Graham Grigg, GF Grigg Ltd. Penstrowed Quarry, Penstrowed, Caersws, Powys, SY17 5SG

Please note - all dimensions must be checked on site.
 1:500 at A1



77 Single Lodges
 12 Twin unit Lodges
 Total - 89 Lodges

Twin Car Space per pitch @ 2.5m x 5.00m

access drive - 2 way @ 4.5m wide

access drive - 2 way @ 4.5m wide

Footpath 6

access drive - 1 way @ 3.00m wide

informal path

Recreation Area

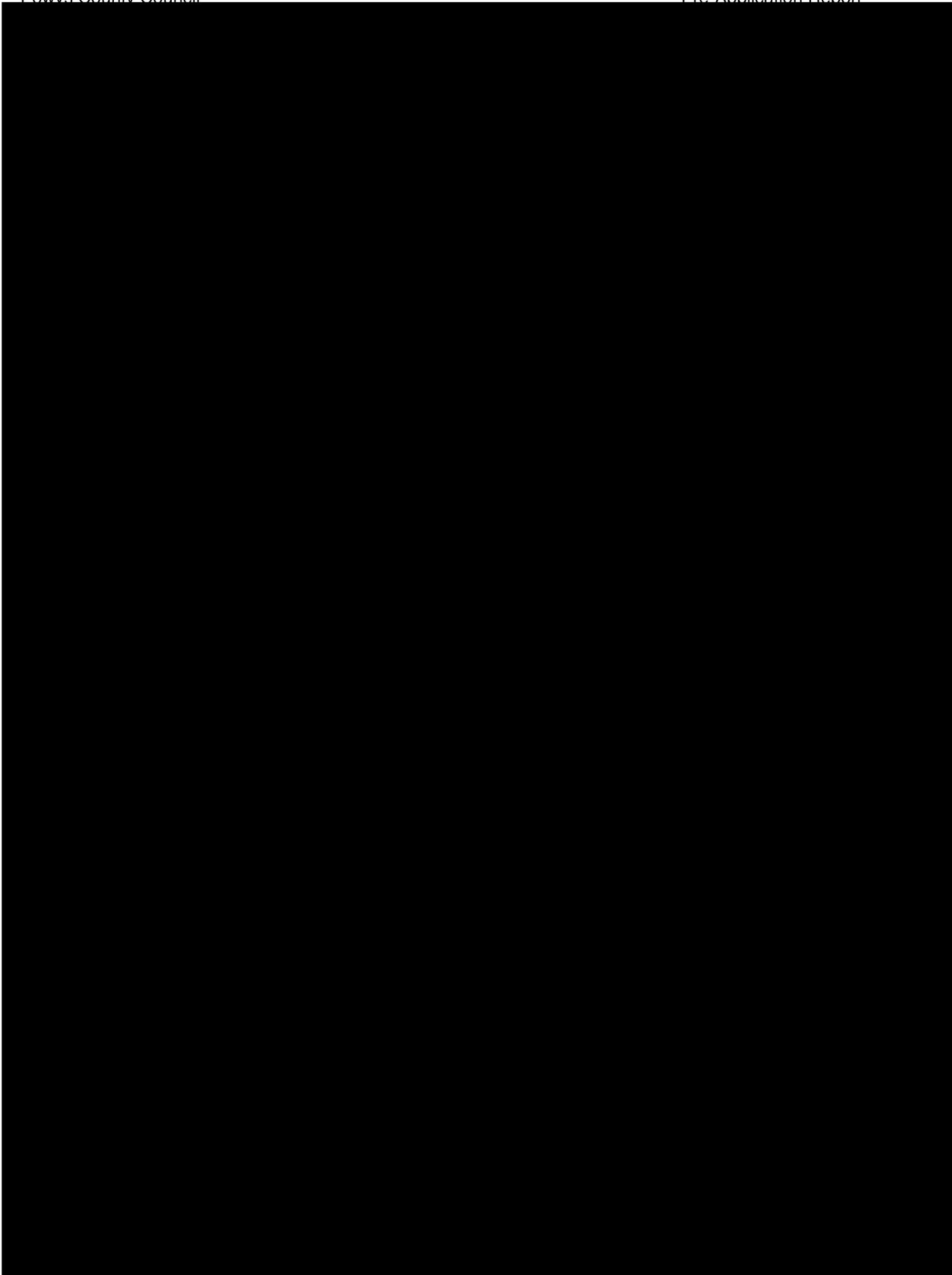
Recreation Area

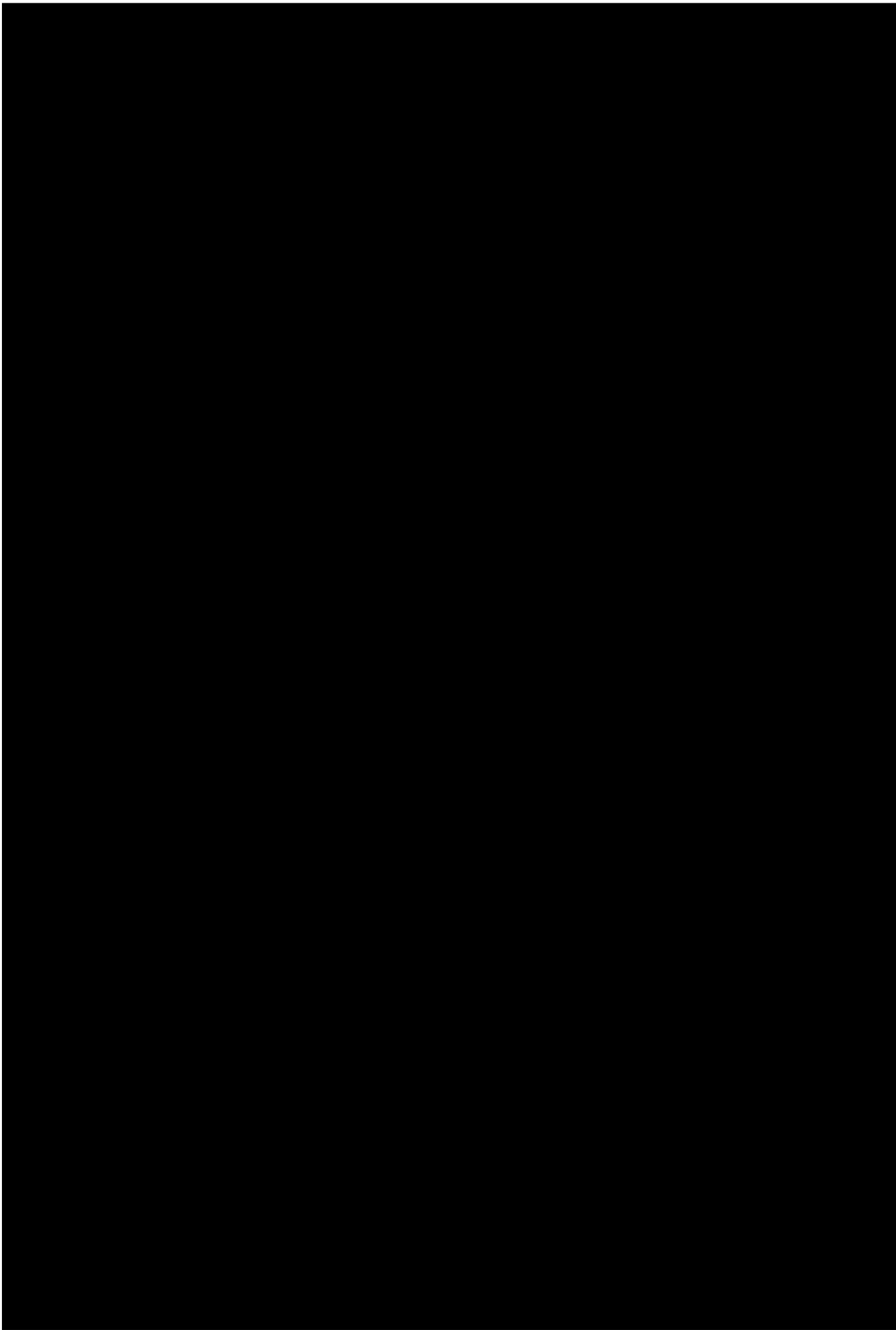
Recreation area

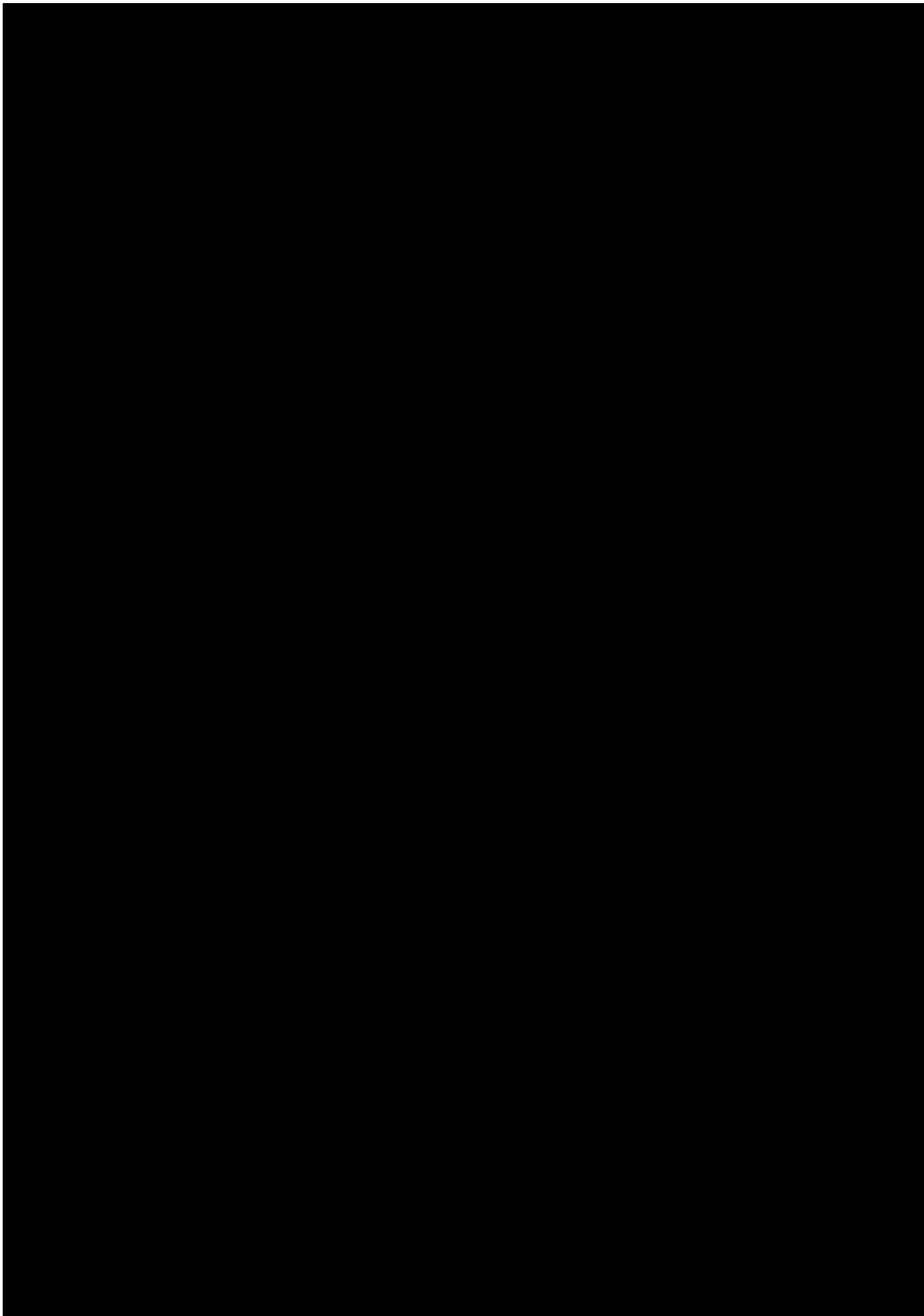
existing mature woodland / tree cover supplemented with buffer planting - please see detailed Landscape Design Scheme

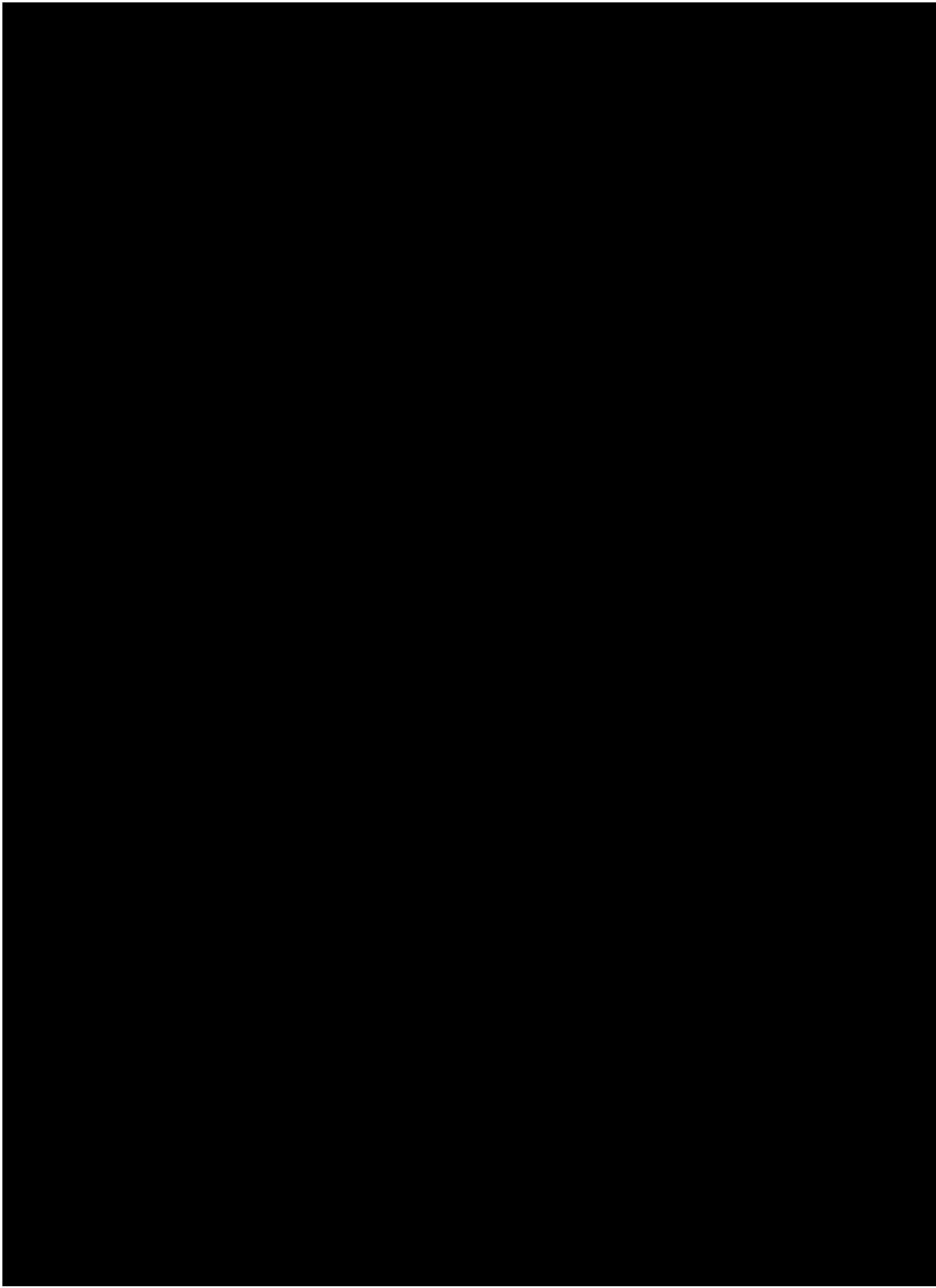
- Footpath 6**
- To be Removed
 - - - - - To be Retained
 - . - . - To be Created

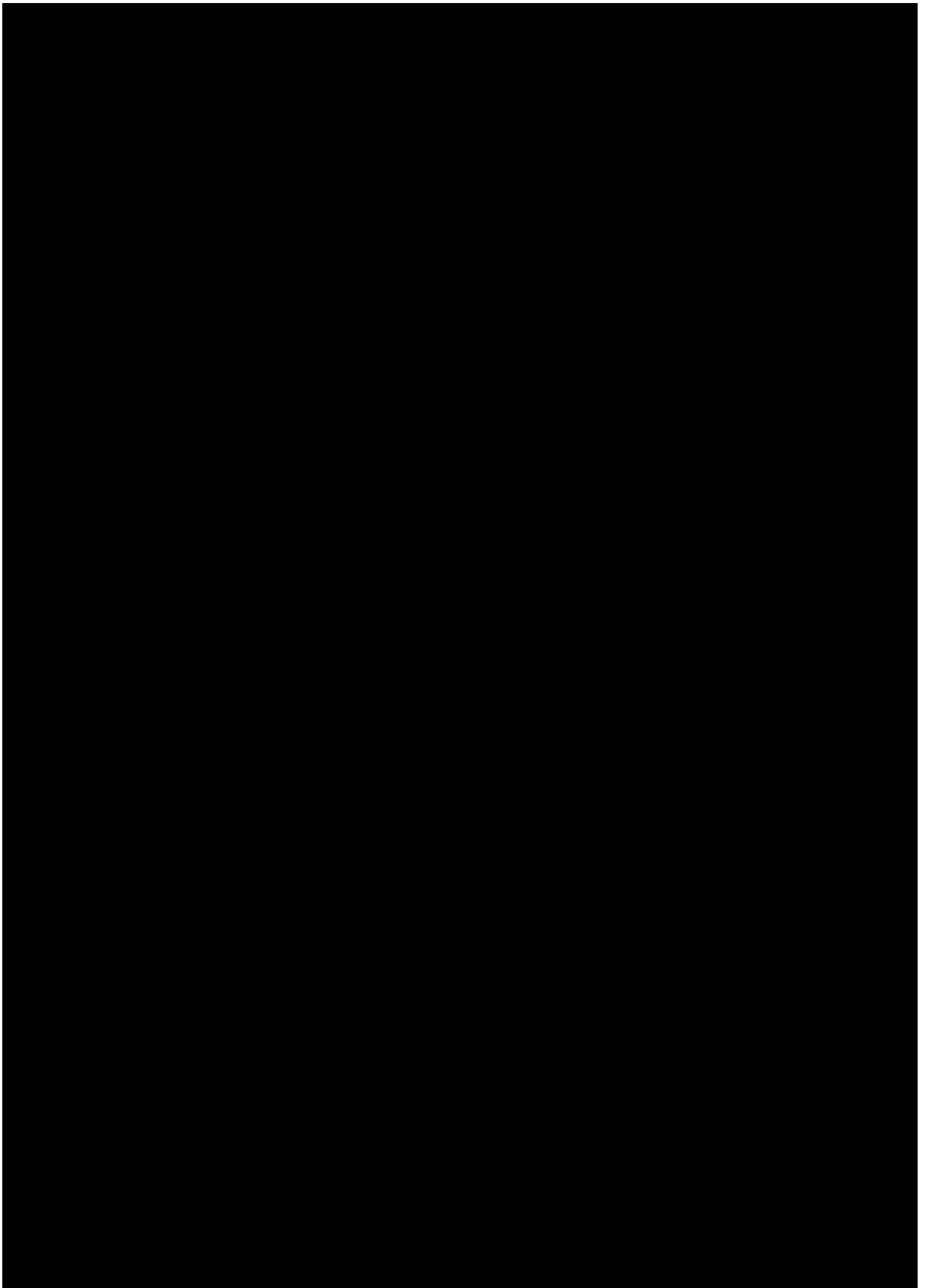
Appendix G Powys County Council Pre-Application Report

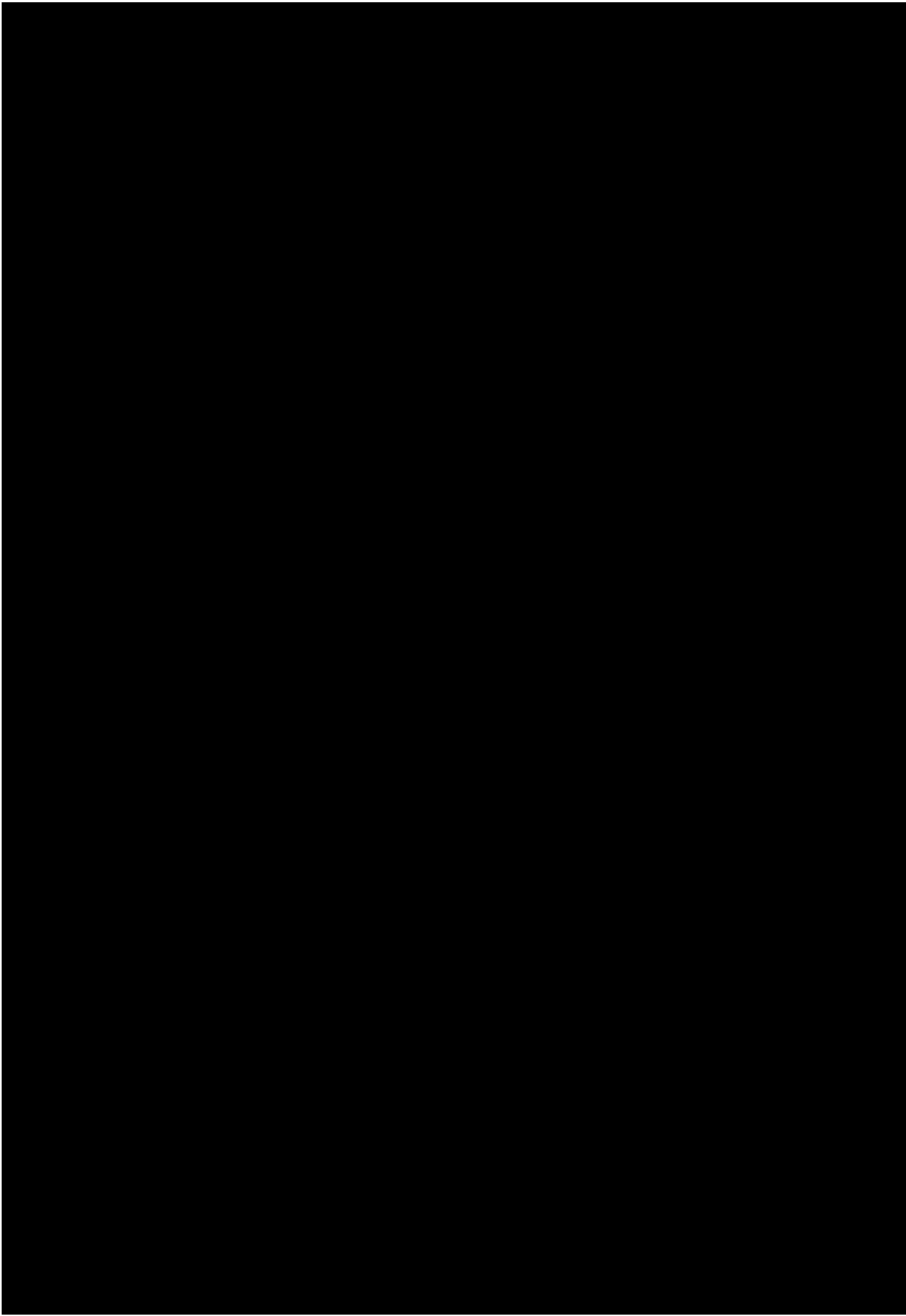


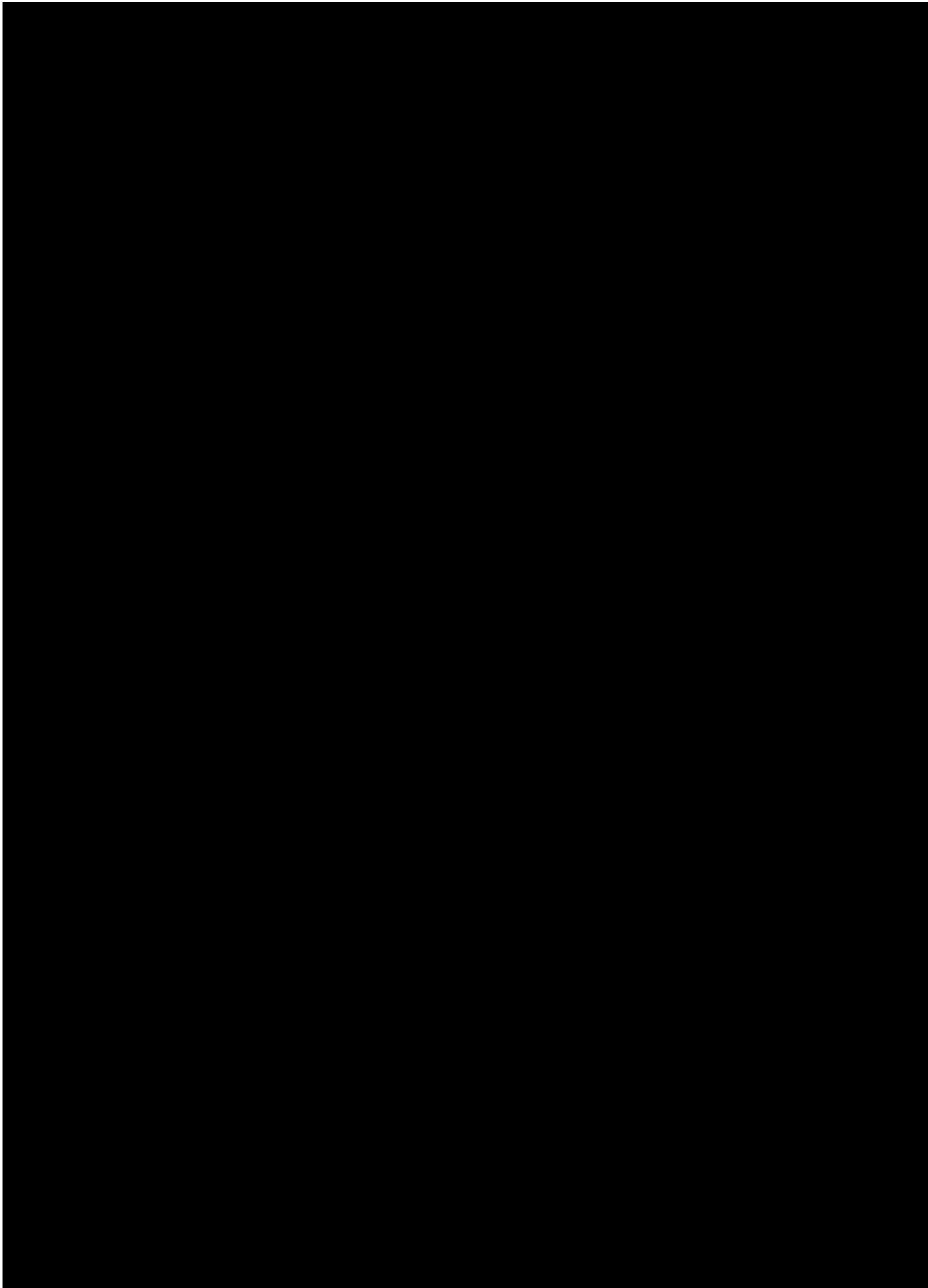


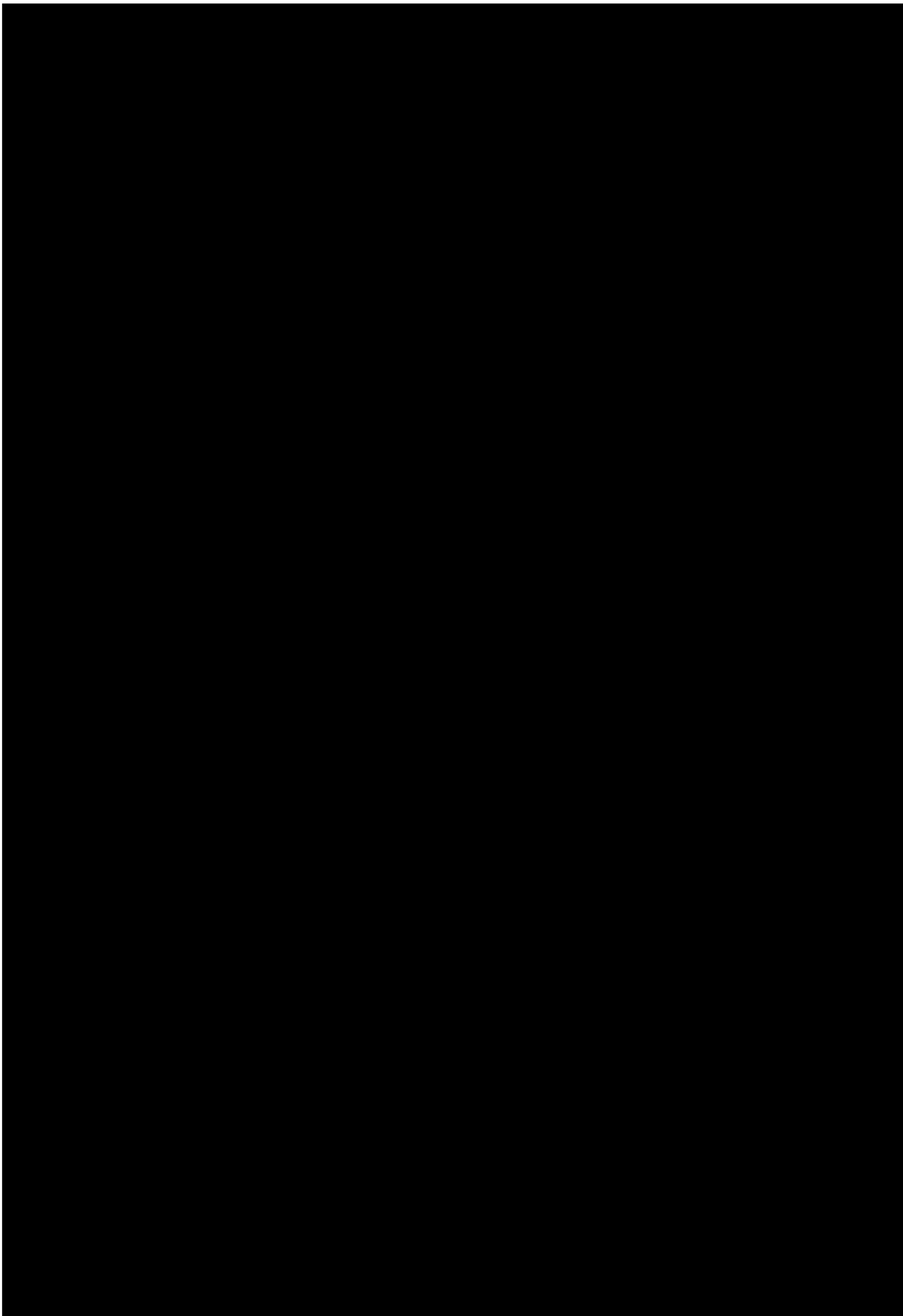


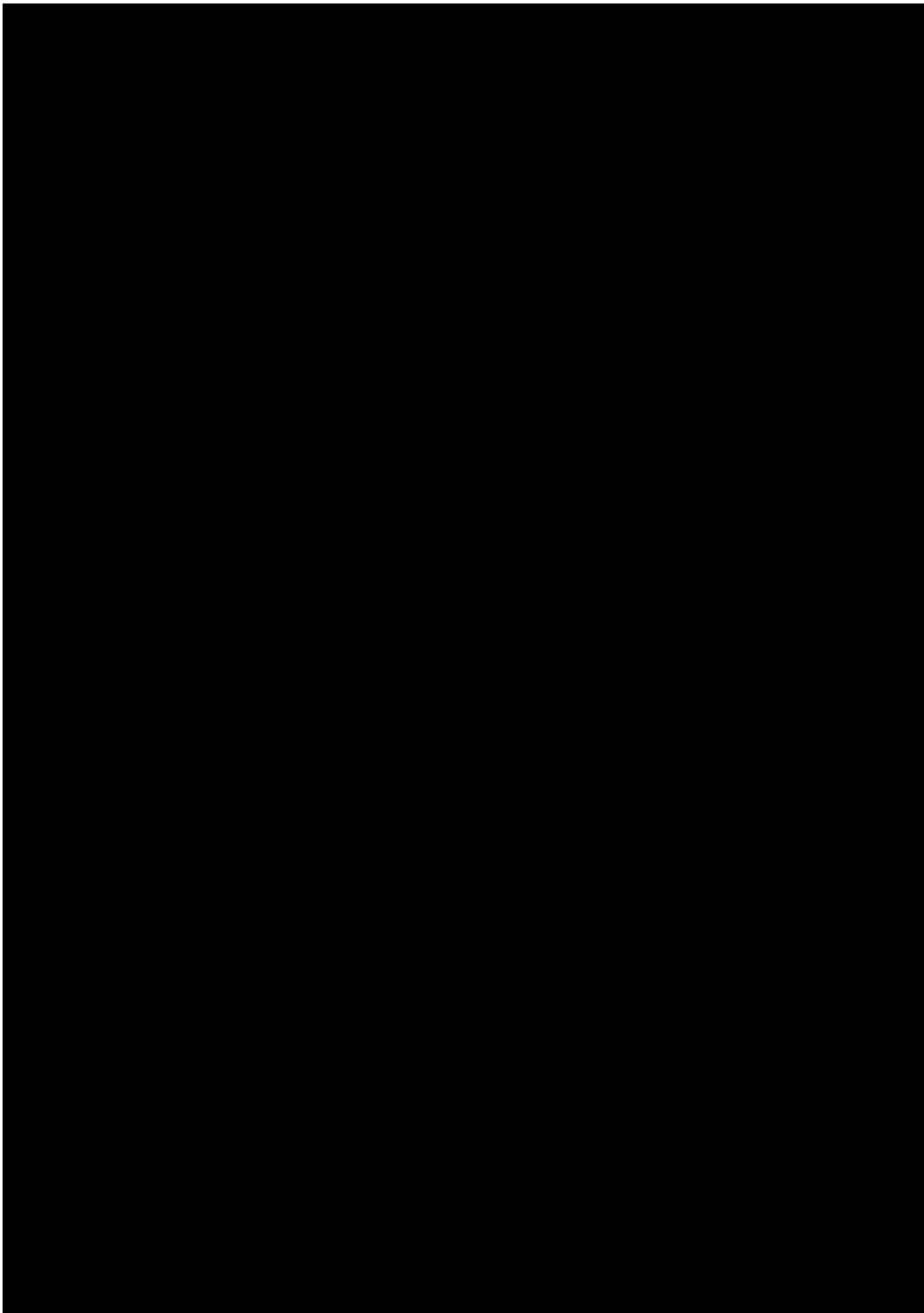


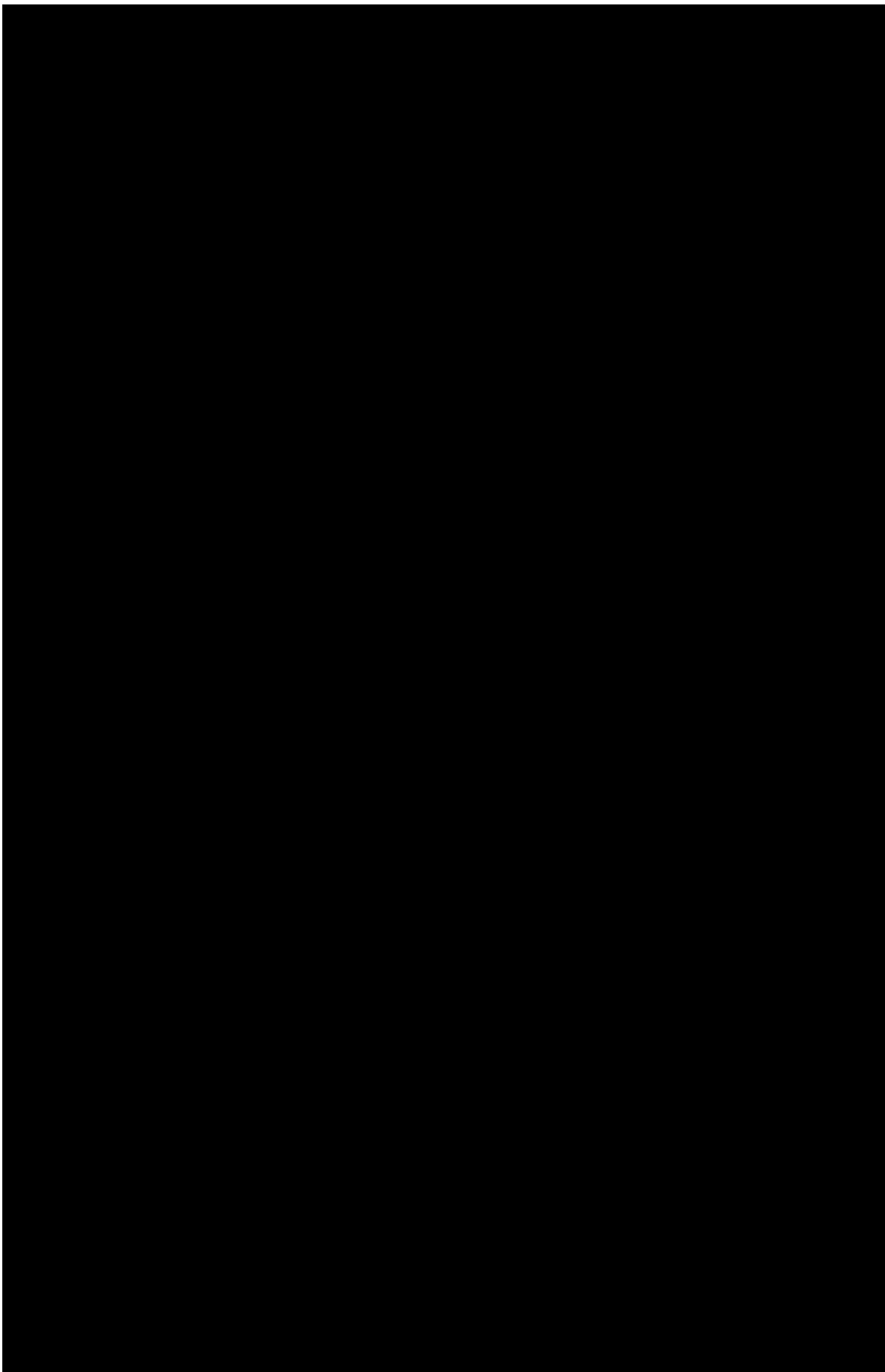


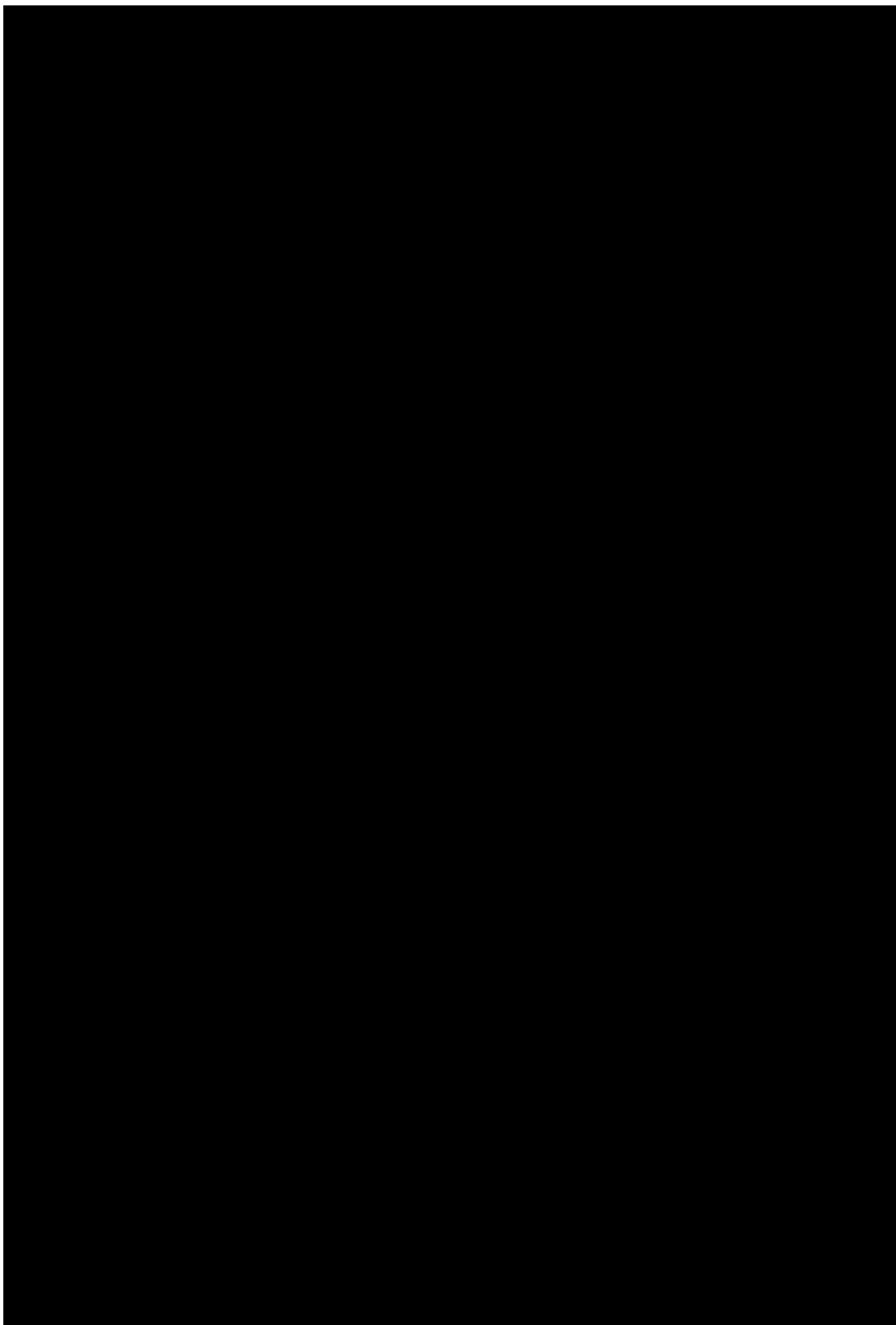


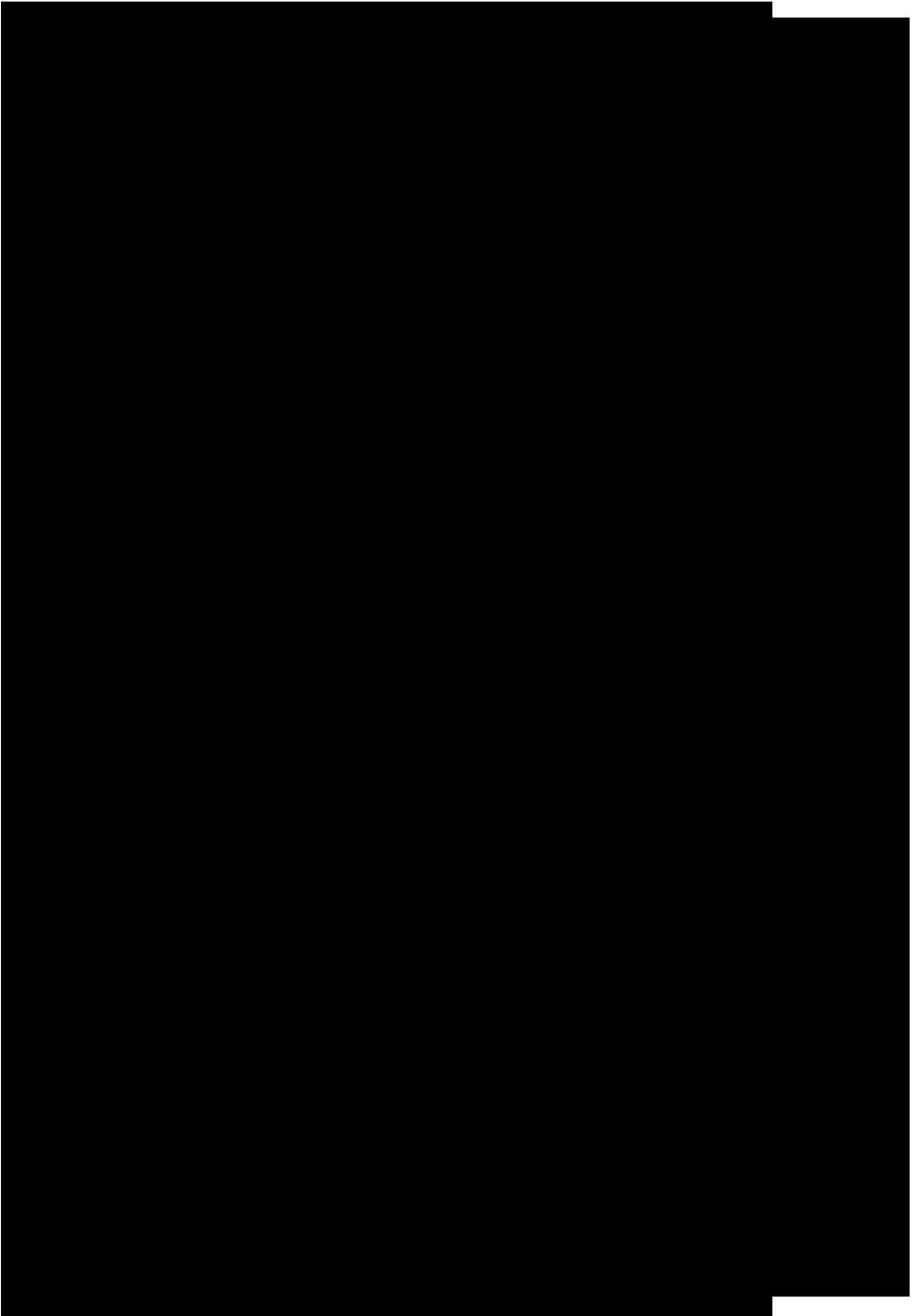


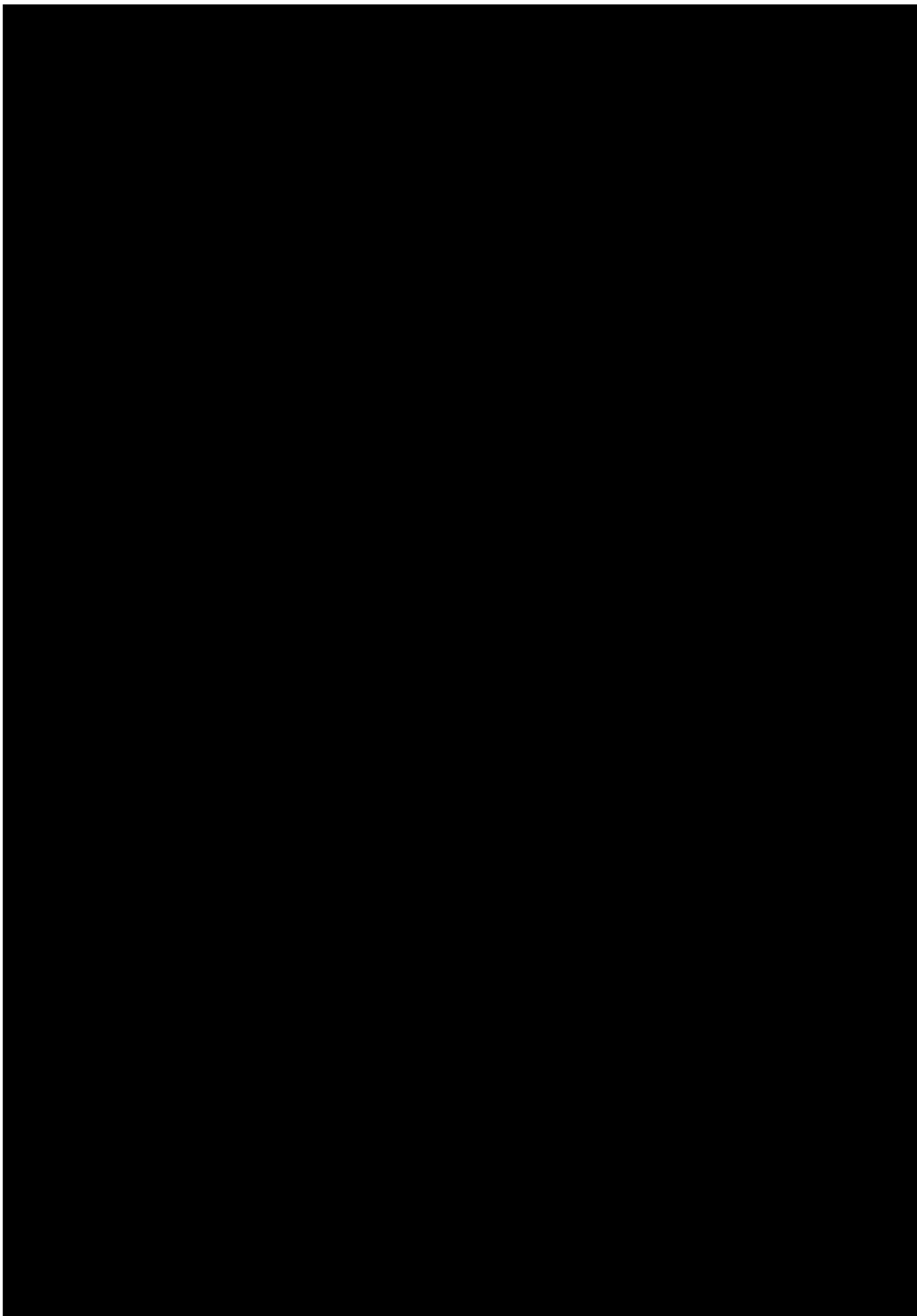


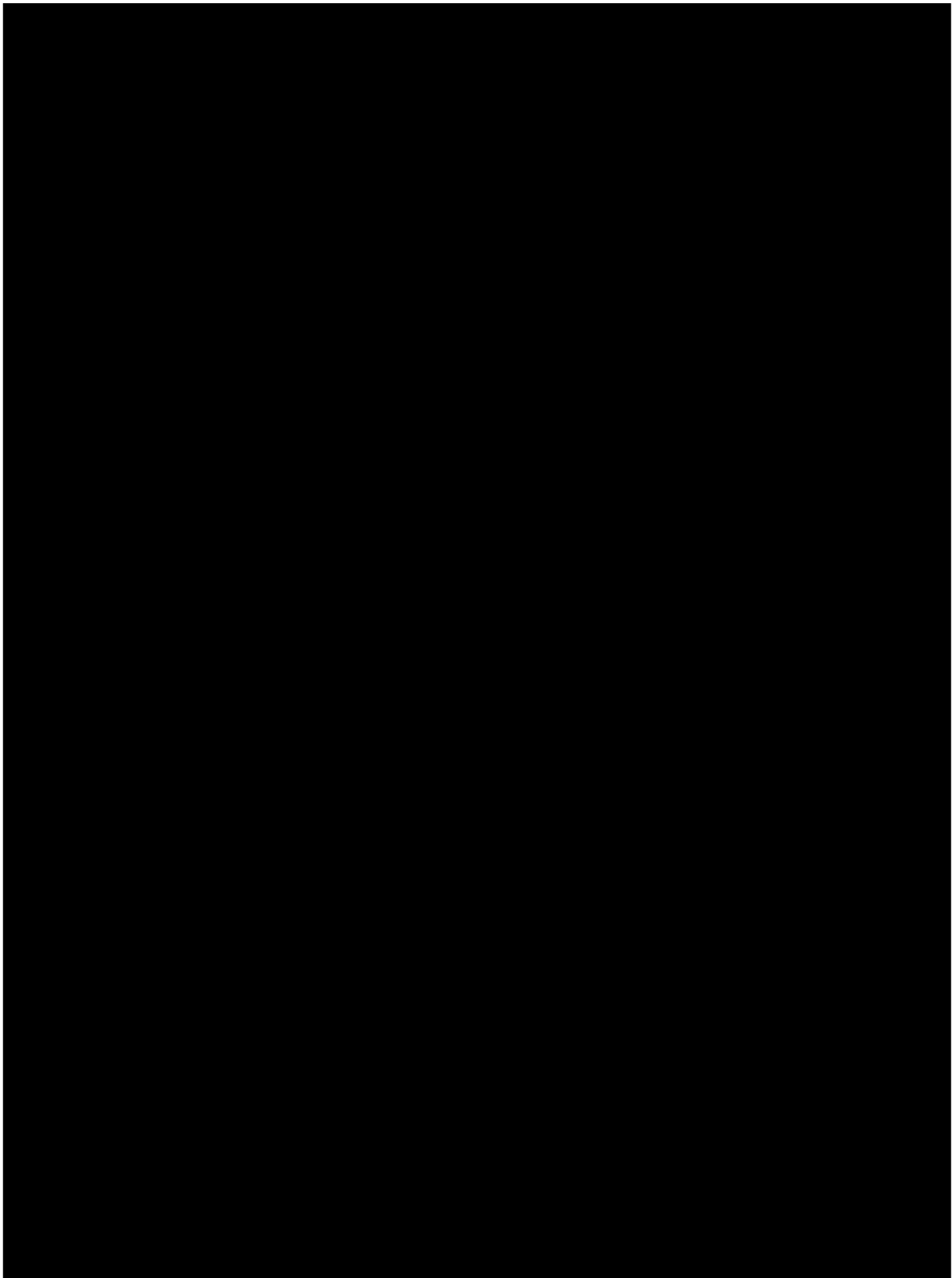


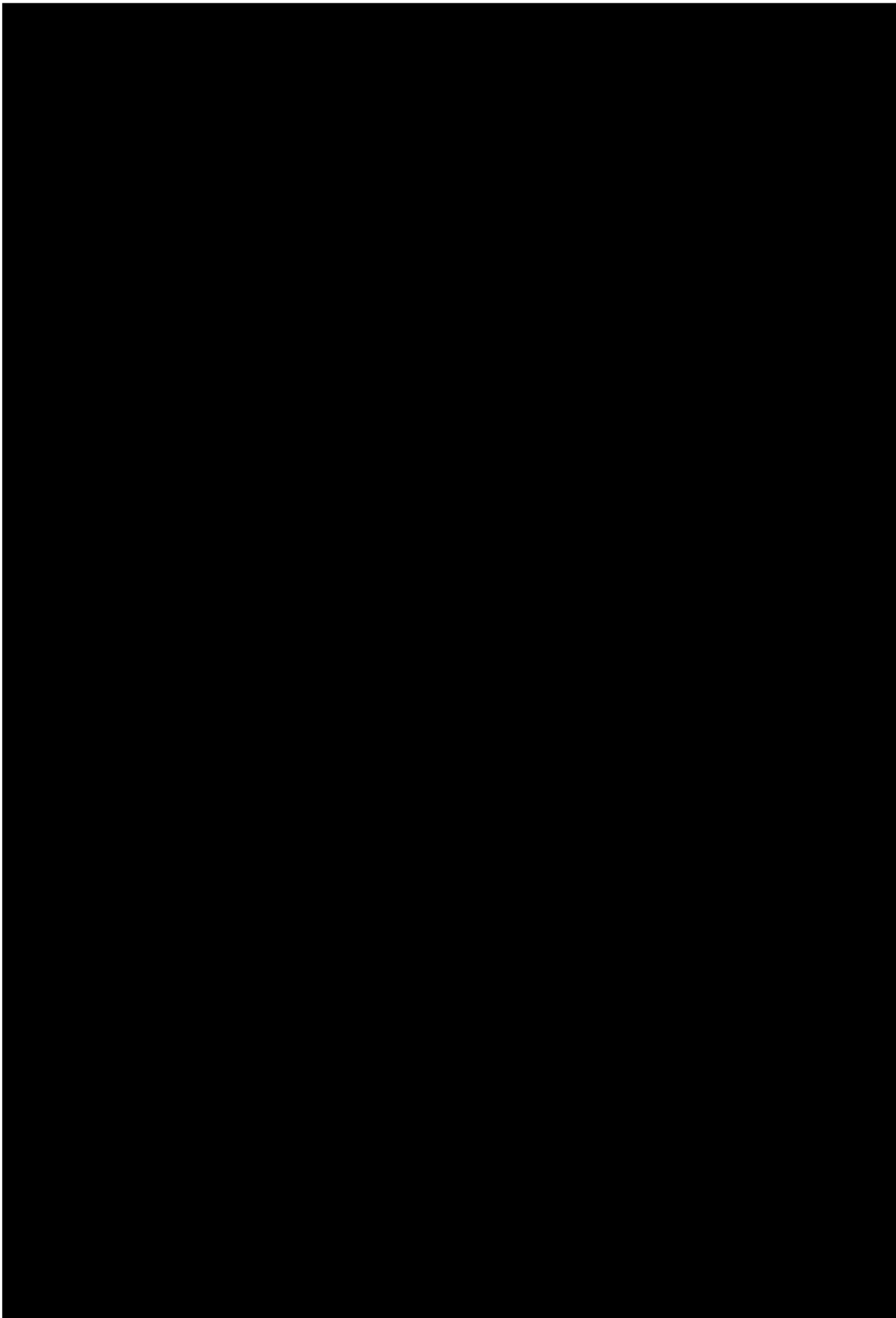


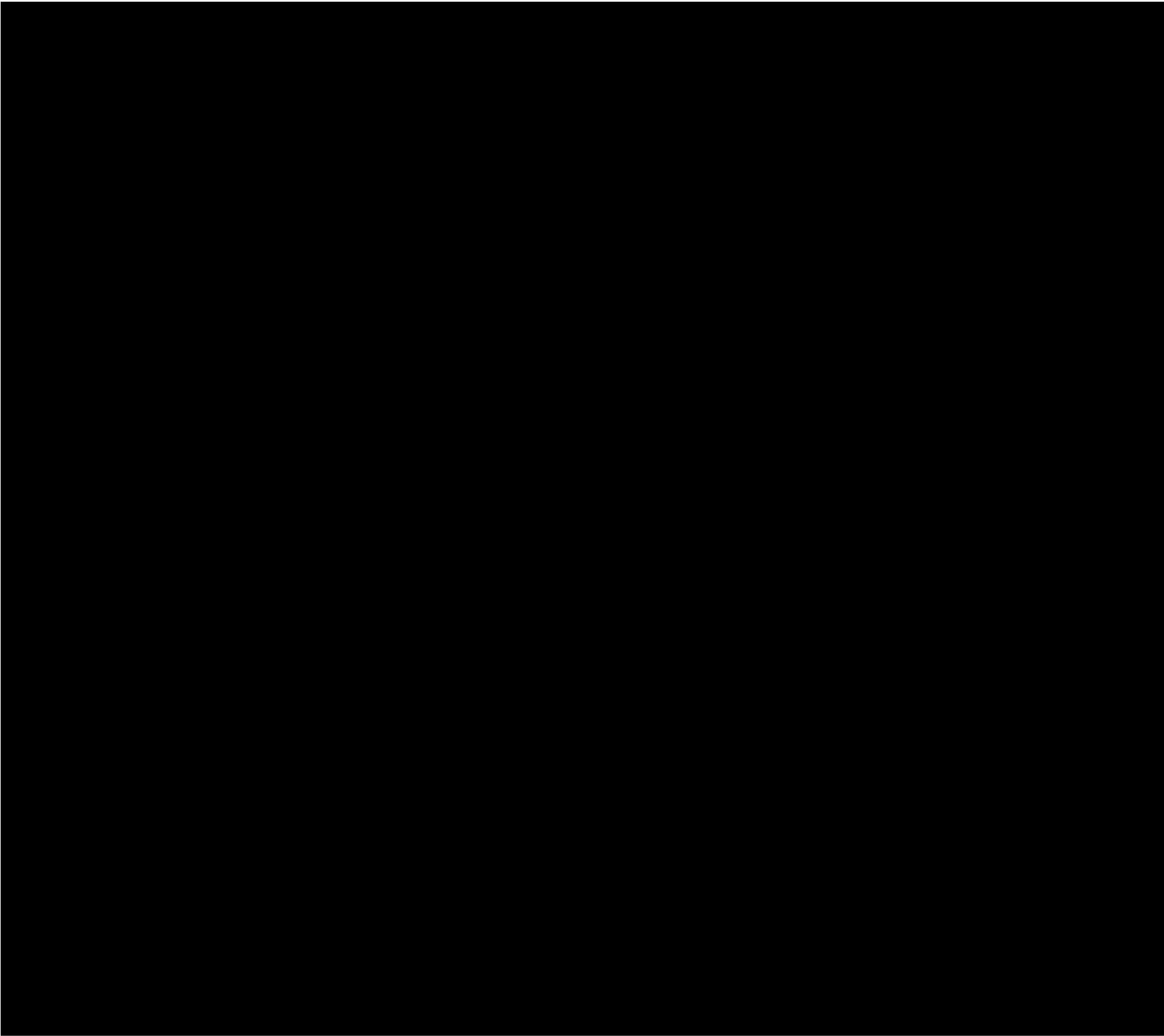




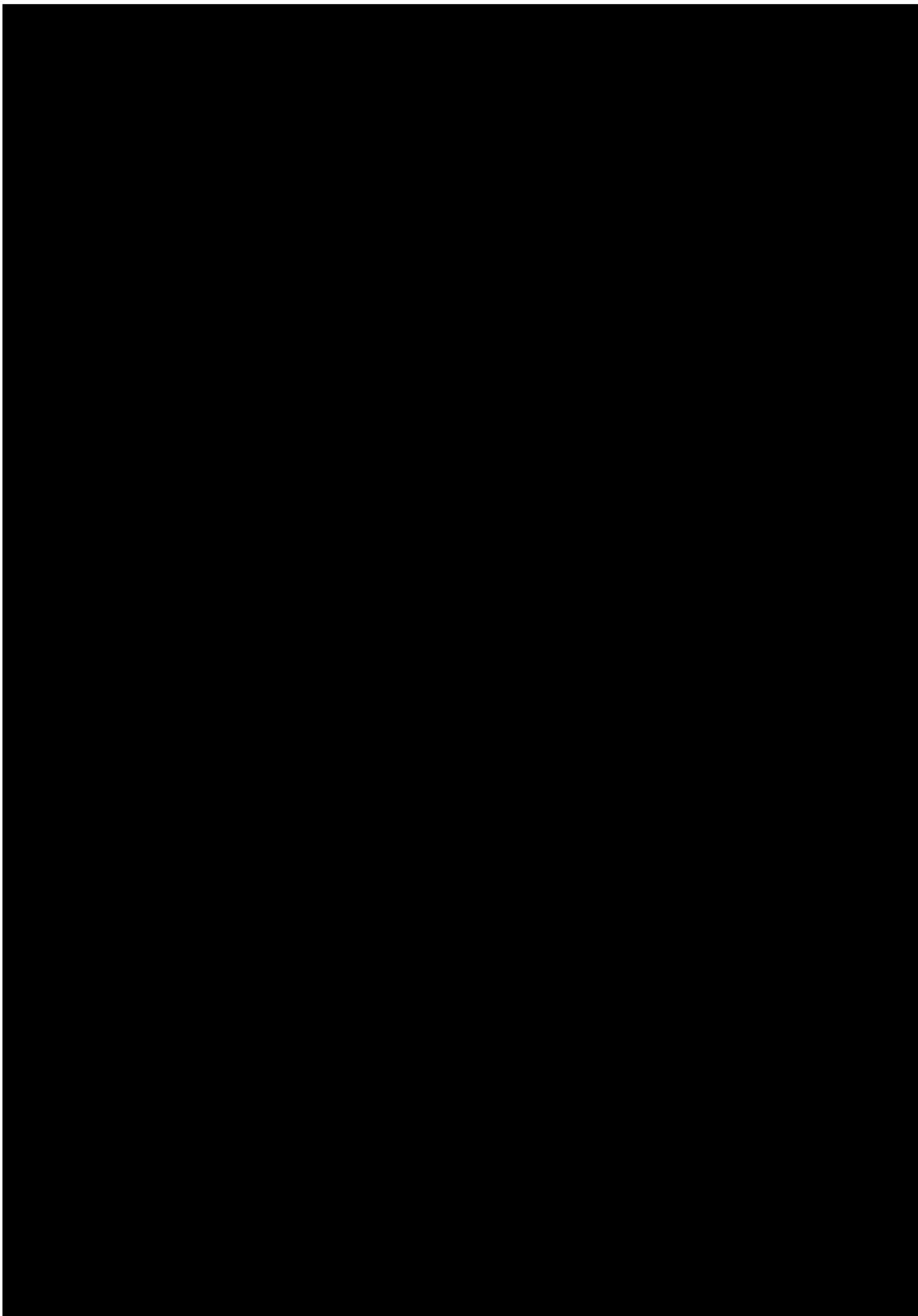


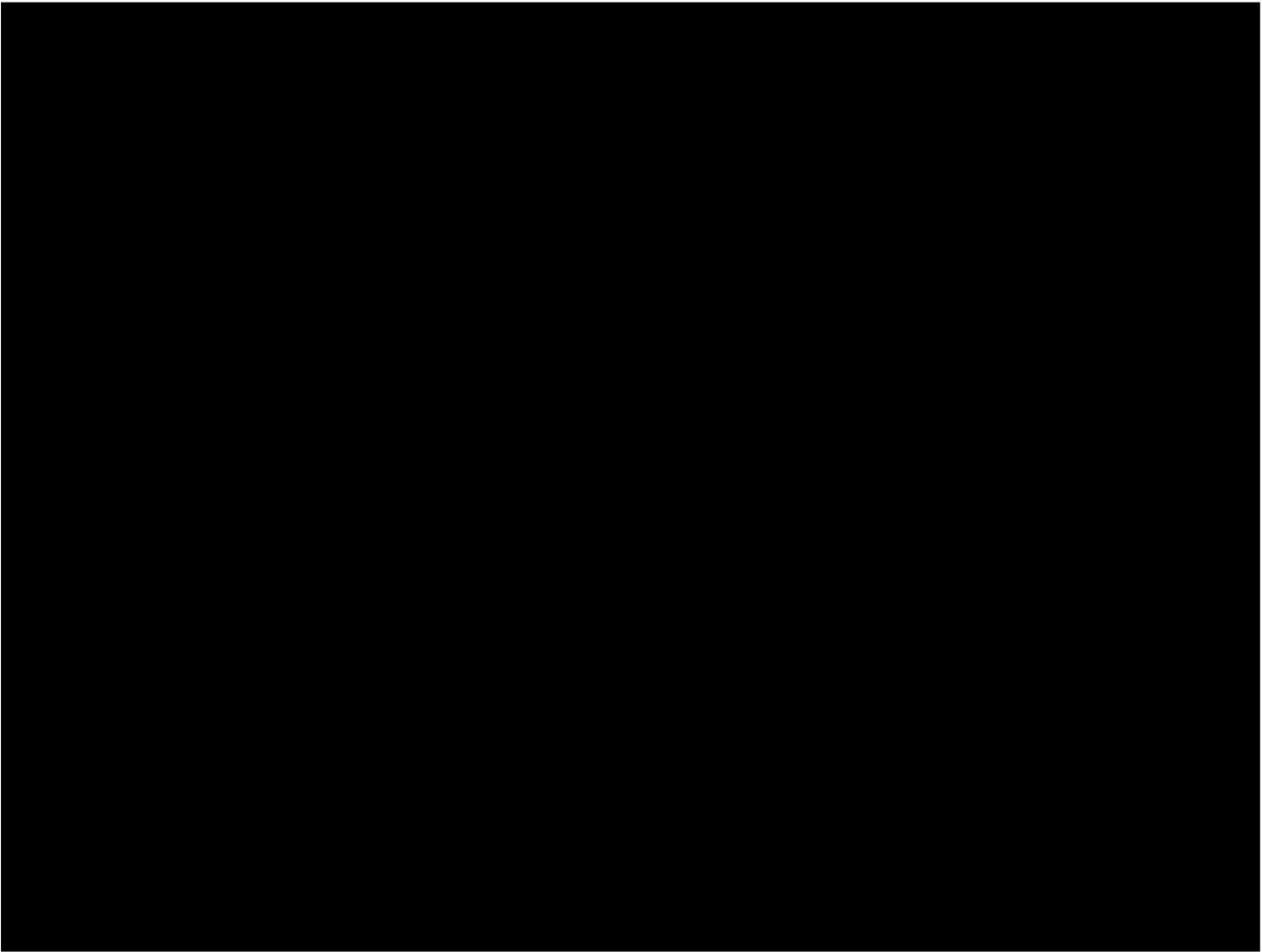


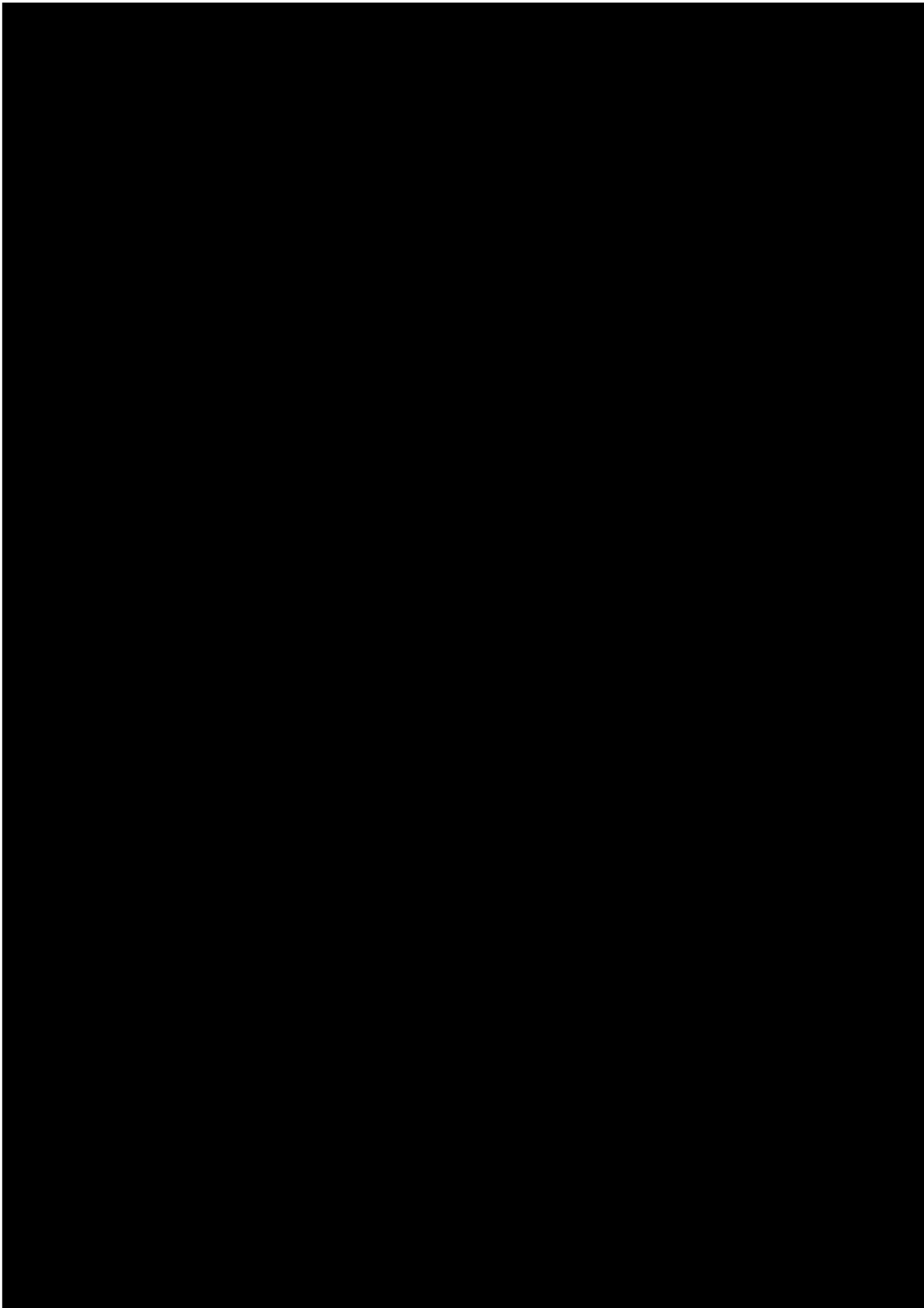


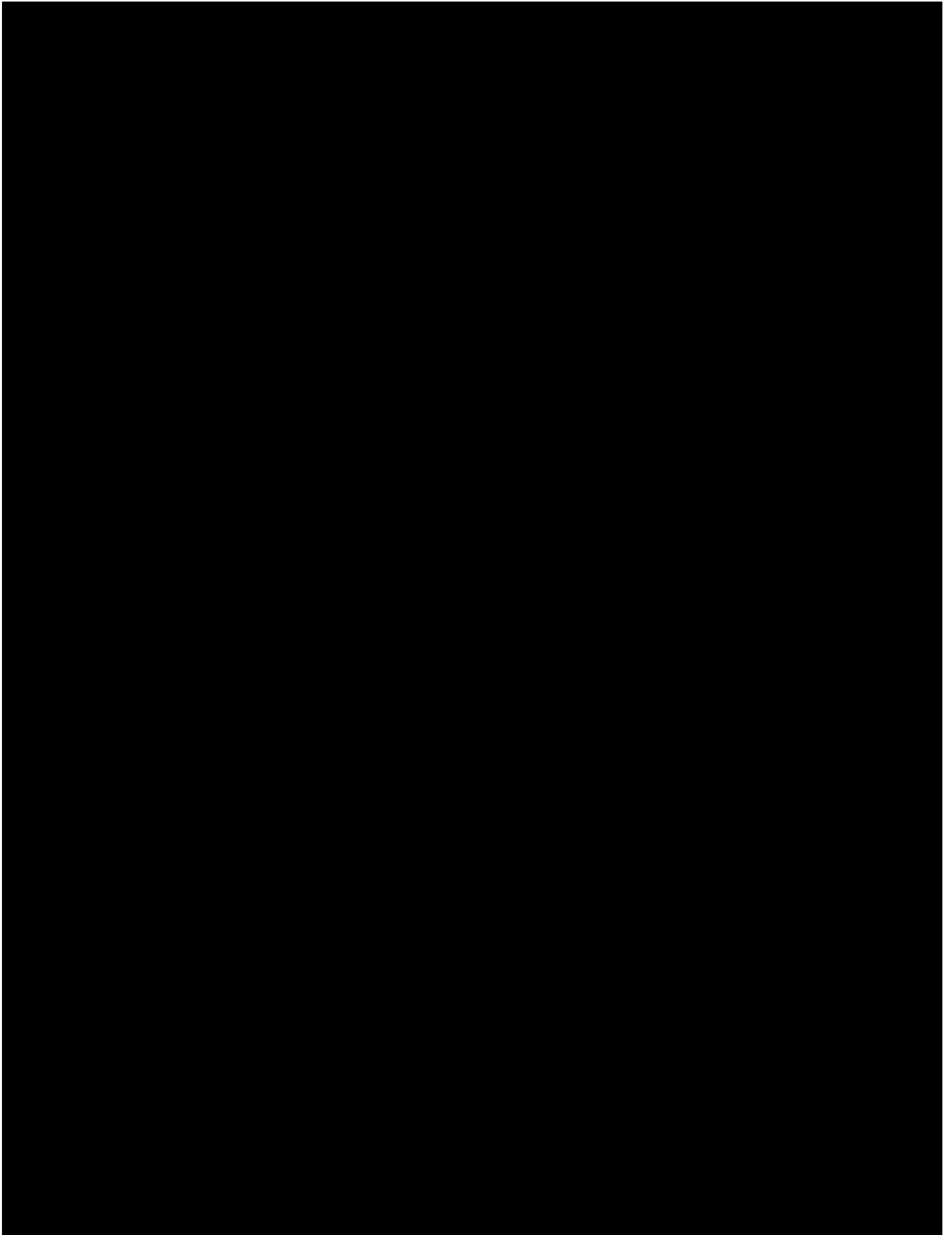


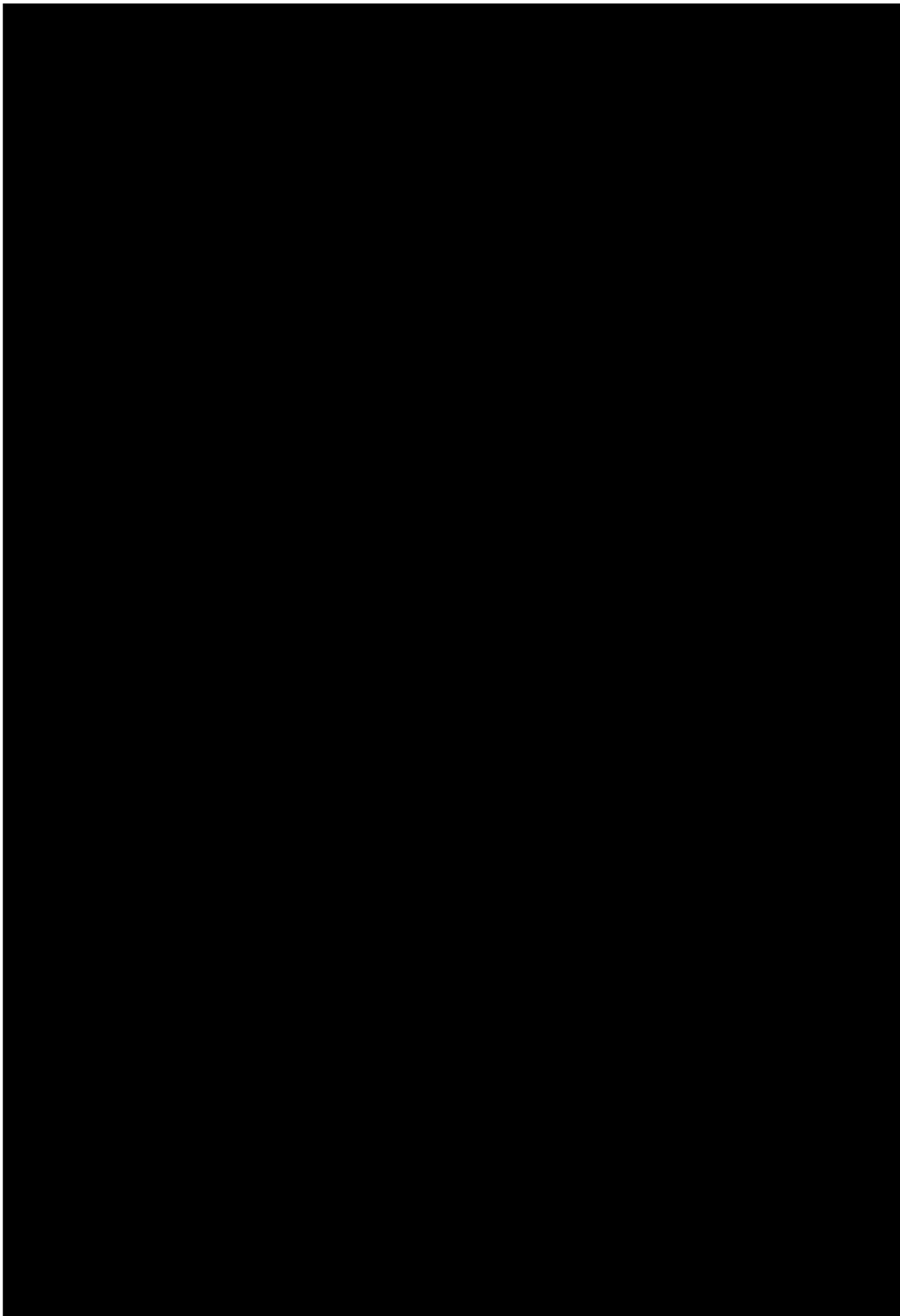


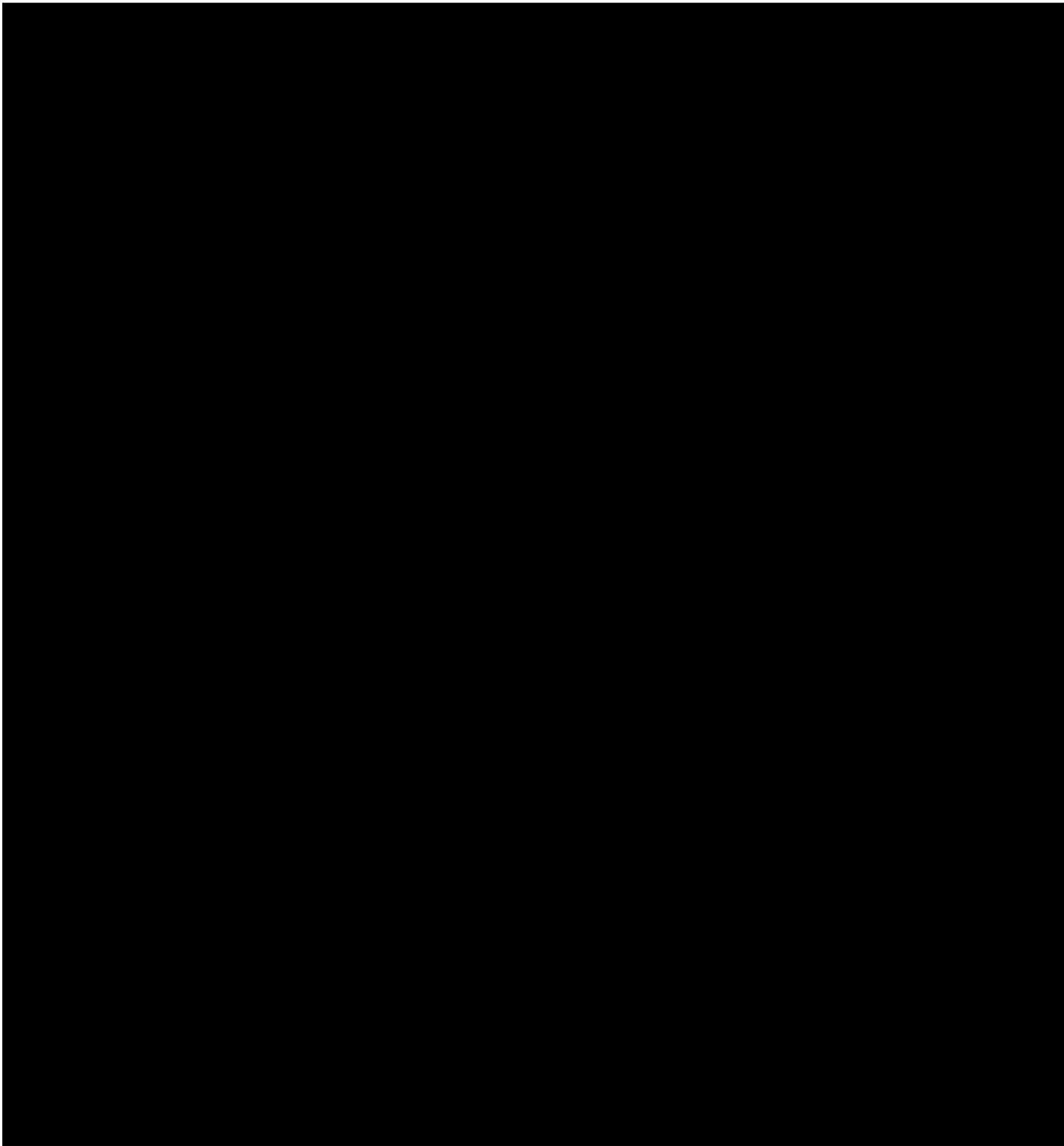












Appendix I Pipeflow Calculations

Scheme: Penstrowed Quarry

page no: 1

Section: Pipeflow Calculation

dated: 10/05/22

Calculation based on Colebrook White equation for water at 15° C.
(Kinematic viscosity $1.141 \times 10^{-6} \text{ m}^2 \text{ s}^{-1}$)

Option 1 - Full bore Velocity / Discharge

Input data:

Diameter (mm) 150.00

Hyd. Gradient (1 in ...) 12.00

Coeff Ks (mm) 1.500

Output details:

Full bore Velocity (m/s) 2.538

Full bore Discharge (L/s) 44.843

Pipe losses (m)

0.5 V² / 2g 0.164

V² / 2g 0.328

1.5 V² / 2g 0.492

Appendix J Greenfield Runoff Rate


DOCUMENT VERIFICATION RECORD	
Project:	Penstrowed Quarry, Caersws
Client:	G F Grigg Ltd
Report Title:	13758-Drainage Strategy-02
Date:	14 th July 2021

DOCUMENT REVIEW & APPROVAL	
Author:	Anthony Jones BSc (Hons) MSc
Checker:	Aled Williams BSc (Hons) MCIWEM
Approver:	Victoria Griffin BSc (Hon) MSc MIEEnvSc CEnv

ReFH2 RUNOFF RATES*	
Return Period (Years)	As-rural Peak Flow (l/s)
1	12.99646
2	15.2844
5	23.24724
10	29.50013
30	41.19356
50	47.70894
75	53.47949
100	57.91707
200	69.87953
1000	104.1049

*Runoff Rates printed from the ReFH Flood Modelling software package


Appendix K MicroDrainage Storage Estimate

Waterco Ltd		Page 1
Eden Court Lon Parcwr Business Park Denbighshire LL15 1NJ	13758-Penstrowed Quarry 1 in 100 yr + 40% CC Attenuation Pond	
Date 03/11/2023 File	Designed by IT Checked by AW	
XP Solutions	Source Control 2020.1.3	

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	9.420	0.420	13.0	369.3	O K
30 min Summer	9.571	0.571	13.0	502.1	O K
60 min Summer	9.738	0.738	13.0	649.4	Flood Risk
120 min Summer	9.826	0.826	13.0	726.8	Flood Risk
180 min Summer	9.861	0.861	13.0	757.6	Flood Risk
240 min Summer	9.875	0.875	13.0	770.0	Flood Risk
360 min Summer	9.873	0.873	13.0	768.4	Flood Risk
480 min Summer	9.855	0.855	13.0	752.2	Flood Risk
600 min Summer	9.836	0.836	13.0	735.3	Flood Risk
720 min Summer	9.817	0.817	13.0	719.2	Flood Risk
960 min Summer	9.782	0.782	13.0	687.9	Flood Risk
1440 min Summer	9.716	0.716	13.0	630.4	Flood Risk
2160 min Summer	9.616	0.616	13.0	542.0	O K
2880 min Summer	9.533	0.533	13.0	468.8	O K
4320 min Summer	9.406	0.406	13.0	357.5	O K
5760 min Summer	9.319	0.319	13.0	280.8	O K
7200 min Summer	9.262	0.262	12.9	230.8	O K
8640 min Summer	9.224	0.224	12.8	197.2	O K
10080 min Summer	9.199	0.199	12.6	174.8	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	142.505	0.0	366.4	16
30 min Summer	97.852	0.0	504.2	31
60 min Summer	64.340	0.0	677.2	62
120 min Summer	37.395	0.0	787.1	122
180 min Summer	26.972	0.0	851.5	182
240 min Summer	21.320	0.0	897.3	240
360 min Summer	15.248	0.0	962.3	360
480 min Summer	12.021	0.0	1011.2	458
600 min Summer	10.000	0.0	1051.1	510
720 min Summer	8.607	0.0	1085.2	570
960 min Summer	6.799	0.0	1142.0	694
1440 min Summer	4.904	0.0	1232.6	978
2160 min Summer	3.559	0.0	1355.4	1364
2880 min Summer	2.854	0.0	1448.6	1756
4320 min Summer	2.124	0.0	1612.9	2504
5760 min Summer	1.747	0.0	1774.4	3176
7200 min Summer	1.520	0.0	1930.2	3888
8640 min Summer	1.369	0.0	2085.1	4584
10080 min Summer	1.261	0.0	2237.9	5248

Waterco Ltd		Page 2
Eden Court Lon Parcwr Business Park Denbighshire LL15 1NJ	13758-Penstrowed Quarry 1 in 100 yr + 40% CC Attenuation Pond	
Date 03/11/2023 File	Designed by IT Checked by AW	
XP Solutions	Source Control 2020.1.3	

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Winter	9.471	0.471	13.0	414.2	O K
30 min Winter	9.641	0.641	13.0	563.7	O K
60 min Winter	9.829	0.829	13.0	729.4	Flood Risk
120 min Winter	9.931	0.931	13.0	818.8	Flood Risk
180 min Winter	9.973	0.973	13.0	856.2	Flood Risk
240 min Winter	9.992	0.992	13.0	872.7	Flood Risk
360 min Winter	9.996	0.996	13.0	876.6	Flood Risk
480 min Winter	9.982	0.982	13.0	864.3	Flood Risk
600 min Winter	9.959	0.959	13.0	844.2	Flood Risk
720 min Winter	9.933	0.933	13.0	820.8	Flood Risk
960 min Winter	9.889	0.889	13.0	782.5	Flood Risk
1440 min Winter	9.801	0.801	13.0	704.9	Flood Risk
2160 min Winter	9.657	0.657	13.0	578.1	O K
2880 min Winter	9.521	0.521	13.0	458.9	O K
4320 min Winter	9.330	0.330	13.0	290.0	O K
5760 min Winter	9.220	0.220	12.8	193.9	O K
7200 min Winter	9.170	0.170	12.3	150.0	O K
8640 min Winter	9.155	0.155	11.2	136.2	O K
10080 min Winter	9.144	0.144	10.3	126.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Winter	142.505	0.0	410.8	16
30 min Winter	97.852	0.0	564.6	31
60 min Winter	64.340	0.0	758.5	62
120 min Winter	37.395	0.0	881.5	120
180 min Winter	26.972	0.0	953.5	178
240 min Winter	21.320	0.0	1004.8	236
360 min Winter	15.248	0.0	1077.5	348
480 min Winter	12.021	0.0	1132.2	458
600 min Winter	10.000	0.0	1176.9	564
720 min Winter	8.607	0.0	1215.0	642
960 min Winter	6.799	0.0	1278.4	740
1440 min Winter	4.904	0.0	1379.1	1052
2160 min Winter	3.559	0.0	1517.9	1496
2880 min Winter	2.854	0.0	1622.5	1876
4320 min Winter	2.124	0.0	1807.4	2592
5760 min Winter	1.747	0.0	1987.4	3224
7200 min Winter	1.520	0.0	2161.8	3752
8640 min Winter	1.369	0.0	2335.6	4496
10080 min Winter	1.261	0.0	2507.7	5240

Waterco Ltd		Page 3
Eden Court Lon Parcwr Business Park Denbighshire LL15 1NJ	13758-Penstrowed Quarry 1 in 100 yr + 40% CC Attenuation Pond	
Date 03/11/2023 File	Designed by IT Checked by AW	
XP Solutions	Source Control 2020.1.3	

Rainfall Details


Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 306766 291007 SO 06766 91007
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.411

Time (mins)	Area
From: To:	(ha)

0	1	1.411
---	---	-------

Waterco Ltd		Page 4
Eden Court Lon Parcwr Business Park Denbighshire LL15 1NJ	13758-Penstrowed Quarry 1 in 100 yr + 40% CC Attenuation Pond	
Date 03/11/2023 File	Designed by IT Checked by AW	
XP Solutions	Source Control 2020.1.3	

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	880.0	1.000	880.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0164-1300-1000-1300
Design Head (m)	1.000
Design Flow (l/s)	13.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	164
Invert Level (m)	8.995
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	13.0
Flush-Flo™	0.312	13.0
Kick-Flo®	0.691	10.9
Mean Flow over Head Range	-	11.1

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)
0.100	5.9	1.600	16.2	5.000	28.0
0.200	12.6	1.800	17.2	5.500	29.3
0.300	13.0	2.000	18.1	6.000	30.6
0.400	12.9	2.200	18.9	6.500	31.8
0.500	12.6	2.400	19.7	7.000	33.0
0.600	12.1	2.600	20.5	7.500	34.1
0.800	11.7	3.000	21.9	8.000	35.2
1.000	13.0	3.500	23.6	8.500	36.2
1.200	14.2	4.000	25.2	9.000	37.2
1.400	15.2	4.500	26.6	9.500	38.2

Eden Court
Lon Parcwr Business Park
Denbighshire LL15 1NJ

13758-Penstrowed Quarry
1 in 100 yr + 40% CC
Attenuation Pond



Date 03/11/2023

Designed by IT

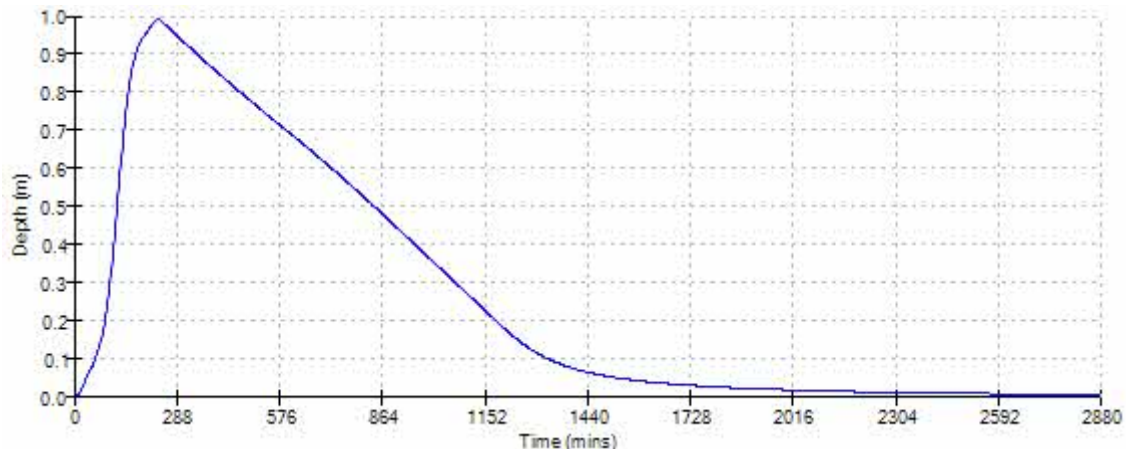
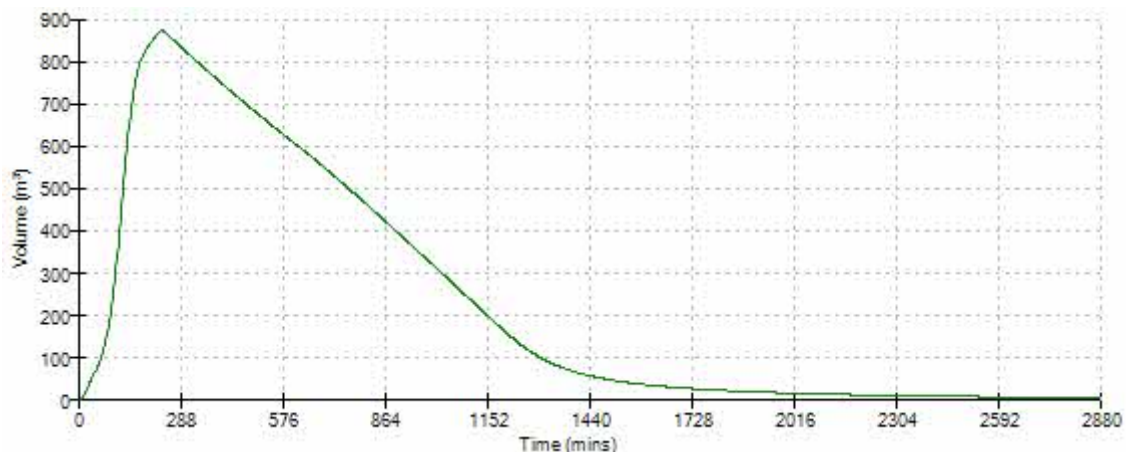
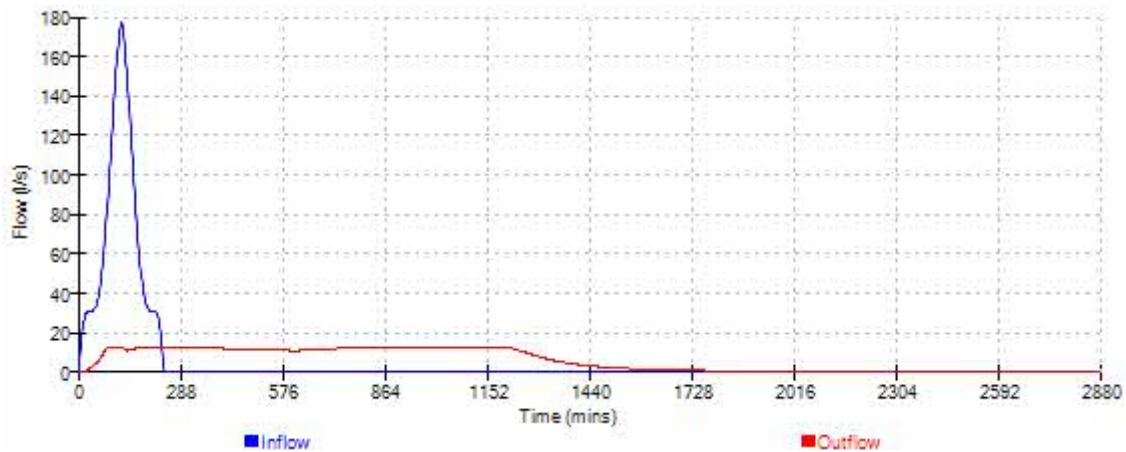
File

Checked by AW

XP Solutions

Source Control 2020.1.3

Event: 240 min Winter



Eden Court
Lon Parcwr Business Park
Denbighshire LL15 1NJ

13758-Penstrowed Quarry
1 in 100 yr + 40% CC
Attenuation Pond



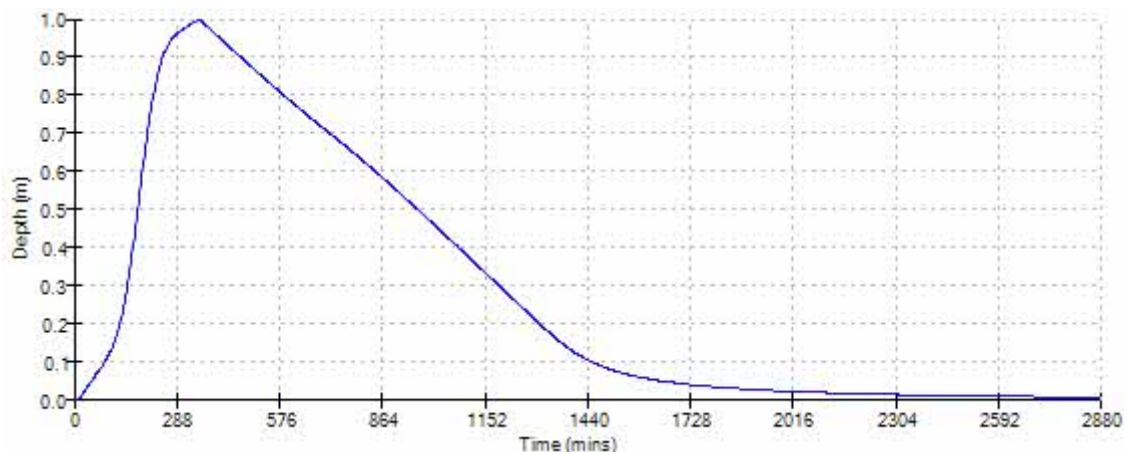
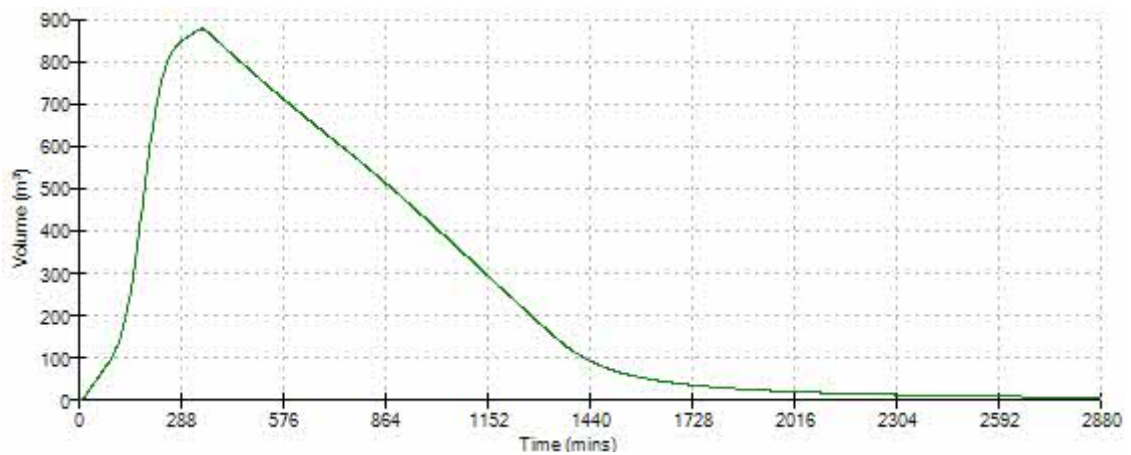
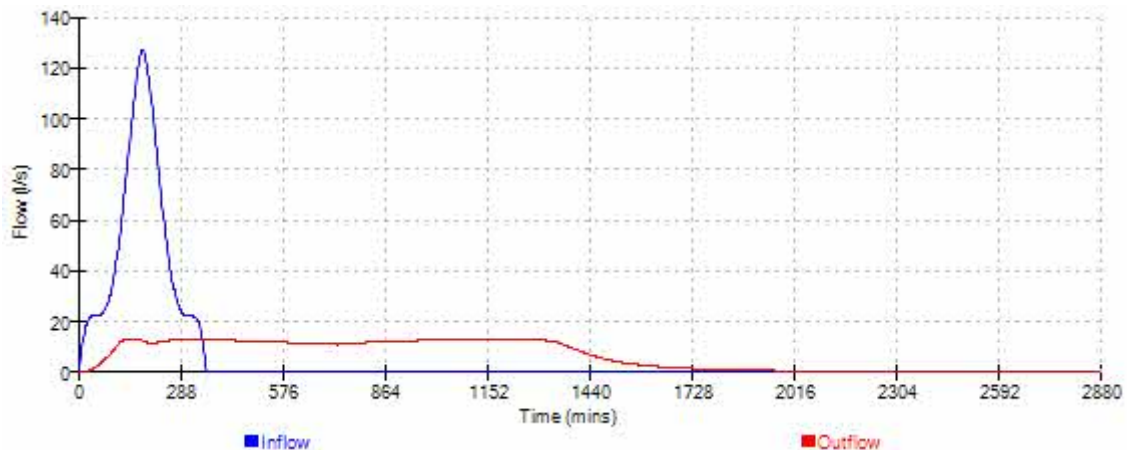
Date 03/11/2023
File

Designed by IT
Checked by AW

XP Solutions

Source Control 2020.1.3

Event: 360 min Winter



Eden Court
Lon Parcwr Business Park
Denbighshire LL15 1NJ

13758-Penstrowed Quarry
1 in 100 yr + 40% CC
Attenuation Pond



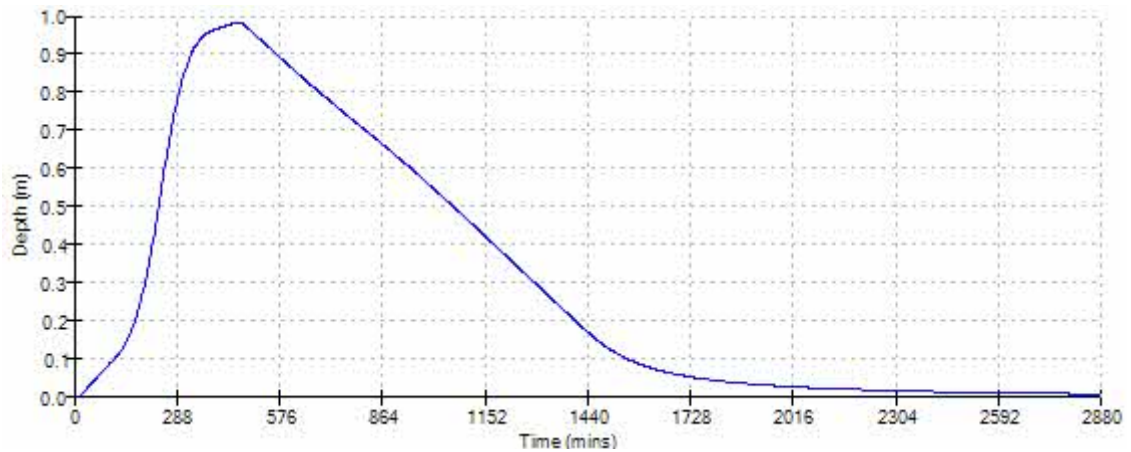
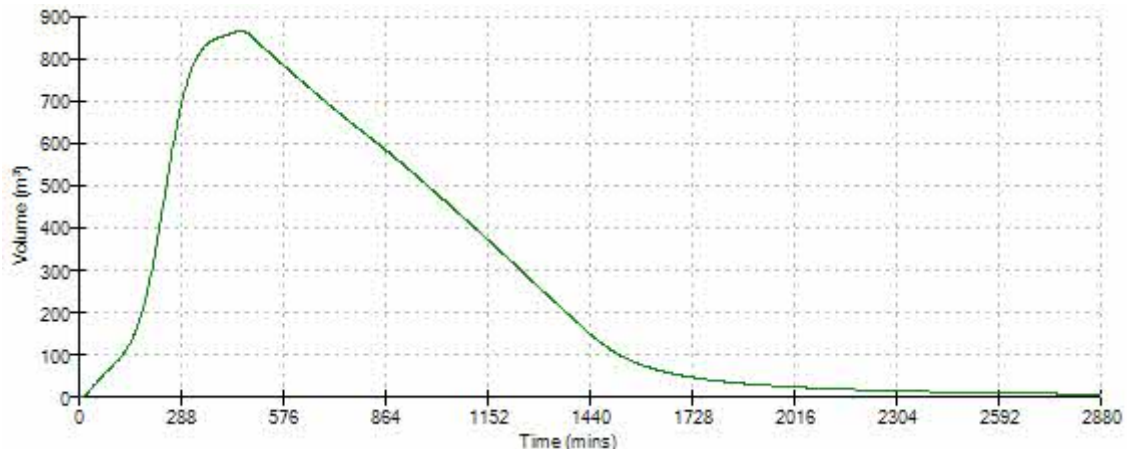
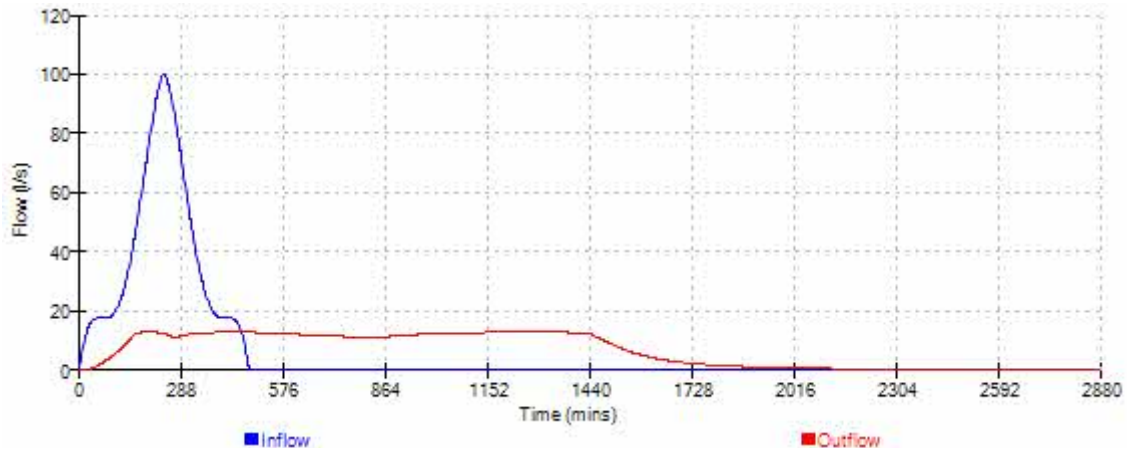
Date 03/11/2023
File

Designed by IT
Checked by AW

XP Solutions

Source Control 2020.1.3

Event: 480 min Winter



Appendix L Concept Drainage Sketch



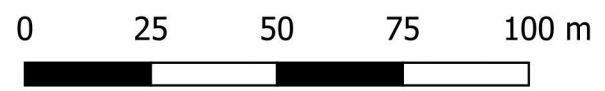
Notes:
 1) This sketch has not been subject to formal checks or approvals. Its validity and use must therefore be limited to discussion and information purposes only.
 2) Unless otherwise noted the risks associated with this proposal are not considered to be extra ordinary and within the remit of an experienced and competent contractor.
 3) All dimensions in millimetres and all levels in metres above ordnance datum unless shown otherwise.
 4) This drawing is an ammendment of Drawing No :GG/MP1/1.4 by 'Lambe Planning & Design'. This drawing provides a concept only and is not intended for detailed design.

LEGEND

- Proposed Attenuation Ponds suitably sized to accomodate surface water runoff from holiday lodges and lined permeable positively drained access roads
- Proposed Surface Water Drain
- Proposed Flow Control Device
- Proposed Surface Water Inspection Chamber
- Existing Surface Water Inspection Chamber

Footpath G

- To be Removed
- To be Retained
- To be Created



CLIENT:		G F Grigg Ltd	
SCHEME:		Penstrowed Quarry, Caersws	
PLOT TITLE:		Concept Drainage Sketch	
PLOT STATUS:	SKETCH	DATE:	07-11-2023
DRAWN:	IT	CHECKED:	AW
APPROVED:	AW	PLOT SCALE AT A3:	1:1500
PLOT NAME:			REVISION:
13758_Concept_Drainage_Sketch_Sewer			-

Appendix M SuDS Maintenance Schedules

Operation and Maintenance Requirements for Permeable Paving

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer’s recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and move contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level or the paving	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Inspect for evidence of poor operation and / or weed growth – if required, take remedial action	Three-monthly, 48hr after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Ref. Table 20.15, CIRIA C753 ‘The SuDS Manual’

The maintenance requirements detailed above are to be undertaken by the site owner.

Name :

Position :

Date :

Signed on behalf of the site owner :

Operation and Maintenance Requirements for Ponds and Wetlands

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass – public areas	Monthly (during growing season), or as required
	Inspect marginal and bankside vegetation and remove nuisance plants (for first 3 years)	Monthly (at start, then as required)
	Inspect inlets, outlets, banksides, structures, pipework etc for evidence of blockage, and / or physical damage.	Monthly
	Inspect water body for signs of poor water quality	Monthly (May – October)
	Inspect silt accumulation rates in any forebay and in main body of the pond and establish appropriate removal frequencies; undertake contamination testing once some build-up has occurred, to inform management and disposal options.	Half yearly
	Check any mechanical devices e.g. penstocks	Half yearly
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1m above pond base; include max 25% of pond surface)	Annually
	Remove 25% of bank vegetation from water’s edge to a minimum of 1m above water level	Annually
	Remove sediment from any forebay	Every 1 – 5 years, or as required
	Remove sediment and planting from one quadrant of the main body of ponds without sediment forebays	Every 5 years, or as required
Occasional maintenance	Remove sediment from the main body of big ponds when pool volume is reduced by 20%	With effective pre-treatment, this will only be required rarely, e.g. 25-50 years
Remedial actions	Repair erosion or other damage	As required
	Replant where necessary	As required
	Aerate pond when signs of eutrophication are detected	As required
	Realign rip-rap or repair other damage	As required
	Repair/rehabilitate of Inlets, outlets and overflows	As required

Ref. Table 23.1 CIRIA C753 ‘The SuDS Manual’

The maintenance requirements detailed above are to be undertaken by the site owner.

Name :

Position :

Date :

Signed on behalf of the site owner :

Appendix N Concept Designer's Risk Assessment

Project: Penstrowed Quarry, Caersws
 Client: G F GRIGG LTD
 Report Reference: 13758- Drainage Strategy-02

Project No: 13758

Prepared by: Anthony Jones Date: 20/05/2021
 Checked by: Aled Williams Date: 25/05/2021
 Reviewed by: Victoria Griffin Date: 28/05/2021

Requirement:

The Construction (Design and Management) Regulations 2015 (CDM 2015) place an obligation on the Designer to take all reasonable steps to provide, with the design, sufficient information about the design, construction or maintenance of the structure, to adequately assist the client, other designers and contractors to comply with their duties under CDM. The Designer has undertaken this assessment to identify any extra-ordinary risks, or those that would not be expected on this particular project by an experienced and competent Contractor. The aim is to avoid needless paperwork and bureaucracy and ensure the assessment is project specific, relevant and proportionate to the risk.

DRA Summary

Each of the following risk areas has been considered using the question below. Is a risk present which is considered to be **extra-ordinary or unexpected** in this instance?

If **YES** - A detailed risk assessment is required at design stage

If **UNKNOWN** - Insufficient information has been provided at concept design stage and the risks are unknown. Further consideration must be given at design stage(s)

If **NO** - No further action is required.

Hazard Ref.	Risk Areas	YES, UNKNOWN or NO	Comments
1	Ground Conditions	Unknown	Sandstone - commercial quarry
2	Hazardous Environment	Unknown	Potential ground gas associated with possibly infilling at quarry.
3	Existing Working Environment	Unknown	
4	Existing Services	Unknown	
5	Proximity to Other Structure(s)	Unknown	Concrete plant to the south-eastern extent of the site
6	Near Waterbody / flood risk	Unknown	Two watercourses adjacent site discharging to River Severn
7	Proximity to Other Activities	Unknown	
8	Sequence of Construction	Unknown	
9	Access	Unknown	
10	Interfaces	Unknown	
11	Confined Space Working	Unknown	
12	Maintenance Considerations	Unknown	
13	Working at Height	Unknown	
14	Steep Slopes	Yes	Commercial quarry
15	Demolition / Refurbishment / Repair	Unknown	Demolition of existing operational buildings
16	Welfare	Unknown	
17	Occupational Health	Unknown	
18	Environmental Issues	Unknown	
19	Other Significant Hazards not Identified Above	Unknown	Stability of excavations and quarry sides.
20	Residual Risk to Future Users	Unknown	