Marinus Link Stage 1B Revenue Proposal

Cost Independent Verification and Review of Expenditure Forecasting Methodology

Marinus Link

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Acronyms

Acronym	Description
AACEI	Association Advancement Cost Engineering International
AER	Australian Energy Regulator
BOW	Balance of Work
CB	Cable Supply, Installation & Commissioning Package (incl. LHDD)
CCW	Converter Civil Works and Installation
CDCS	Converter Station Design, Supply & Installation
CDSE	Converter Equipment Design, Supply & Commissioning
DAB	Dispute Avoidance Board
D&A	Design and Approvals
ECI	Early Contractor Involvement
EES	Environmental Effects Statement
EIA	Environmental Impact Assessment
EPC	Engineer Procure Construct
FO	Fiber Optic
FTE	Full Time Equivalent
GFA	Gross Floor Area
GHG	Greenhouse Gas
GIS	Gas Insulated Switchgear
GPS	Generator Performance Study
HDD	Horizontal Directional Drilling
HE	Hitachi Energy
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
ISP	Integrated System Plan
ITC	Incentivised Target Cost Scheme
ITP	Inspection and Test Plan
LCC	Land Cable Civils
LDV	Leonardo Da Vinci (Cable Installation Vessel)
LHDD	Landfall Horizontal Directional Drilling
LNTP	Limited Notice to Proceed
MLPL	Marinus Link Pty Ltd
NEM	National Energy Market
PEC	Project Energy Connect

PPL	Prysmian Powerlink S.r.l
PQ	Pre-qualification
PSA	Planning Scheme Amendment
TBH	Tracey Brunstrom & Hammond
T&I	Transport and Installation
TCD	Transmission Cost Database
TDR	Time Domain Reflectometry
TJB	Transition Joint Bay
TNSP	Transmission Network Service Provider
TOV	Temporary Overvoltage
TR	Thermal Resistivity
UXO	Unexploded Ordinance
VSC	Voltage Source Converter

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Executive Summary

Aurecon was engaged to provide Marinus Link Proprietary Limited (MLPL) with an independent assessment of the prudency and efficiency of the expenditure estimates it is seeking to put forward to the AER as part of its Stage 1B Revenue Proposal from July 2025 to June 2030 (FY30).

Marinus Link will be delivered through five major capital works and delivery scopes which are outlined below:

Table 1-1 MLPL Expenditure Items and Status

Scope Item	Description
Converter Design and Equipment Supply (CDSE)	▪ As part of the project's scope, MLPL has separated out converter stations (equipment) – which convert alternating current into direct current or vice versa – Into one capital works contract. ▪ MLPL has undergone a competitive procurement process and has an executed contract with Hitachi Energy to deliver this scope of work. ▪ This item is a focus of the AER's assessment of MLPL's submission as a contract has been signed.
Cable System Design, Supply and Installation (CB)	▪ The design, supply and installation of submarine and land cables has been separated out from civil works into a single contract which MLPL took to market. ▪ The scope of the contract also includes landfall horizontal directional drilling ▪ MLPL has signed an executed contract for this item with Prysmian Powerlink S.r.l ▪ This item is a focus of the AER's assessment of MLPL's submission as a contract has been signed.
Balance of Works – Land Cable Civil Works & Converter Civil Works and Installation	▪ Civil works for both Land Cables and Converter Stations are to be tendered within a single "Balance of Works" package in the future. ▪ It is understood that MLPL is currently undergoing an early contractor involvement process with the view of tendering under an Incentivised Target Cost (ITC) scheme in the future. ▪ As the design and scope of work for this package is subject to further iteration, MLPL has put forward expenditure estimates from external advisors for the AER's consideration. However, we understand that the AER will assess this expenditure category again once a contract is executed.
Supporting Activities	▪ MLPL has put forward an estimate of the expenditure it will be required to incur relating to various activities such as land and easement acquisition, stakeholder engagement, technical designs, procurement, program management, corporate business costs, and others. ▪ These expenditure items could be subject to further updates in the future (e.g once all contracts are finalized), but an estimate has been put forward for the AER's consideration.

Scope Item	Description
Risk	▪ Major infrastructure is subject to various risks which can be inherent or contingent in nature. Costs may also relate to prolongation of the project. ▪ Risk allowances are included in major infrastructure project budgets to accommodate for these risks materialising. ▪ Aurecon would expect the risk analysis to be mature for packages which have been tendered and executed, with refinement of the allowance over time for pieces which are subject to finalisation. Aurecon was not asked to assess the maturity and basis for the current risk allowance for the project and therefore cannot confirm this. ▪ MLPL has advised that the risk analysis is not final and will be impacted by the outcome of the Balance of Works tender process, and arrangements for managing interface risk between the various work packages. ▪ Aurecon understands that the MLPL has agreed with the AER for the risk allowance to be assessed once all contracts have been tendered and when supporting activity costs are finalised.

In the table below, we summarise our findings for each of the scope elements included within our review.

Table 1-2 Key Findings

Expenditure Item	Real June 23 $m Cumulative to FY30	Key Takeaways
Converter Design and Equipment Supply	737.2	▪ The scope of work, procurement process, and price outcome for the CDSE package appears reasonable in the context of the current market environment. Risks where identified have been contracted out or managed wherever possible under the EPC structure, with reasonable deviations accepted by MLPL as necessary. ▪ The Hitachi tender offer is based on standard OEM specification with limited room for deviation and is expected to comply with the scope and technical specifications with some exceptions. These exceptions appear to be well understood by all parties and are being managed to ensure that there are no scope gaps in the overall project delivery. ▪ Despite current supply chain challenges and limited market players in the HVDC sector, MLPL's procurement process was competitive and efficient. The receipt and evaluation of more than one detailed proposal aligns with industry expectations, showcasing a prudent approach under current market conditions. ▪ The negotiated cost for the CDSE package aligns with interconnector project benchmarks but is higher than offshore generation project references. No recent interconnector projects in Australia were considered due to the absence of comparable local references. Whilst there are limited Australian references, we note that we would expect the cost to be higher in Australia than international benchmarks due to local technical requirements and market dynamics. The project's lower capacity at 750MVA also impacts economies of scale, contributing to the cost differences. ▪ Aurecon notes that in terms of assessing the complete CDSE package, further analysis may be required once the Balance of Work package and risk analysis (including management of interface risks and provisioning for unknown risks which could impact CDSE costs) is finalised to confirm if all elements are prudent and efficient. However, the information reviewed for the purposes of this submission appears reasonable in our view.

Expenditure Item	Real June 23 $m Cumulative to FY30	Key Takeaways
Cable System Design, Supply and Installation	895.0	▪ The scope of work, procurement process, and price outcome for the CB package appears reasonable in the context of the current market environment. Risks where identified have been contracted out or managed wherever possible under the EPC structure, with reasonable deviations accepted by MLPL as necessary. ▪ The cable supply contract meets the Owner's Requirements, adhering to appropriate design standards and management plans. ▪ The contracts adopt a conservative approach in areas such as cable sizing, thermal backfill, and depth of LHDDs to minimize unforeseen cost escalations. This approach may limit potential cost savings but reduces the risk of substantial future expenses. ▪ The chosen delivery package split aligns with industry norms and aims to gauge market interest, balancing complexity with strategic benefits. This approach and procurement process was considered competitive and efficient by Aurecon given the market constraints. ▪ Including the HDD scope in the contract, despite its complexity, helps mitigate significant project risks, such as vessel standby costs. This approach was crucial for securing project bankability and satisfying financiers' concerns. ▪ Total design supply and installation costs for the offshore and onshore cable system were also benchmarked against four similar projects and the MLPL cost can be seen to be at the lower end in terms of cost per km. However, it is marginally higher on a cost per km basis than Reference Project 4 which is the most comparable benchmark being a 320 kV system and having the closest total cable length. ▪ The price received is reflective of a competitive market process in a region which offers less opportunity for suppliers relative to the European market. As such, MLPL has limited market power, and we would not expect a more competitive outcome given the current climate. ▪ Aurecon notes that, in terms of assessing the complete CB package, further analysis may be required once the Balance of Work package and risk analysis (including management of interface risks and provisioning for unknown risks which could impact CB costs) is finalised to confirm if all elements are prudent and efficient. However, the information reviewed for the purposes of this submission appears reasonable in our view.
Balance of Works – Land Cable Civil Works	[redacted]	▪ [redacted] ▪ [redacted] ▪ [redacted] ▪ [redacted]

Expenditure Item	Real June 23 $m Cumulative to FY30	Key Takeaways
		[redacted]
Balance of Works – Converter Civil Works and Installation	[redacted]	[redacted]
Supporting Activities	[redacted]	[redacted]
Risk	TBC	[redacted]

Expenditure Item	Real June 23 $m Cumulative to FY30	Key Takeaways
		[redacted]
Total	**TBC**	▪ The basis of the estimates put forward by MLPL for contracted elements (CDSE & CB) appear reasonable and prudent. ▪ The overall project's prudency and efficiency will need to be revisited once the risk provision is finalised and the BOW package is tendered.

Aurecon notes that MLPL has been through a competitive market process with a high level of OEM and market engagement – with an AER observer – for the CDSE and CB packages which are executed. For these two packages, we believe the cost elements and scope, (excluding items to be considered in the risk analysis), are likely to be prudent and efficient due to the appropriate process observed.

Whilst Aurecon has sought to provide a view on the suitability of the scope, procurement methodology, and resultant costs of the various MLPL expenditure items that are being put forward, we note that we have not yet been able to review the complete treatment and allowances for risk at the project level, including interface risks across the entire project. Therefore, we cannot yet comment on the overall prudency and efficiency of the project. We are only able to comment on the contracted elements at this stage.

We recommend that the following items be re-assessed in the future to form a more definitive view as to whether the project as a whole is prudent and efficient:

- The Balance of Works package, once the scope has progressed beyond its current design and has been tendered (with costs contracted)
- Support costs, which we understand could be subject to revision
- Treatment and allowances for risk. We understand that risk considerations, mitigation measures, and expected costs are still subject to further refinement. We recommend that the project be re-assessed once these aspects have been articulated, and that any risk allowances included within the current submission are assessed for completeness against the final position to ensure all risks have been accounted for, (including interfaces and potential overlaps).

1 Introduction

This section specifies the project's background, purpose of the report, Marinus Link's project status, Aurecon's scope of work and independent review limitations.

1.1.1 Background

Marinus Link is a significant national infrastructure project that should deliver considerable benefits to electricity consumers by reducing wholesale electricity prices. The project includes the construction of approximately 255 kilometres of undersea High Voltage Direct Current (HVDC) cable and roughly 90 kilometres of underground HVDC cable in Victoria. It also includes converter stations in both Tasmania and Victoria.

The total interconnection capacity will reach 1500 MW, facilitated by two 750 MW cables (circuits). The first cable is expected to be commissioned in 2030, while the second cable is not expected to be required before 2034. The timing of the second cable will be kept under review, including through the Australian Energy Market Operator's (AEMO's) national planning role.

Figure 1-1 Marinus Link

Marinus Link is part of a larger project, which is referred to as Project Marinus, which will be developed and owned by different entities:

- Marinus Link will be owned and operated by Marinus Link Pty Ltd (MLPL).
- The Northwest Transmission Development component of Project Marinus will be owned and operated by TasNetworks.

Marinus Link aims to address Australia's need for affordable and reliable electricity as coal-fired generation plants retire. By leveraging Tasmania's existing hydro capacity, wind resources, and energy storage capability, Marinus Link will provide the National Electricity Market (NEM) with low-cost, on-demand, and clean energy.

1.1.2 Marinus Link project status

In accordance with the Australian Energy Regulator's (AER) Commencement and Process Paper, as amended in March 2024:

- Marinus Link's Revenue Proposal Part 1A (Early works) covered its early works expenditure period from 1 July 2021 to 31 December 2024.
- The scope of MLPL's Revenue Proposal – Part 1B (Construction costs) is limited to the works required to deliver the first cable and the necessary works in readiness for the second cable.
- MLPL's first regulatory period will apply from 1 July 2025 to 30 June 2030.
- The second cable will be treated as a Contingent Project, which may be triggered during MLPL's first regulatory control period.

Figure 1-2 below shows the timelines for the revenue determinations for Stage 1, which comprises the Part A (Early works) and Part B (Construction costs) and Stage 2. It also shows the proposed duration of the first and second regulatory periods, the latter being for information only.

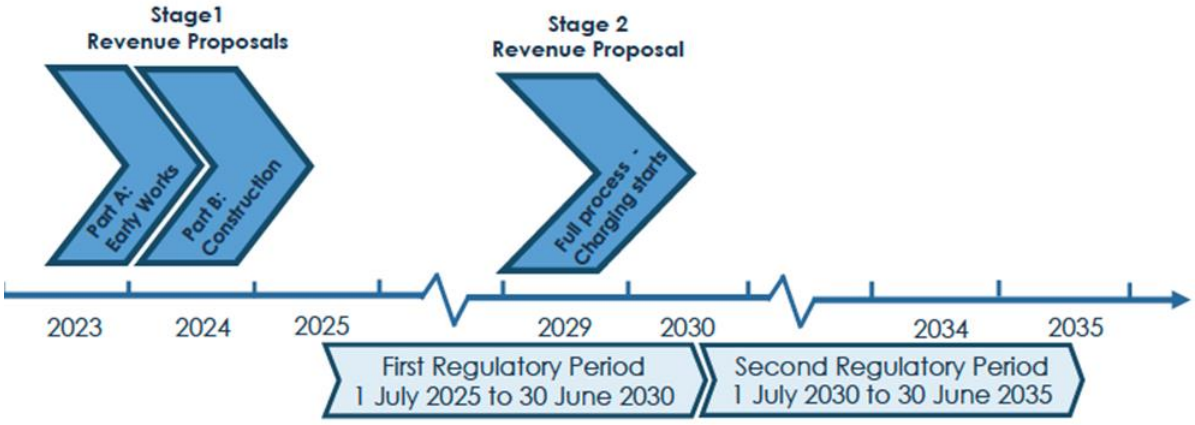


Figure 1-2 Marinus Link Regulatory Process

1.1.3 Delivery Package and Procurement Overview

The Marinus Link project will be delivered primarily through three major capital works packages:

- Cable supply and installation (CB)
- Converter design and supply of equipment (CDSE); and
- Balance of works packages – Converter design and construct and land cable civils

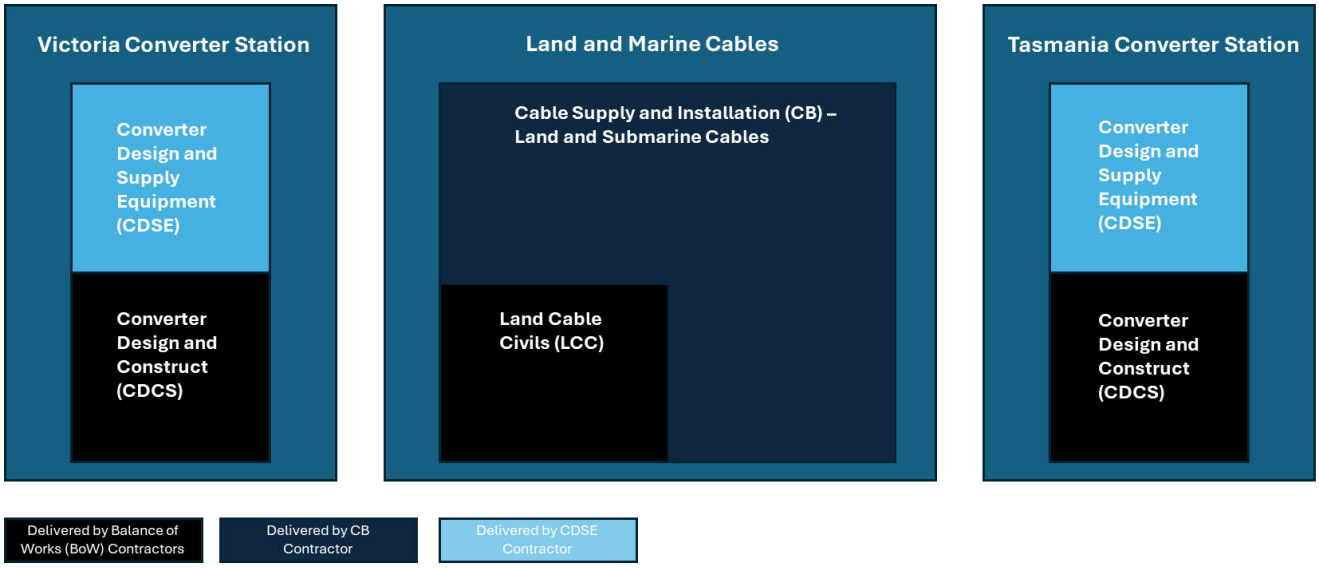


Figure 1-3 Marinus Link Delivery Packages

The delivery of the project in these three packages is based on extensive feedback that MLPL has received to ensure that its procurement approach and delivery strategy is best in class, given several unique challenges due to the project's isolated location in Australia:

- A limited number of international suppliers exist with the required skills and experience to meet MLPL's requirements. They may also have limited experience in the Asia Pacific region.
- Marinus Link is located remotely from manufacturing bases, headquarters and engineering offices, creating logistical challenges for prospective service providers.
- Cable laying vessels will likely need to be relocated from the Northern Hemisphere, which is time sensitive and costly, given the high demand for their services in Europe and North America.

- Prospective service providers are less likely to have relationships with local contractors, which introduces additional risks and uncertainties compared to competing projects located in more familiar markets.
- Suppliers for HVDC projects are likely to have greater market power than MLPL, given that there is a larger demand for HVDC projects in Europe relative to the Asia Pacific/Oceania region where Australia is located (see Figure 1-4 below). This implies that suppliers and manufacturers are less willing to negotiate on key risk positions.

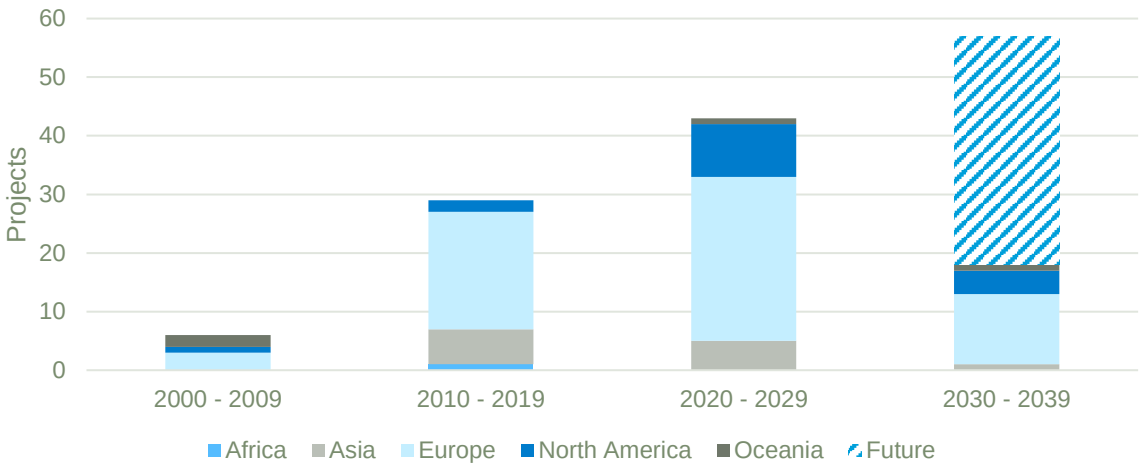


Figure 1-4 Market Outlook for Converter Stations (sourced MLPL)

MLPL has sought to manage these risks by seeking expert advice on its procurement and delivery strategy, specifically on aspects such as (but not limited to):

- Packaging capital works for efficiency
- Optimal number of parties within each procurement process and their respective market power against each package
- Suitability of various contracting models when considering package specific risks and their alignment to supplier's expectations
- Ensuring that technical requirements in RFQs are aligned to the majority of the tenderer's capabilities and expectations as far as reasonably practicable
- Ensuring that incentive and risk sharing arrangements are balanced
- Provisioning for risk that could arise from interface risks

Aurecon has seen MLPL's explanatory notes across each of its various delivery packages, which articulate its procurement approach as a result of the above analysis (noting that not all information has been reviewed due to commercial sensitivity). Aurecon has also relied on discussions with MLPL.

MLPL has also engaged heavily with the AER to provide background on the challenges faced by the project and MLPL's decision making process.

MLPL has also engaged heavily with its Consumer Advisory Panel from 2022 where possible, to receive feedback on procurement decisions which are likely to involve price-risk trade-offs, which will be of particular interest to consumers.

The Consumer Advisory Panel received encouragement from MLPL to also procure an independent procurement advisor to facilitate their input into MLPL's procurement approach to ensure it was balanced. The Panel subsequently appointed Tate Consulting Services, who has provided input into MLPL's procurement approach on behalf of the Panel since 2023.

As part of MLPL's Stage 1B submission to the AER, we note that tender outcomes have been confirmed for the CB and CDSE contractors. The balance of works packages is still pending. It should be noted that the expenditure put forward by MLPL for the Balance of Works Package (Land Cable Civils and Converter Civils) should be considered as a placeholder estimate for MLPL's investment decision. MLPL will submit revised

expenditure estimates in 2025 to the AER as it engages further with contractors and receives tender responses.

1.1.4 Purpose of this report

The purpose of this report is to:

- Provide an independent assessment of the real expenditure (June 2023) from 1 July 2025 to 30 June 2030 for Stage 1 Part B (Construction Works) of Marinus Link.
- Evaluate the likely prudency and efficiency of the forecasts based on the Expenditure Forecasting Methodology used in Stage 1 Part B.
- Determine whether the costs and forecasts outlined in Stage 1 Part B are likely to be prudent and efficient, and whether they are essential to meet project timelines, reduce final project costs, and/or minimise schedule and cost risks.

1.1.5 Limitations

- The scope of Aurecon's work relates to Marinus Link which encompasses the scope of converter sites, the required infrastructure between the sites in Hazelwood in Victoria and Heybridge in Tasmania, and not "Project Marinus" which includes broader transmission infrastructure within Tasmania.
- Given the time constraint placed on Aurecon in undertaking this review, we have focused our review on the material cost items within Marinus Link's expenditure model and Stage 1B proposal to the AER. For costs related to capital works, this generally means costs in excess of $10m. For those related to labour or services costs, this relates to those greater than $1m or so.
- The scope of this assessment only spans one circuit of 750MW within the overall project. Civil works for both circuits however are included within the scope of our review.
- This report, prepared by Aurecon for MLPL, is intended solely for the use and reliance of MLPL for the agreed-upon purpose stated in section 1.1.2 of this report.
- Aurecon explicitly disclaims any responsibility to any other party arising from this report. Implied warranties and conditions are also excluded to the extent permitted by law.
- Aurecon's services in preparing this report were limited to the scope limitations stated within the report.
- The opinions, conclusions, and recommendations in this report are based on the conditions and information reviewed at the time of its preparation. Aurecon is not obligated to update the report to account for subsequent events or changes.
- The opinions, conclusions, and recommendations in this report are based on assumptions made by Aurecon as outlined in the report. Aurecon disclaims any liability that may arise from the incorrect assumptions.
- Although Aurecon has made assertions on the scope of the activities Marinus Link has sought to undertake, Aurecon has not in all instances cited or verified every output produced by MLPL or provided judgement on the quality or completeness of all documents referenced.
- Aurecon has not verified the integrity of any calculations or inputs to the expenditure estimates provided to us by MLPL and assumes information provided is accurate unless otherwise stated or observed.
- As the risk analysis will be updated following the completion of the Balance of Works tender, Aurecon has not been asked at this stage to provide a complete view on the prudency and efficiency of all elements of expenditure with respect to how risk is being addressed, and how interface risks have been managed across various packages of the project.

2 Independent Verification Process

Aurecon has provided an independent verification of the capital works put forward by Marinus Link by utilising a range of verification approaches such as:

- Engaging with MLPL to understand how the scope of work has been developed, testing the resourcing and procurement strategy and timeframes for implementation.
- Reliance on tender documentation – Aurecon has reviewed documents provided by MLPL which provide the basis for pricing via a competitive process.
- Benchmarking – Aurecon has benchmarked expenditure cost elements based on publicly available project benchmarks, our project experience, and databases such as AEMO's Transmission Cost Database.
- Assessing whether costs proposed are prudent and would be incurred by other Transmission Network Service Providers (TNSP) in similar circumstances.
- Evaluating whether internal or service providers costs are complete and represent an efficient team structure and position rate.
- Reviewing timeframes developed by MLPL to deliver on its work programs.
- Verification of unit rates and underlying assumptions where costs have been provided by third parties.

3 MLPL Stage 1B Expenditure Cost and Methodology Summary

This section summarises the total expenditure MLPL is seeking to recover as part of this revenue proposal and the methodology Aurecon understands has been applied to derive actual and forecast projections. Aurecon's summary is outlined below.

Table 3-1 Total Expenditure Cost

Expenditure Item	Real June 2030 $m Cumulative to FY30	MLPL Methodology
Converter Design and Equipment Supply	737.2	▪ MLPL has worked with its technical advisors and internal SMEs to develop a technical specification for this work package. ▪ MLPL issued this technical specification to contractors and undertook both a long-listing and short-listing process as a part of its EPC procurement process. ▪ MLPL received responses from three parties, then evaluated the competitiveness of their financial offer, technical alignment to the specification, and risk profile. ▪ The proposed cost reflects market pricing from the tender process. ▪ With respect to the treatment and provisioning for risk, we note that some aspects are incomplete (e.g interface risk).
Cable System Design, Supply and Installation	895.0	▪ MLPL has worked with its technical advisors and internal SMEs to develop a technical specification for this work package. ▪ MLPL issued this technical specification to contractors and undertook both a long-listing and short-listing process as a part of its EPC procurement process. ▪ MLPL received responses from two parties, then evaluated the competitiveness of their financial offer, technical alignment to the specification, and risk profile. ▪ The scope includes Landfall Horizontal Directional Drilling (LHDD). ▪ The cost put forward reflects market pricing from the tender process. ▪ With respect to the treatment and provisioning for risk, we note that some aspects are incomplete (e.g interface risk).
Balance of Works – Land Cable Civil Works	[redacted]	▪ Marinus Link is still progressing its technical design and procurement process for a balance of works contractor, which will include land cable civils (LCC). ▪ MLPL has put forward a cost estimate produced by a suitably qualified and experienced civil estimator for the LCC component as a credible alternative at this stage. The cost estimate is aligned to the technical specification put forward by MLPL. ▪ It is expected that this value will be superseded by a competitive market process that incentivises the contractor to provide the lowest-cost LCC scope. ▪ With respect to the treatment and provisioning for risk, we note that some aspects are incomplete (e.g interface risk).

Expenditure Item	Real June 2030 $m Cumulative to FY30	MLPL Methodology
Balance of Works – Converter Civil Works and Installation	[redacted]	▪ Marinus Link is still progressing its technical design and procurement process for a balance of works contractor, which will include converter civil works and installation (CCW). ▪ MLPL has put forward a cost estimate produced by a suitably qualified and experienced civil estimator for the CCW component as a credible alternative at this stage. The cost estimate is aligned to the technical specification put forward by MLPL. ▪ It is expected that this value will be superseded by a competitive market process that incentivises the contractor to provide the lowest-cost scope. ▪ With respect to the treatment and provisioning for risk, we note that some aspects are incomplete (e.g interface risk).
Supporting Activities	[redacted]	▪ MLPL has put forward a bottom-up cost estimate for supporting activities, which includes activities such as land and easement acquisition, engineering and technical support, system studies, environmental impact assessments, and corporate support costs, among others. ▪ Land and easement acquisition costs has been derived from expert input from MLPL's advisors, in accordance with State legislation with respect to land acquisition where applicable. ▪ MLPL has also prepared bottom up cost estimates for engineering and technical support and system studies which it will require for implementation of the project. ▪ The majority of costs have been cross checked against benchmarks where possible or reviewed by the appropriate internal SMEs. ▪ MLPL has developed a bottom up cost estimate for its management costs (owners' costs). This includes the cost of technical staff, corporate staff, indirect costs, and on-costs of labour. ▪ The majority of costs have been cross checked against benchmarks where possible or reviewed by the appropriate internal SMEs.
Risk Allowance	TBC	▪ Aurecon has not been asked to review MLPL's provisioning and treatment of project risk in full. ▪ It is understood that this will be submitted to the AER at a later date
Total	**TBC**	

*Totals may not sum due to rounding

In the sections below Aurecon provides further detail on the components which have formed the basis of MLPL's projections and our view on the reasonableness and prudency of these costs.

4 Contracted Cables and Converter Construction Costs

This section assesses contracted construction costs for cables and converter stations as proposed by MLPL.

4.1 Methodology

This section summarises Aurecon's review of the activities MLPL has undertaken as part of its Stage 1B submission to the AER for its prudency and efficiency.

This section focusses on elements which are currently contracted by MLPL, namely:

- Converter design and equipment supply (CDSE).
- Cable system design, supply and installation (CB).

At the time of this report, project contingency provisions and the associated project risk registers have not been finalised as they are pending the completion of the Balance of Works tender. Therefore, the following sections have highlighted risks that Aurecon recommends for consideration in preparing the final risk register and contingency provisions of the project once the tender is progressed. This will be necessary to ensure that the final expenditure for the project is prudent and efficient.

Additionally, the costs presented below exclude any provisions beyond FY2030. Benchmark projects included in the following section account for all costs, incorporating contingency for planned projects and final contingency expenditures for completed projects. Consequently, the benchmarks are provided to assess the rough order of magnitude of MLPL's cost provisions, and we note that there could be differences in inclusions in costs.

4.2 Converter Design and Equipment Supply

This section assesses Converter Design and Equipment supply.

Objectives and scope

Table 4-1 below summarises the objectives and scope of Converter Design and Equipment Supply.

Table 4-1 Objectives and scope of Converter Design and Equipment Supply

Objectives	Scope
▪ Contractually agree the expenditure required for contractors to deliver major capital works. ▪ Ensure that the tender responses and technical specifications put forward are reasonable and meet MLPL's requirements. ▪ Ensure risk is adequately considered or priced into contracts by MLPL and its contractors. ▪ Secure contractors to deliver major capital works packages for the design and supply of converter station equipment. ▪ Develop a suitable procurement and delivery approach which generates value for money.	▪ Procure and install key Converter Station equipment which are designed to fit MLPL's technical specifications, specifically: – VSC Converters. – Interface Transformers. – Converter Cooling System. – Converter Reactors and Smoothing Reactors. – AC Filters. – DC and AC Voltage and Current Measuring Devices. – AC Circuit Breakers. – DC and AC Disconnectors and Earth Switches; and

Objectives	Scope
▪ Ensure project risks are well defined and managed.	– Others

4.2.1 Expenditure Summary

MLPL executed a contract with Hitachi Energy (HE) on 1st May 2024, for the design, supply and commissioning of HVDC equipment for the two converter stations located in Victoria and Tasmania. A Limited Notice to Proceed (LNTP) was issued to HE on August 14, 2024.

The executed contract is a lump sum and as such detailed expenditure breakdowns per activity or sub-package were not provided by HE. While this increases the difficulty to benchmark sub-package costs, it is not unusual for contractors to offer lump sums and provide rates for additional work generally higher than rates used to build the lump sum budget.

Table 4-2 below summarises the costs provisioned by MLPL for the CDSE package in the cost model provided (Marinus Link, 2024). For the purpose of this assessment, prices presented in the signed contract were de-escalated, presented in real June 2023 terms and converted into AUD following the exchange rates provisioned in MLPL's hedging contract.

Table 4-2 Summary of Supply Costs – Real June 2023 (CDSE)

Cost Element ($ Real) to FY30	Total ($m)
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
Total cost[1]	**737.2**

[1] Subtotals and totals may not sum due to rounding.

4.2.2 Scope and Specification Assessment

The table below summarises our review of the scope of work and key terms referenced in the executed CDSE contract and our views on the appropriateness of technical assumptions.

Table 4-3 Scope Provisions & Appropriateness (CDSE)

Subpackage	Description of main provisions	Aurecon's view on the appropriateness of the scope
Fitness for Purpose of MLPL Specifications	■ MLPL has included a Converter Station Technical Specification (MLPL, 2023) on which the executed contract is based. This Technical Specification includes detailed requirements for all major converter station equipment and systems including: – VSC Converters. – Interface Transformers. – Converter Cooling System. – Converter Reactors and Smoothing Reactors. – AC Filters. – DC and AC Voltage and Current Measuring Devices. – AC Circuit Breakers. – DC and AC Disconnectors and Earth Switches. – Surge Arresters. – Insulators, Bushings, Connectors and Buswork. – Control and Protection system. – SCADA system. – AC and DC auxiliary power systems including transformers, switchgear, switchboards, backup UPS and diesel generator. – Lightning protection and earthing. ■ In addition to the equipment and systems technical specifications, the MLPL Technical Specification (MLPL, 2023) includes detailed performance requirements for the Converter Station.	■ Aurecon has reviewed the technical specifications and performance requirements provided by MLPL for the major converter station equipment and systems and is of the opinion that these: – Are well aligned with typical industry practice for similar projects – Include sufficient detail for the Contractor to provide a solution that is aligned with the intent of the Technical Specification.

Subpackage	Description of main provisions	Aurecon's view on the appropriateness of the scope
Hitachi Tender Design	▪ The HVDC technology being provided is multi-level VSC technology using a newer version of Hitachi's proven VSC technology that is presently in operation in many projects around the world. ▪ Hitachi's proposed solution includes a Grid forming solution on both sides of the HVDC system which will benefit both the AusNet and TasNetworks Grids. It is understood that simultaneous operation of Grid forming capabilities on both sides of the HVDC system has not yet been implemented in practice. ▪ The Interface Transformers proposed are Hitachi transformers. ▪ The HV Control and Protection system is a proprietary Hitachi system known as MACH3 which is a proven system currently in operation across many Hitachi HVDC VSC control systems. Typical HV protection functions are included for the converter, DC poles, transformers, filters and busses. ▪ Hitachi has indicated that their proposed converter design will have lower losses than required by the contract and meet the availability and reliability performance requirements.	▪ Hitachi is contractually obligated to meet all Owner Requirements with some deviations as noted and discussed towards the end of this table. Aurecon is of the opinion that these Owner Requirements are aligned with typical industry practice for similar HVDC Converter Stations. The detail of the Hitachi proposed solution is lacking in some areas (for example, detailed control and protection drawings), but Hitachi has a proven record delivering HVDC technology and it is understood that most of the equipment and systems will be based on Hitachi's standard design. Consequently, Aurecon expects that Hitachi can deliver a solution that meets the Owner Requirements (Aurecon was not provided any model specifications to cross check this but has believes this to likely be the case from our experience). ▪ The Owner Requirements include scope for the Contractor to develop any new technologies that may be required for the project and Aurecon is of the opinion that this includes any necessary development of any new HVDC technology being proposed, including the control technology for the grid-forming converter capabilities which have not yet been implemented by Hitachi on other projects. It is recommended that a comprehensive new technology validation process be implemented as part of this project and that this new technology risk be quantified in project allowances ▪ Specifications are in accordance with MLPL tech spec, Hitachi has a standard OEM specification with limited room for deviation.
Scope of Work: Converter Station Design	▪ Design all HVDC equipment, systems and sub-systems required for the Stage 1 Converter Stations, including the auxiliary supply system. ▪ Complete all necessary electrical studies required to allow for safe and reliable construction and operation of the Stage 1 Converter Station. Hitachi has provided a detailed assessment of the studies that are within their scope of supply in document (Hitachi Energy, 2024).	▪ Aurecon is of the opinion that the design scope is aligned with typical industry practice for similar HVDC Converter Stations and generally meets the requirements of the MLPL technical specifications. ▪ Aurecon is of the opinion that the approach to the electrical studies as outlined in the Study Assessment report (Hitachi Energy, 2024) is generally aligned with typical industry practice for similar HVDC projects.
Scope of Work: Converter Station Equipment Supply	▪ Manufacture and/or procure all HVDC equipment, systems and sub-systems required for the Stage 1 Converter Stations, including the auxiliary supply system.	▪ Aurecon is of the opinion that the manufacturing and procurement scope is aligned with typical industry practice for similar HVDC Converter Stations and meets the requirements of the MLPL technical specifications.

Subpackage	Description of main provisions	Aurecon's view on the appropriateness of the scope
	▪ Transport and supply all HVDC equipment, systems and sub-systems required for the Stage 1 Converter Stations, including the auxiliary supply system to the Converter Station sites. ▪ Installation of the Interface transformers and the converter valves for the Stage 1 Converter Stations.	▪ Aurecon is of the opinion that the installation scope being limited to the Interface transformers and converter valves is aligned with typical industry practice for similar HVDC Converter Stations adopting a similar contracting strategy.
Scope of Work: Converter Station Testing and Commissioning	▪ Test and commission all HVDC equipment, systems and sub-systems required for the Stage 1 Converter Stations, including the auxiliary supply system.	▪ Aurecon is of the opinion that the testing and commissioning scope is aligned with typical industry practice for similar HVDC Converter Stations and meets the requirements of the MLPL technical specifications.
Key Interfaces	▪ The scope of the executed contract is fairly typical of similar HVDC equipment design and supply contracts for other projects undertaken recently around the world with the key interfaces being: – Interface between CDSE and CDCS Contractors. – Interface between CDSE and AusNet / TasNetworks / AEMO. – Interface between CDSE and Cable Contractor. ▪ The design of the 500 kV overhead connection between the interface transformers and the new 500 kV switchyard seems like it may require an outage to install the second 500 kV connection for Stage 2 which may require an update to the layout.	▪ Aurecon is of the opinion that the Division of Responsibility between the CDSE and CDCS contractor is aligned with typical industry practice for similar HVDC Converter Stations adopting a similar contracting strategy. ▪ Aurecon is of the opinion that challenges related to the scope split between the CDSE and CDCS Contractor are unavoidable aspects of the adopted contracting strategy but can be properly managed to deliver a successful project. Examples of these challenges include: – LV auxiliary system design and supplied by CDSE but the cables and cable trays connecting all the equipment are designed and supplied by CDCS. – Electrical equipment support structures designed and supplied by CDSE, but foundations are designed and supplied by CDCS. – The interdependency of design and delivery of different Contractors' scope means that parties are reliant on each other to progress certain scope items. This requires careful management of schedule risk. ▪ The risk to project delivery due to interfaces not being properly managed are significant and should be captured in the project allowances via development of a risk report ▪ Aurecon is of the opinion that any layout changes required to facilitate integration of Stage 2 without requiring an outage of Stage 1 can be incorporated during detailed design.

Subpackage	Description of main provisions	Aurecon's view on the appropriateness of the scope
Key Exemptions	■ Notable exceptions to the scope include: – The 500 kV switchyard extension required to connect to the existing Hazelwood 500 kV switchyard. It is understood that this project component is not within the scope of this funding request. – The 220 kV AC switching station required to connect to the existing TasNetworks 220 kV system. It is understood that this project component is not within the scope of this funding request. ■ There do not appear to be any costs associated with Stage 2 Converter Station incorporated into Stage 1 aside from reasonable scope items that would be common to both sites including: – Main access road and gates. – Provision of sufficient space within the site for Stage 2 to be constructed using the Stage 1 access roads. – Provision of administrative rooms in Stage 1 that may also end up being used for Stage 2. – Preliminary layout design of Stage 2. – Audible noise report for Stage 2. – Power system studies to demonstrate Stage 2 is feasible assuming same design as Stage 1.	■ Aurecon is of the opinion that the exceptions to the scope are well understood by all parties and are being managed to ensure that there are no scope gaps in the overall project delivery. ■ Aurecon is of the opinion that the costs associated with Stage 2 Converter Station that are incorporated into the Stage 1 scope are limited to what is necessary for the Stage 1 scope delivery while leaving sufficient provision for Stage 2 to be delivered at a later stage.
Key Deviations to Owner's Requirements	■ Several technical deviations to the Owner Requirements have been identified in the executed contract that may lead to change orders. These include the following: – Protection control and monitoring system functionality including integration with AEMO/TNSP requirements. – RSI cubicle locations. – Cable fault locator requirements.	■ Aurecon was not able to confirm from the information provided if these deviations are presently resolved, or if the resolution of these deviations may lead to change orders and price increases which should be captured in the project allowances. ■ It is suggested that the risk analysis which is subject to finalisation confirm this, then considers the impact of these items on cost (if any).
Availability and Reliability Guarantees	■ Undertake all activities required to demonstrate compliance with the performance requirements, including Availability and Reliability Guarantees.	■ Aurecon is of the opinion that the Availability and Reliability Guarantees and calculation methods are well detailed in the executed contract and are in line with industry standards.

4.2.3 Procurement and Delivery

The table below summarises the procurement process adopted to secure the CDSE contract and our views on its appropriateness.

Table 4-4 Adopted Procurement Strategy (CDSE)

Category	Adopted Strategy	Aurecon's view on the appropriateness of the adopted strategy
Package Split	▪ MLPL initiated a procurement process focused on Tier 1 HVDC equipment suppliers. ▪ Five responses were received in the pre-qualification invitation from parties including ABB Power Grids Sweden (Hitachi), UK Grid Solutions, NARI Technology, Siemens Energy, Toshiba International. ▪ Three parties were prequalified for the design and supply of HVDC equipment packaged (denoted as "CDSE"). ▪ The design and construct station package (denoted as "CDCS") is not part of the CDSE package.	▪ Aurecon is of the opinion that the adopted package split reflects industry expectations. ▪ Aurecon understands some work has been undertaken on interface risk between CDCS and CDSE packages, but this is subject to further review as the risk piece from MLPL is pending finalisation
Competitiveness of the process	▪ MLPL advised tenderers of the revised project programme and intention to focus on Stage 1. ▪ MLPL allowed a bid preparation time of 6 months reflecting the high maturity of lumpsum proposals expected from contractors. Initial proposals were received in July 2023 while a revision of the scope was communicated in October 2023. The preferred supplier status was disclosed to the selected bidder in December 2023 as a result of extensive negotiations. A LNTP was then issued in August 2024.	▪ Aurecon is of the opinion that the limited number of proposals reflect the current supply chain challenges in the HVDC market and is pleased to note that more than one detailed proposal was received and evaluated. ▪ In consideration of the limited number of market players and strong demand in the sector, Aurecon is satisfied that MLPL's procurement process for this scope was as competitive and efficient as possible, and therefore prudent and efficient.
Contract Price Adjustments	▪ Aurecon assessed the exposure of the Project to cost fluctuations post contract award. The contract executed with Hitachi provisions that payments will be made in SEK, EUR, USD and AUD. In order to mitigate the risk of foreign exchange, fluctuations identified by MLPL, a hedging contract is provisioned as a Project cost. ▪ The executed contract provisions for positive and negative adjustments associated with commodity price fluctuations. In order to mitigate the risk of commodity price fluctuations identified by MLPL, a hedging contract is provisioned as a Project cost.	▪ While this exposes the project to substantial fluctuations, this risk was identified and quantified in the project budget via a hedging cost provision. ▪ Hedging is currently in place for foreign exchange up to the Notice to Proceed milestone. Hedging for foreign exchange and relevant commodity fluctuations post NTP will be entered into at NTP. ▪ Aurecon is also pleased to note that negative adjustments are permitted, offering a benefit-sharing mechanism to the Project should global raw material prices decline as currently forecasted and likely optimising the cost of the hedging contract.

4.2.4 Forecast Expenditure and Benchmarking

HVDC equipment supply costs generally are linearly related to voltage with an intercept. An increase in voltage usually results in a large increase in cost per MW. As such, references relying on 320 kV were prioritized for this assessment. Further, key European HVDC suppliers tend to offer different prices as they offer varying technologies.

Table 4-5 below presents a summary of normalised CDSE benchmarks against anonymised sources. Though all costs are presented in $real June 2023, references were obtained between 2018 and 2024 and as such capture the evolving nature of the HVDC market. Aurecon is of the opinion that the cost negotiated for the CDSE package is within the range of that of an interconnector project and relatively higher than other reference offshore generation projects. No reference project in Australia was used due to a lack of recent interconnector projects. While the local premium on the supply of equipment remains limited, local requirements impacting technical specifications justify the differences between reference projects. The limited economies of scale associated with the project capacity affects the cost.

Table 4-5 Summary of Normalised Benchmarks – Real $ June 2023 (CDSE)

Ref.	Project Type	Capacity (MW)	Voltage (kV)	Reference Year	Total[1] ($m/MW)
R1	Subsea interconnector	1,400	525	2020	0.49
R2	Subsea interconnector	1,400	525	2023	0.41
R3	Subsea interconnector	1,400	525	2021	0.44
R4	Subsea interconnector	700	320	2026	0.66
MLPL	**Subsea Interconnector**	**750**	**320**	**2023**	**0.49**
R5	Offshore generation project	1,050	320	2018	0.33
R6	Offshore generation project	1,200	320	2018	0.30
R7	Offshore generation project	1,200	320	2021	0.33
R8	Offshore generation project	400	150	2021	0.22
R9	Offshore generation project	800	320	2021	0.23
R10	Offshore generation project	1,200	320	2021	0.20
R11	Offshore generation project	1,200	320	2022	0.27
R12	Offshore generation project	1,000	320	2022	0.38
R13	Offshore generation project	1,000	320	2022	0.48
R14	Offshore generation project	1,000	320	2022	0.59
R15	Offshore generation project	1,200	320	2024	0.36

[1] Cost per MW per converter station.

4.2.5 Conclusion

Scope

The scope and technical specifications for the converter station design and supply are reasonable and aligned with typical industry practice for similar HVDC converter stations adopting a similar contracting strategy

The Hitachi tender offer is based on standard OEM specification with limited room for deviation and is expected to comply with the scope and technical specifications with some exceptions. These exceptions appear to be well understood by all parties and are being managed to ensure that there are no scope gaps in the overall project delivery.

Challenges related to the scope split between the various contractors involved in the converter station delivery are unavoidable aspects of the adopted contracting strategy but can be properly managed to deliver a successful project

The costs associated with Stage 2 Converter Station that are incorporated into the Stage 1 scope are limited to what is necessary for the Stage 1 scope delivery while leaving sufficient provision for Stage 2 to be delivered at a later stage.

Price Risk

There are risks of price increases due to:

- Presently unresolved deviations between the Hitachi offer and the MLPL scope/technical specifications
- Interface risk
- Technology risk

Suitability on procurement process:

Despite current supply chain challenges and limited market players in the HVDC sector, MLPL's procurement process was reasonably competitive and efficient. The receipt and evaluation of more than one detailed proposal aligns with industry expectations, showcasing a prudent approach under current market conditions.

Aurecon confirms that the executed contract's base scope will be protected from foreign exchange and commodity price fluctuations. Additionally, the inclusion of a benefit-sharing mechanism for potential global raw material price declines is recognized as a cost-optimizing strategy that supports financial stability for the project.

Benchmarking

The negotiated cost for the CDSE package aligns with interconnector project benchmarks but is higher than offshore generation project references. No recent interconnector projects in Australia were considered due to the absence of comparable local references. Whilst there are limited Australian references, we note that we would expect the cost to be higher in Australia relative to international benchmarks due to local technical requirements and market dynamics. The project’s lower capacity at 750MVA also impacts economies of scale, contributing to the cost differences.

The cost related to the MLPL CDSE package could increase, considering that the $737m figure for MLPL accounts for 2023 real cost up to June 2030 only and excludes any final risk costs (which are yet to be finalised by the project), making benchmarking challenging, as benchmarks are based on total completed project actual costs. However, we note that MLPL has undergone a competitive procurement process and engaged extensively with the market. The current price fits within benchmarks and reflects a prudent process.

Concluding comments

The scope of work, procurement process, and price outcome for the CDSE package appears reasonable in Aurecon’s view and in the context of the current market environment. Risks have been contracted out or considered wherever possible under the EPC structure, with reasonable deviations accepted by MLPL.

Aurecon notes that in terms of assessing the complete CDSE package for prudency and efficiency, some uncertainty still remains as the Balance of Work package and risk analysis is subject to further refinement. However, the information reviewed for the purposes of the current expenditure MLPL is seeking to receive approval for appears reasonable in our view.

It is suggested that once the Balance of Work package is contracted and risk piece is updated that interface risks and other provisions relating to the CDSE package are re-assessed as there could be potential expenditure impacts that need to be captured.

4.3 Cable System Design, Supply, and Installation

This section assesses Cable System Design, Supply, and Installation.

Objectives and scope

Table 4-6 summarises the objectives and scope of Cable System Design, Supply and Installation.

Table 4-6 Objectives of Cable System Design, Supply and Installation

Objectives	Scope
▪ Contractually agree the expenditure required for contractors to deliver major capital works. ▪ Ensure that the tender responses and technical specifications put forward are reasonable and meet MLPL's requirements. ▪ Ensure risk is adequately considered or priced into contracts by MLPL and its contractors. ▪ To develop a suitable procurement and delivery approach which generates value for money. ▪ Ensure project risks are well defined and managed. ▪ Minimise interface risks between Landfall HDD and the Submarine Cable scope.	▪ To secure contractors to deliver major capital works packages for Cable System Design, Supply and Installation, including landfall HDD.

4.3.1 Expenditure Summary

MLPL executed a contract with Prysmian Powerlink S.r.l (PPL) on 1 August 2024, for the design, supply and installation of the Stage 1 power cable, covering the onshore and offshore portion of the Project, along with the LHDD to accommodate the Stage 1 and Stage 2 power cables.

The executed contract is a lump sum and as such detailed breakdown per activity were not provided by PPL (Aurecon was not provided an executed contract from PPL to review otherwise).

Table 4-7 below summarises the costs provisioned by MLPL. For the purpose of the assessment, prices presented in the signed contract were de-escalated, presented in real June 2023 terms and converted into AUD following the exchange rates provisioned in MLPL's hedging contract.

Table 4-7 Summary of Supply Costs – $ Real June 2023 (CB)

Cost Element ($ Real) to FY30	Total ($m)
Cable System Design, Supply and Installation Work (Contract)	755.6
Subtotal cost[1]	**755.6**
LHDD Work (Subcontract)	105.6
[redacted]	
Subtotal cost[1]	**131.4**
Additional Allowances (Cost Adjustments for Metals, Fuels, HDPE, Submarine Cable Sizing)	**8.0**
Total cost[1]	**895.0**

[1] Subtotals and totals may not sum due to rounding.

4.3.2 Scope and Specification Assessment

A summary of the Marinus Link cable system is as follows: two point-to-point symmetrical monopoles that adopt voltage source converter modular multilevel converter technology between the State of Tasmania, Australia and the State of Victoria, Australia. Where each interconnector is operated at 750 MW continuous capacity and a nominal voltage of ±320 kV. A point-to-point symmetrical monopole system requires two cables (positive and return) meaning the full 1,500 MW capacity requires four cables. The executed Cable Supply contract covers the supply of stage 1 only i.e. a single symmetrical monopole system comprising of two cables.

Table 4-8 below summarises our review of the scope of work and key terms referenced in the executed cable contract and our views on the appropriateness of technical assumptions.

Table 4-8 Scope Provisions & Appropriateness (CB)

Subpackage	Description of main provisions	Aurecon's view on the appropriateness of the scope
Tender Design: Land Cable	▪ Options for the onshore cable section are specified with Aluminium (Al) or Copper (Cu) conductors with cross-sectional area 2,000 mm^2, 2,500 mm^2 or 3,000 mm^2 with cross-linked polyethylene insulation technology. The onshore cable length is approximately 90 km through Gippsland in Victoria between end terminations in the Hazelwood Converter Stations and the transition joint located in Waratah Bay. ▪ Land cable rating calculation reports. Schedule 6 outlines assumed thermal resistivity (TR) values (TR = 3, 1.4, 1.2, 1.0 K.m/W). ▪ Design of earthing system, fibre optical telecommunication cables, cable monitoring systems, cable fault locating equipment, other necessary fittings and accessories, back-up materials, spare parts, terminations, joints, joint bays, link boxes and all related auxiliary equipment. ▪ Design interfaces with the LCC, CDCS and CDSE contractors including the following specific items: – Review LCC contractor's designs covering construction, as-built data, installation method statements for cable installation, including the cable termination civils and structures – Design requirements for laydown areas and access / haul roads to the joint bays to be constructed by the LCC Contractor. Inspection of these items prior to LCC installation activities.	▪ Overall, the design requirements outlined in the Owners Requirements are appropriately addressed by the execute cable supply contract. Appropriate design standards are specified, and design documents outlined in the LNTP Work. ▪ LCC design interface with cable supply contract is outlined in 'the interface register (MarinusLink) which captures PPL's responsibility for LCC handover works and other parties' milestones (including LCC). ▪ The cable supply contract makes allowance for provision of final TR values to replace assumed TR values (stated to the left). When these are provided by MLPL, if a portion of the cable section requires a larger conductor or the LCC works required is increased) this could trigger a variation that is presently not included in the observed packed. This should be addressed in the Risk package, which we have not been able to review. ▪ Again, in discussion around the interface with the LCC works, section 4.2 point (c) (iv) of the Owners Requirements outlines use of a 50°C isotherm to design the thermally stable backfill for the 90 km onshore cable section in Victoria. The critical temperature for soil drying of 50°C is defined originally in UK National Grid Technical Specification 2.05 as a temperature increase from ambient (i.e. for the UK 50°C isotherm means 35°C temperature rise above 15°C ambient). 50°C is an industry standard value used for these calculations and it is reasonable that MLPL has requested this be assumed at this stage of the design process. At the detailed design stage samples from ground investigation should be used to determine the local critical temperature and used to design the LCC works. ▪ It is understood that PPL's proposal for the land cable system is a single conductor material and size for the entire 90 km route (see clarification comment in cell

Subpackage	Description of main provisions	Aurecon's view on the appropriateness of the scope
	▪ The onshore cable design offered by PPL states a maximum allowable conductor temperature of 80 degrees and a maximum allowable temperature rise across the insulation of 20 degrees. Both PPL and MLPL acknowledge that this cable system does not yet have a valid PQ test and as such its capability is unproven. The last occasion this cable system had a valid PQ test was over 5 years ago, and the insulation material specification varied significantly meaning the maximum allowable conductor temperature was 70 degrees. ▪ It is understood that PPL were due to be providing PQ for almost the same cable type that is being specified for the MLPL onshore cable section (320 kV, 3500 mm^2, Aluminum conductor, Borealis LS4258DCS insulation and max conductor temperature of 80°C) commencing Q1 2024 in the Delft factory. The only difference being that the MLPL cable is specified with a lower electrical stress at the cable installation screen.	CB2.NF1.3.7 (pdf page 175 of the Tender Evaluation Report). A 3500mm^2 Al conductor cable. Defining a cable of this size across the full 90 km route is conservative given that some regions are likely to have TR low enough to allow for a reduced conductor CSA. This should be further considered by MLPL in terms of cost implications, however, given the lumpsum nature of this contract, this is a conservative approach to pricing and potentially reduces cost risk. ▪ In Aurecon's experience, it is uncommon for a contract to be in place whilst PQ has yet to be provided for the cable being commissioned. It is common for the type testing (which is typically more project specific) to be conducted post contract execution. ▪ PPL provide reasonable evidence of their confidence that the PQ will be successful, given the existing similar cable PQ'd in the last 5 years. The residual risk to MLPL is that the PQ for the cable they are specifying (which was planned for Q1 2024 for a different project) is not completed by Q2 2026 for prototype production and/or that the cable design post PQ varies significantly from the one issued to the other contractors as part of the LNTP works in Q4 2024. ▪ Given the need to secure the contract within reasonable timescales and the evidence provided by PPL regarding existing and in progress PQs for the cable system the risks described above are manageable in our view.
Tender Design: Submarine Cable	▪ Options for the submarine cable section are specified with Al conductors with cross-sectional area 2,100 mm^2 or 2,500 mm^2, cross-linked polyethylene insulation technology and either single or double wire armour layer. The submarine cable length is approximately 255 km across the Bass Strait between end terminations in the Heybridge Converter Station in Tasmania and a transition joint in Waratah Bay located approximately 200m inland from the sand dunes in Victoria. ▪ Submarine cable rating calculation reports. Schedule 6 outlines assumed TR values (TR = 1.4, 1.2, 1.0 K.m/W). ▪ The offshore cable design offered by PPL states a maximum allowable conductor temperature of 80 deg. C and a maximum allowable temperature rise across the insulation of 20 deg. C. Both PPL and MLPL acknowledge that this cable system does not yet have a valid PQ test and as such its capability is unproven.	▪ As with the land cable system, the executed cable contract allows for revision of the seabed TR values and therefore the possibility of updated conductor cross-sectional areas. ▪ MLPL should also be aware of possible confusion caused by the inconsistency between Schedule 5, point 25A and Schedule 6 'Assumptions at contract date' which state different seabed TR values. ▪ However, the overall design requirements outlined in the Owners Requirements are appropriately addressed by the executed cable supply contract. Appropriate design standards are specified, and management plans and design documents outlined in the LNTP Work. ▪ It is understood that PPLs proposal for the offshore cable system is a single conductor material and size for the entire 255 km route (see clarification comment in cell CB2.NF1.3.1 (pdf page 175) of the cable tender evaluation report). A 2100 mm^2 Al conductor cable. There may have been possible cost reductions available to the project by allowing for a tapered cable design between the seabed and LHDDs,

Subpackage	Description of main provisions	Aurecon's view on the appropriateness of the scope
	▪ It is understood that PPL were due to be providing PQ for a similar cable type to that being specified for the MLPL offshore cable section (400 kV, 2500 mm^2, Aluminum conductor, Borealis LE0550DC insulation and max conductor temperature of 80°C) which is ongoing at present in the Arco Felice factory. Note that the ongoing PQ and previously completed PQ are for higher voltage and higher electrical stress at the insulation screen than the 320 kV MLPL system. ▪ Design of earthing system, fibre optical telecommunication cables, cable monitoring systems, cable fault locating equipment, other necessary fittings and accessories, back-up materials, pulling stock kit, armour clamp, rigid repair joint, transition joint, spare parts, and all related auxiliary equipment.	if more detailed design data had been available prior to the contract execution stage. However, the existing approach is likely to be conservative in terms of pricing which is likely to reduce the risk of further cost increases. ▪ Through this review process MLPL confirmed that PPL have not developed a factory joint for the cable system being specified for the project meaning that a tapered design would have to be facilitated via field joints. This type of jointing operation has a high risk associated with it and is a common cause of cable failure. Therefore, the existing approach effectively avoids this this risk. ▪ It is not common for a contract to be in place whilst PQ has yet to be provided for the cable being commissioned, it is common for the type testing (which is typically more project specific) to be conducted post contract execution. ▪ PPL provide reasonable evidence of their confidence that the PQ will be successful, given the existing similar cable PQ'd in the last 2 years. The ongoing PQ is for a 400 kV cable system with higher electrical stress at the insulation screen than is planned for the MLPL cable system. It is not uncommon for cables with lower electrical stress across the insulation screen to be considered as being covered by the PQ of the similar cable with higher stress. ▪ The remaining risk to MLPL is that the PQ for the cable they are specifying (which was planned for Q1 2024 for a different project) is not completed by Q2 2026 for prototype production and/or that the cable design post PQ varies significantly from the one issued to the other contractors as part of the LNTP works in Q4 2024.
Tender Design: Fibre Optic Cable	▪ MLPL's Owners Requirements outlines high-level requirements for a standalone Fibre Optic (FO) cable system in seabed and on land comprising 96 single mode fibres to allow for the following: – Communication between Converter Stations (6 nos fibres). – The protection of electrical and cable monitoring systems (number of fibres to be determined by PPL) including the capability to support: ▪ Distributed Temperature Sensing (DTS), Distributed Acoustic Sensing (DAS) and Distributed Vibration Sensing (DVS). – For commercial telecommunication purposes (remaining fibres).	▪ Overall design requirements outlined in the Owners Requirements are appropriately addressed by the execute cable supply contract. Appropriate design standards are specified, and preliminary datasheets provided for the design of the FO cable system. The requirements are flexible as to if the FO cable will be standalone or integrated within the cable system for the submarine portion of the route. It is expected that this decision can be appropriately managed at the detailed stage.

Subpackage	Description of main provisions	Aurecon's view on the appropriateness of the scope
Tender Design: Landfall HDD (LHDD)	▪ Design of the LHDD falls within the scope of the executed cable supply contract. ▪ PPLs scope includes the LHDD survey and design, which is captured via a subcontract with Spiecapag. ▪ PPL will manage the subcontractor scope taking on risks associated with schedule and quality for the LHDD via their contract with Spiecapag. ▪ The LHDD scope includes for Stage 1 and Stage 2 and includes allowance for six LHDDs at each landfall (Tasmania and Victoria). One LHDD per Marinus Link cable and one spare.	▪ The specification of a spare LHDD bore could be considered as conservative. However, given the nationally significant Project CAPEX associated with the LHDDs and the lack of final geotechnical and nearshore site data it is felt that this assumption is reasonable. ▪ Section 3.5 (a) (1) of the executed cable contract outlines a 10m depth of cover for the LHDDs, but it is not clear from the Appendices and Annexes of the Owners Requirements how this depth has been calculated and the executed cable contract allows for an increase in price if this value increases. LHDDs with depth greater than 10m are common for the type of geology present at both landfall locations. ▪ Section 2.2C (a) of the executed cable contract outlines LHDD base penetration rates and that if the future geotechnical data received lead to slower penetration rates than planned, compensation can be claimed at a rate of [redacted] (equipment) + [redacted] (PM). We are of the opinion that the base rate is reasonable for the rock type specified, however those are not conservative and reduced rates are possible. ▪ Programme for LHDD installation is approximately 30 days per bore (12 bores in total), each of these durations would only need to increase by [redacted] to increase Project CAPEX by [redacted] ▪ We have not been able to review any risk assessment of associated costs for this package. We are of the opinion that, although wrapping the LHDD scope into the cable supply scope reduces risk for the project, it does not completely avoid risk.
Scope of Work: Cable System Testing and Supply	▪ PPL's cable contract scope includes supply, installation and commissioning of the Stage 1 offshore power cable. Supply and installation instructions of the Stage 1 onshore power cable and supply and installation of the LHDDs to accommodate the Stage 1 and Stage 2 power cables. ▪ At contract execution there are no valid prequalification tests for the offered cable system. Land cable PQ is planned for start in Q1 2024 in the Delft factory (Netherlands), which is the same factory the land cable system was previously PQ'd in 2017. Submarine cable PQ is ongoing at the Arco Felice factory (Italy) for 525 kV and 400 kV systems using the same semiconductive and insulation materials. Completion date for both PQ tests is unknown. ▪ PPL provision for Inspection and Test Plan including; Type Testing, Routine and Sample Tests, Site Acceptance Tests.	▪ The testing and supply package is broadly in line with industry standards. ▪ Installing LHDDs for Stage 2 is logical in terms of reducing future mobilisation costs. However, should Stage 2 not proceed or incur substantial delays, the impact on the economics of the project remains significant. ▪ The Owner's Requirements are not clear on whether or not Transition Joint Bays (TJBs) and onshore cables are required at the Tasmania landfall at the approach to the Heybridge Converter Station. If the stage 1 cable system does require a TJB in Tasmania the impact on Project CAPEX could be greater than $5m. ▪ There is a risk that PQ tests are delayed for both cable systems. The existing programme would suggest acceptable PQ results are required prior to Q1 2026 in order to avoid a delay to the overall schedule. It is understood that PPL accepts responsibility should PPL cause delay to Contractor Interface Milestones.

Subpackage	Description of main provisions	Aurecon's view on the appropriateness of the scope
Scope of Work: Submarine Cable T&I	▪ The Leonardo Da Vinci (LDV) is a suitable vessel for cable laying but is more costly for transport relative to benchmarks. We understand that this decision has been made to minimise schedule delays between transport and laying, which could have high contractual penalties. ▪ The LDV has been identified as the proposed cable installation vessel for surface laying of the subsea segment of the cables. According to the installation document, Submarine Power Cable - Cable Trenching Systems and Reasonable Endeavours, Doc: RSC-1-41-CB2, Rev 02, the SeaRex trencher will be employed for pre-lay trenching in soils that are not suitable for jetting, estimated to comprise approximately 5% of the cable route. Additionally, a high-powered jetting ROV (similar to the Q Trencher series), is planned for post-lay burial along the entire route, while a controlled flow excavator (CFE) equipped with mass flow and jetting capabilities will be used for the burial protection of the offshore omega cable joint.	▪ The Leonardo Da Vinci is specified within the contract as the transport and cable laying vessel. In Aurecon's view, the vessel is suitable for cable laying, but may be at a higher cost relative to other vessel types for transportation. ▪ Furthermore, through this review process MLPL confirmed that they challenged PPLs assumption for using the LDV for cable transportation. In response, PPL confirmed use of the LDV to; reduce the number of loading and un-loading operations for the cable system and to maintain use of PPLs own vessel instead of a third party's. MLPL were reasonable to challenge the use of the LDV for these tasks however, the risks highlighted by PPL which are mitigated through use of the LDV are reasonable. This is especially accurate regarding the reduction of onboarding activities. As such, Aurecon is of the opinion that the method is prudent. ▪ In contrast to the loading duration for the HVDC cable, the fibre optic cable loadout, particularly if transpooling is involved, seems to be scheduled with aggressive durations and lacks a clear buffer for potential adverse developments, such as the breakdown of cable handling equipment. ▪ Based on the detailed schedule for Stage 1, in conjunction with technical particulars from the method statement and provided documentation, several observations have been made that are worth noting: – Potential scheduling conflict is noted between the post-lay burial jetting first pass (CB2 Campaign 1) and the free lay of the 85 km cable (CB2 Campaign 2), as both activities are scheduled to start on the same date. – In general, assumptions for vessel speed are found to be conservative and likely to be overestimating the durations specified in the schedule for transit duration between Naples and Nordenham, pre-lay trenching activities and application of the absolute minimum advance rate for the full sections of chain cutter. This should reduce the risk allowance cost for these activities. – In Aurecon's view, there appear to be both scheduling assumptions which are optimistic, and assumptions which are conservative, which on balance are reasonable overall.
Scope of Work: Commissioning	▪ PPL provided indicative ITPs for the submarine cable, land cable and both cable systems accessories including: – Conductor and insulation resistance measurements.	▪ The quality and appropriateness of the tests prior to commissioning is reasonable given the stage of the project. ▪ Some residual risk remains with the ongoing PQ tests for both cable systems:

Subpackage	Description of main provisions	Aurecon's view on the appropriateness of the scope
	– Visual Inspection on earthing connections. – Perform circuit resistance measurement after installation completion. – Screen continuity test. – DC high voltage test. – Time domain reflectometry (TDR) measurements. – OTDR test on integrated fibre optical cable.	– This is lower for the onshore cable system where MLPL are aware that PPL is providing PQ for the same cable type that is being specified the MLPL cable section (320 kV, 3500 mm^2, Aluminum conductor, Borealis LS4258DCS insulation and max conductor temperature of 80°C) commencing Q1 2024 in the Delft factory. – The risk is higher for the offshore cable system where the ongoing PQ from PPL is for a similar but not the same cable type (400 kV, 2500 mm^2, Aluminum conductor, Borealis LE0550DC insulation and max conductor temperature of 80°C) which is ongoing at present in the Arco Felice factory. Note that the ongoing PQ and previously completed PQ are for higher voltage and higher electrical stress at the insulation screen than the 320 kV MLPL system. This goes some way to reducing the ongoing PQs.
Relied-upon Information	▪ PPLs executed cable contract includes Relied Upon Information predominantly pertaining to environmental and ambient conditions in the offshore portion of cable route as follows: – Ordtek UXO Desktop Study set out in Annexure EPC-4C1-8-CB to the Technical Specifications. – In-Service subsea infrastructure Report (existing & planned), Out-of-Service subsea infrastructure Report set out in Annexure EPC-4C1-9-CB to the Technical Specifications. – LCC Handover Works Information. – Fugro Geophysical Survey Integrated Report dated 2020 set out in Annexure EPC-4C1-4-CB to the Technical Specifications including relevant annexes comprising charts 156491-064-DRN-0001 to 53. – MMA Factual Report set out in Annexure EPC- 4C1-10-CB to the Technical Specifications. – The GIS layer Boulders.lpk. – "Waratah Bay Geophysical Survey Results Report", and all corresponding annexes, including charts, and boulder picking. – Maritime Archaeological Desktop Assessment September 2021 (Cosmos) set out in Annexure EPC-4C1-5-CB to the Technical Specifications.	▪ The quality and appropriateness of the relied upon information is reasonable given the stage of the project where much of the system design is to be completed at the detailed design stage. ▪ Overall, it is felt that the Owners Requirements document and Interface Management documents provide some further detail regarding the electrical design of the system. Little else in this regard is provided in terms of electrical design in the relied upon information.

Subpackage	Description of main provisions	Aurecon's view on the appropriateness of the scope
Key Interfaces	▪ PPL's scope has significant interfaces which are typical of similar HVDC cable equipment design and supply contracts for other projects undertaken recently around the world: – Converter Design and Supply Equipment (CDSE) contractor. – Converter Design and Construct Station (CDCS) contractor. – (as yet undefined) Land Cable Civils (LCC) contractor.	▪ The challenges related to the scope split between the cable contract CDSE, CDCS and as yet undefined LCC contractor are unavoidable aspects of the adopted contracting strategy but can be properly managed. ▪ At present the key interface risk is with the LCC works which are less well defined in the existing Interface Register (see second comment in 'Tender Design: Land Cable').
Key Exemptions	▪ PPL excludes all onshore civil works from their scope.	▪ This exclusion is reasonable and generally reflects common practice for this type of project.
Key Deviations to Owner's Requirements	▪ PPL accepts no responsibility for design of the interface stating that MLPL is to coordinate. PPL offer no indemnities regarding review of other Contractor Documents. ▪ PPL states they have no requirement to complete Transmission System Tests and Trial Operation to achieve Taking Over.	▪ Aurecon is of the opinion that these deviations are presently partially resolved. The interface requirements and Owners Requirements documents outline the overarching responsibilities, but a more detailed risk report should be developed to adequately capture and allow for any potential price increases associated with changing testing and commissioning activities.
Availability and Reliability Guarantees	▪ PPLs executed cable contract includes provision of guaranteed response times (Section 24) with respect to Defect notified to the Contractor before the end of the last Defects Notification Period or Serial Defect notified to the Contractor before the end of the last Serial Defects Notification Period. ▪ Schedule 5 (a) (20) outlines Contractor Document 'Reliability, availability and maintainability analysis'. There are no guarantees provisioned within the executed cable contract.	▪ Aurecon is of the opinion that reliability, availability and maintainability is not well outlined in the executed cable contract. This is not unreasonable given the stage of design and it is reasonable that the 'Reliability, availability and maintainability analysis' is included within the Schedule 5 (a) Late Notice To Proceed work.

4.3.3 Procurement and Delivery

The table below summarises the procurement process adopted to secure the Cable Supply, installation and LHDD contract.

Table 4-9 Adopted Procurement Strategy (CB)

Category	Adopted Strategy	Aurecon's view on the appropriateness of the adopted strategy
Package Split	▪ MLPL initiated a procurement process focused on Tier 1 subsea power cable contractors, leading to the pre-qualification of 4 bidders for the supply and installation of the Stage 1 power cable with associated nearshore civil work for both stages (denoted as "CB1") and/or supply and installation of the Stage 2 HVDC cable (CB2). As a result of the limited appetite for civil work from pre-qualified manufacturers, MLPL received two quotations for CB2 via the tender process and a third proposal outside the tender process.	▪ Aurecon is of the opinion that the adopted package split reflects industry expectations, while enabling to test the market's appetite for a scope including civil work.
Competitiveness of the process	▪ The re-evaluation of the Project led to the postponement of the Stage 1 cable programme and pause of the Stage 2 cable scope. Proposals submitted for CB2 were therefore considered for the Stage 1 power cable with the inclusion of the LHDD scope as a mitigation to the key interface risk, in the original Project programme, identified between the subsea installation and nearshore civil work. MLPL highlighted that Project shareholders trusted this risk would be best managed by the contractor and as such decided to include the LHDD scope in CB2. The adopted contracting strategy reduces interfaces between the subsea cable installation scope contingent to the availability of a limited supply of installation vessels and nearshore civil work required to be completed for the installation to start. Financing risk was also flagged as a justification to include the LHDD scope in CB2. ▪ Proposals were received in May 2023 while the LHDD scope was transferred onto CB2 during the first semester of 2024 and the contract was executed in August 2024. MLPL chose to not disclose any preferred supplier status to the awarded bidder to ensure competition is maintained until contract signature. The adopted timeline provided ample time for MLPL to negotiate the original and amended scopes and ensure the proposed solution is optimal for the Project.	▪ This risk-based decision from MLPL demonstrates a rational understanding of project risks despite increasing the complexity of contract negotiations. ▪ In consideration of the limited number of market players and strong demand in the sector, Aurecon is satisfied that MLPL's procurement process for this scope was as competitive as possible and therefore prudent and efficient.
Contract Price Adjustments	▪ International contractors and equipment suppliers often pass through foreign exchange and partially commodity fluctuation risks to project owners. ▪ Considering the hedging contract, limited cost variations on the cable supply and installation scope are expected as a result of the lump sum nature of the contract relying on detailed technical assumptions and industry-standard commercial terms. The quoted price for the LHDD	▪ The contract executed with PPL includes an adjustment provision that is commonly seen in the industry. While this exposes the project to substantial fluctuations, this risk was identified and quantified in the Project budget via a hedging cost provision. ▪ Hedging is currently in place for foreign exchange up to the Notice to Proceed milestone. Hedging for foreign exchange and relevant commodity fluctuations post NTP will be entered into at NTP.

Category	Adopted Strategy	Aurecon's view on the appropriateness of the adopted strategy
	contract comprises of a variable share representing 17% of the total cost as a result of provisions for marine support subcontracted by PPL. ▪ Aurecon assessed the exposure of the Project to cost fluctuations post contract award due to foreign exchange fluctuations. The contract executed with PPL provisions that payments will be made in both EUR and AUD. To mitigate the risk of foreign exchange fluctuations identified by MLPL, a hedging contract is provisioned as a Project cost. While the hedge is expected to be entered into once NTPs are provided, Aurecon reviewed the envisaged terms of the hedging contract and found them generally in alignment with the Project's exposure.	▪ Aurecon is also pleased to note that negative adjustments are permitted, offering a benefit-sharing mechanism to the Project should global raw material prices decline as currently forecasted and offering an upside to the Project CAPEX.
Additional Scope	▪ PPL approached six LHDD subcontractors and pre-selected proposals were shared with MLPL in a semi-transparent process expected considering the targeted lumpsum contracting strategy. ▪ Further to extensive negotiations, the awarded subsea power contractor agreed to include the LHDD scope under the main contract subject to [redacted] on the selected subcontractor's price and provision for insurance and other contracting costs. The mark-up remains lower than quoted by another contractor. ▪ MLPL highlighted that the offered mark-up mitigated the market risk during the tender process, interface and quality risks during execution. ▪ The contract with PPL is based on a fixed price for 84% of the scope thereby transferring potential cost increase within the limits of the contract to the contractor. Bankability risk flagged by the Project's financier was also listed as a justification to accept the proposed mark-up.	▪ [redacted] However, the outcome of this contracting strategy eliminates a key interface risk thereby reducing the Project contingency. That is, the risk of having the cable vessel on standby due to any delay and incurring a daily cost of [redacted] is mitigated if MLPL were to directly procure the completion of LHDD with another party. ▪ While a cost-benefit analysis to justify [redacted] was not performed by MLPL, we understand that the decision was justified based on a qualitative risk assessment of the impacts of interface risks materialising on this item if the activity was undertaken by another party. ▪ In Aurecon's view, Prysmian's procurement process (of which MLPL had limited visibility) appears to be reasonable, with a long-list of six parties invited to respond. Of this list, two responded with Prysmian selecting the most cost optimal response [redacted] ▪ Cable suppliers, including PPL, seldom take on the responsibility of civil work, including HDDs, in their main supply and installation contract. As such, MLPL highlighted the complexity of negotiations with PPL to include the HDD scope, which lead to a [redacted] that anticipated for subcontracts. ▪ We are of the opinion that the approach is sound and greatly mitigates one of the key project risks. This risk was of key concern to MLPL's financiers, and ensuring the scope was undertaken by Prysmian was determined to be key to bankability.

4.3.4 Forecast Expenditure and Benchmarking

Aurecon compared contract costs with international benchmarks to assess the relevance of cost input assumed in the global market. **The contract executed with PPL is based on a lump sum and as such, limited visibility was provided on cost breakdown**. Based on the information available and criticality of each component, our benchmarking focuses on cable supply cost per km and the LHDD scope.

Reference projects were selected based on Aurecon's experience providing expertise to interconnector and offshore electricity generation projects globally. Key details were provided as a justification of the relevance of each reference. However, due to confidentiality restrictions Aurecon is unable to provide further details on these projects.

As such, land and subsea cable costs provisioned by MLPL in alignment with the contract with PPL were compared with the following reference projects and summarized in Table 4-10.

- Project: Australia, 2030 COD (denoted as "MLPL").
- Project A: Aurecon's Partner, OWC's internal cable system supply cost tool (denoted as "Ref. A").
- Project B: USA, 200 km, 2028 COD (denoted as "Ref. B").

We note that rates used for benchmarking below are provided by PPL to calculate adjustments and are not directly reflective of rates used to build the lump sum. Therefore, these rates are expected to be higher than base rates, but sufficient to provide an indication on supply rates assumed in the base scope of the contract.

Table 4-10 below indicates that the Project's unit rates (with an expected markup) for cable supply align reasonably with our international and internal benchmarks. *Aurecon is therefore satisfied that the provisioned cost is reflective of market expectations.*

As discussed in Section 4.3.2 the exact specification of cable sizes for the offshore and onshore cable sections are not clear in the executed contract. However, the tender evaluation report prepared by MLPL highlights that PPL suggest using the 2100 mm^2 Al conductor cable for the full portion of the offshore route and the 3500 mm^2 Al conductor cable for the full portion of the onshore route. Using the unit costs provided below this accounts for an approximately 23% of the total contract price from PPL. This is lower than is typical in our experience but not surprising given the higher CAPEX associated with the T&I (use of LDV) and landfall HDD scope.

Table 4-10 Cable Supply Benchmarking – Real $ June 2023

Component	Unit	MLPL (Marked up)	Ref. A[1]	Ref. B[1]
Al 2500 mm^2 XLPE +/- 320 kV HVDC land cable	$/m	[redacted]	423	-
Cu 2500 mm^2 XLPE +/- 320 kV HVDC land cable	$/m	[redacted]	960	-
Al 3500 mm^2 XLPE +/- 320 kV HVDC land cable	$/m	[redacted]	504	-
Al 2100 mm^2 XLPE +/- 320 kV HVDC submarine cable, single wire armour	$/m	[redacted]	440	475

[1] Benchmarks converted in AUD and are presented in Real $2023.

Table 4-11 below provides a further benchmark of the total design supply and installation cost of the MLPL cable system against reference projects.

Table 4-11 Overall Benchmarking – Real $ June 2023

Ref.	Characteristics	Location	Target COD	Total ($m)[1]	Total ($m/km)[1]
MLPL	2x cables (symmetrical monopole) of 345 km (750 MW, 320 kV)	Australia	2030	**755.6**	2.2
R1 [1]	2x cables (rigid bi-pole) of 623 km (1400 MW, 525 kV)	Germany - Norway	2020	**1,793.4**	2.9
R2 [1]	2x cables (rigid bi-pole) of 720 km (1400 MW, 525 kV)	UK - Norway	2021	**1,815.9**	2.5
R3 [1]	2x cables (rigid bi-pole) of 760 km (1400 MW, 525 kV)	UK - Denmark	2023	**1,721.3**	2.3
R4 [1]	2x cables (symmetrical monopole) of 575 km (700 MW, 320 kV)	Ireland - France	2026	**1,215.9**	2.1

[1] Final costs are not publicly disclosed. This estimate relies on the market assumption that subsea and onshore cables represent approximately 55% of the total CAPEX of 2.0 EURb (3.3 AUDb)

The LHDD contract was benchmarked against comparable projects denoted as “Ref. C”, “Ref. D” and “Ref .E”. Table 4-12 below reveals that the cost provisioned for the LHDD, excluding PPL’s mark-up and provisional allowances, is comparable to our references in comparable markets. The cost per bore remains lower than our benchmarks due to the higher economies of scale achieved in MLPL. We note however that soil conditions could impact cost and would need to be considered when undertaking any benchmarking.

Table 4-12 LHDD Benchmarking – Real $ June 2023

Ref.	Characteristics	Location	Target COD	Total ($m)[1]	Total ($m/bore)[1]
MLPL	Twelve LHDD bores (six per Stage) – Excluding markup	Australia	2030	[redacted]	9.2
MLPL	Twelve LHDD bores (six per Stage) – Including markup	Australia	2030	[redacted]	10.9
Ref. C	Six LHDD bores (three per landfall)	USA	2028	100.9	16.8
Ref. D	Two LHDD bores	Europe	2030	24.8	12.4
Ref. E	Six LHDD bores (three per landfall)	Europe	2030	48.0	8.0

[1] Benchmarks converted in AUD and are presented in Real $2023.

4.3.5 Conclusion

Scope reasonableness

Aurecon makes the following conclusions on the reasonableness of the specified scope:

- **Design Compliance and Standards** – The cable supply contract meets the Owner’s Requirements, adhering to appropriate design standards and management plans. There are provisions for revising technical parameters (e.g., TR values) as needed, but this may impact costs if revisions increase LCC work.
- **Interface and Risk Management** – A material project risk lies in the undefined interface between the cable supply contract and LCC works. While the contracts include responsibilities for interface milestones, the risk management of these interdependencies remains unclear and needs attention. It is expected that MLPL will seek to resolve these as the BOW tender is progressed.

- **Approach to Cable Sizing** – The contracts adopt a conservative approach in areas such as cable sizing, thermal backfill, and depth of LHDDs to minimize unforeseen cost escalations. The cable sizes have been determined so as to leverage the larger cable size into lower civil costs by reducing the amount of thermally stable backfill required. Common industry practice has been followed in order to develop this strategy and it is reasonable given the stage of design.
- **Schedule and Resource Risks** – The project schedule has aggressive (short) timelines, for cable loadouts and LHDD installations). These factors could lead to CAPEX increases associated with extended drilling operations but the duration between planned LHDD construction completion and cable installation is reasonably large and should mitigate significant programme variations if the drilling operations are extended.
- **Potential Project Impacts and Vessel Use** – The choice of vessels (e.g., Leonardo Da Vinci) is deemed prudent to minimize delays and reduce risks associated with additional cable storage and load-out operations. It is possible that PPLs specification of the LDV comes at a higher cost than a typical transport vessel, but this would be difficult to confidently quantify. The lack of clarity on certain components, like TJBs in Tasmania and PQ test timing, may impact the project's CAPEX and schedule if not properly managed.

Suitability on procurement process:

Aurecon makes the following conclusions on the reasonableness of the procurement process:

- **Strategic Contracting Approach** – The chosen package split aligns with industry norms and aims to gauge market interest, balancing complexity with strategic benefits. This approach was deemed competitive and efficient given the market constraints.
- **Risk Management and Contingency Planning** – The decisions made reflect an understanding of project risks and includes common adjustment provisions to mitigate fluctuations. Identified risks were quantified and incorporated into the project's contingency planning, ensuring financial preparedness.
- **Mitigation of Key Project Risks** – Including the HDD scope in the contract, despite its complexity, helps mitigate significant project risks, such as vessel standby costs. This approach was crucial for securing project bankability and satisfying financiers' concerns.
- **Cost and Pricing Considerations** – [redacted] Prysmian however did proceed with the lowest cost offer it received and the implied cost per bore appeared to sit within benchmark.
- **Procurement Process and Justification** – The procurement process by MLPL and Prysmian, although challenging and involving limited participants, was seen as prudent. The [redacted] was supported by a qualitative risk assessment and deemed necessary to secure reliable scope execution.

Benchmarking

Aurecon makes the following conclusions on benchmarking of project costs:

- Cable unit costs are benchmarked against internal 'bottom-up' cost estimation tools and similar reference projects. PPL's cable unit costs are found to be less than 30% higher than benchmarks for the Aluminium conductor cables and comparable to copper conductor cables. The proportion of the executed contract price associated with the cable supply is thought to be reasonably efficient from a cost perspective.
- Total design supply and installation costs for the offshore and onshore cable system were also benchmarked against four similar projects and the MLPL cost can be seen to be at the lower end in terms of the $m/km metric.
- The MLPL cost is shown to be lower than projects with 525 kV cable systems which we would expect to be more expensive. However, it is slightly higher than Reference Project 4 which is the most comparable benchmark being a 320 kV system and being closest in terms of total length.
- We note that MLPL has worked extensively to ensure a competitive procurement process was undertaken and there are few comparable benchmarks in Australia for a project of this scale. The price received is reflective of a competitive market process in a region which offers less opportunity for

suppliers relative to the European market. As such, MLPL has limited market power, and we would not expect a more competitive outcome given the current climate.

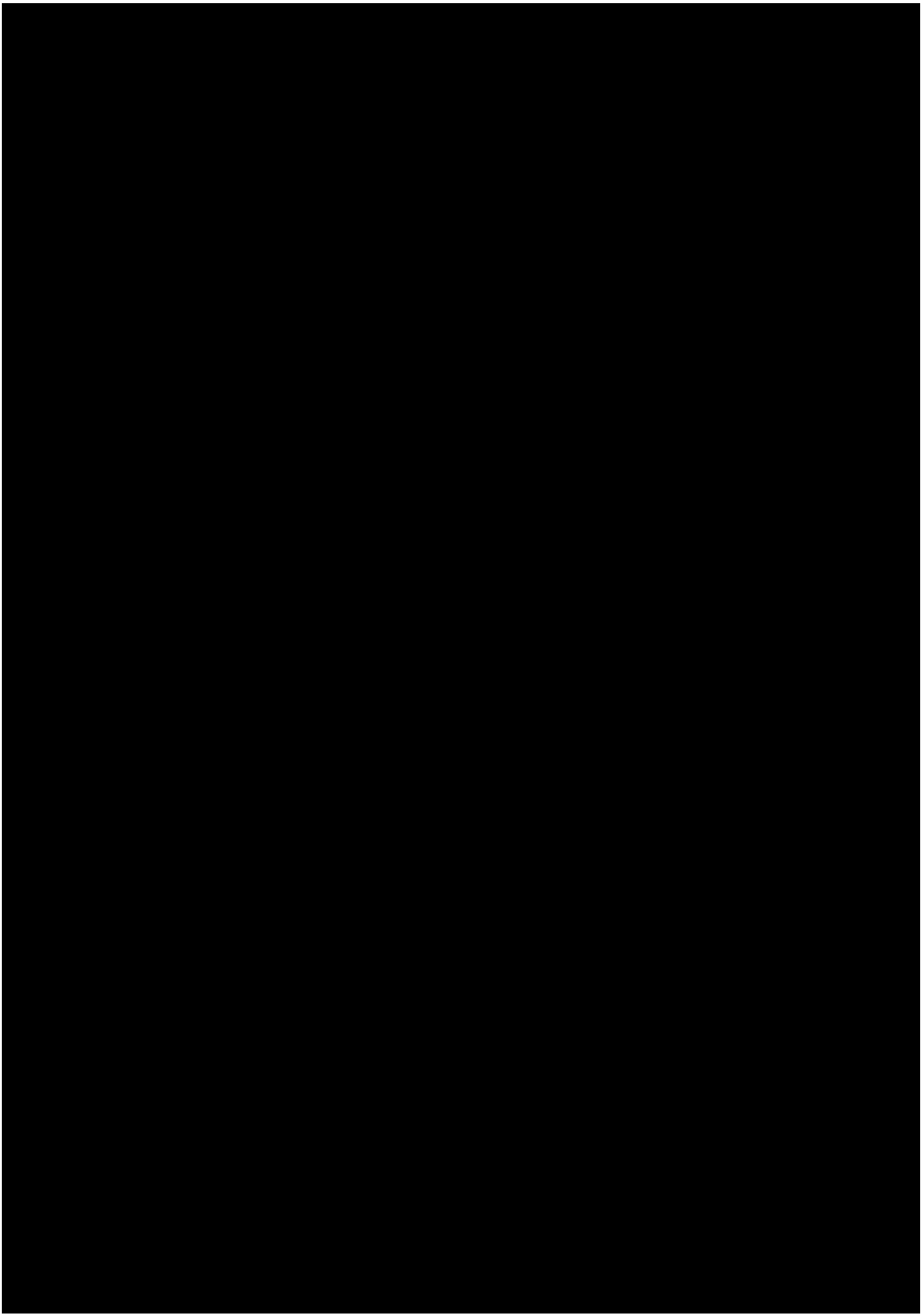
- LHDD costs are benchmarked showing that the cost provisioned for the LHDD, excluding PPL's mark-up and provisional allowances, is comparable to our references in comparable markets. The cost per bore remains lower than our benchmarks due to the higher economies of scale achieved by MLPL

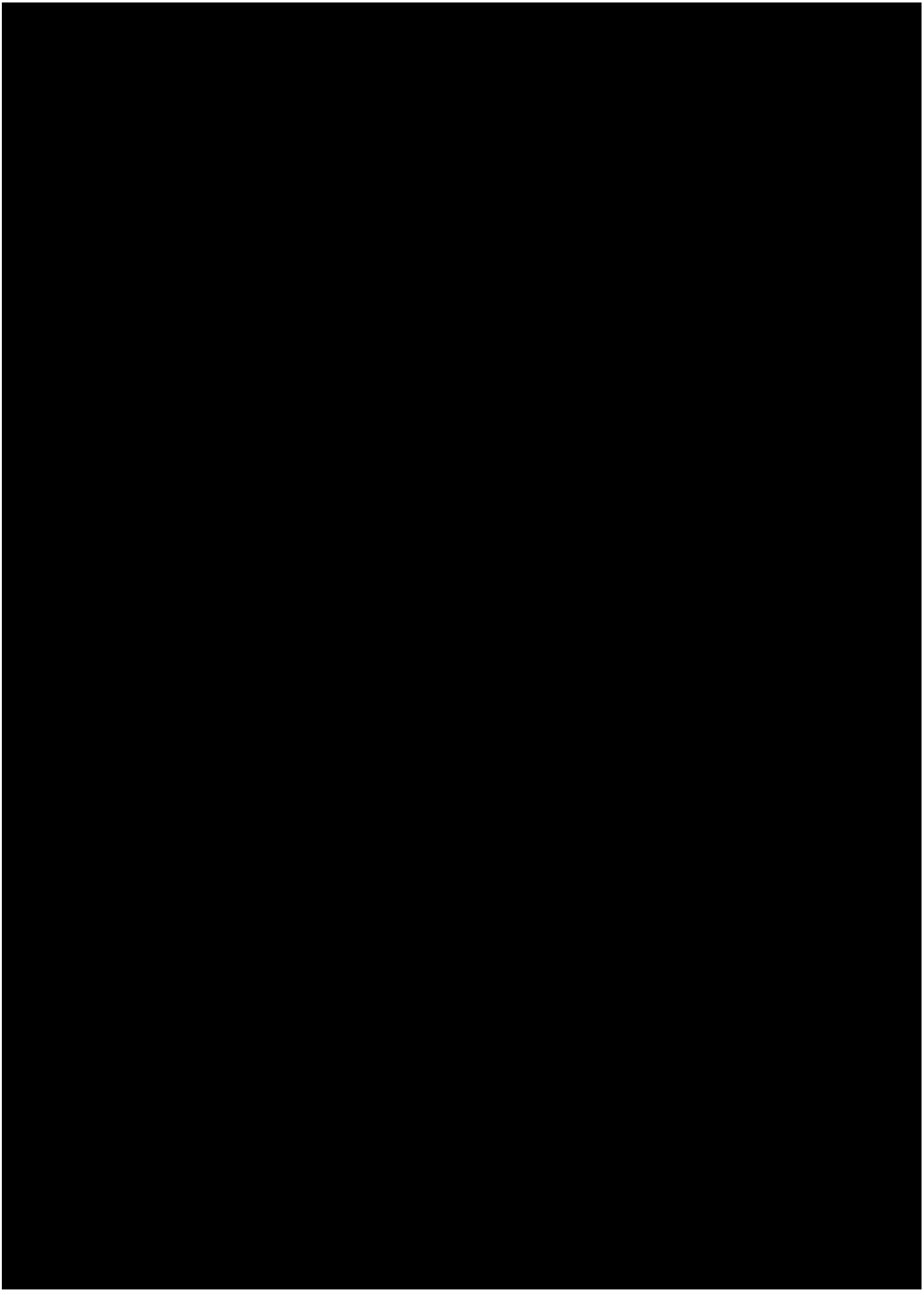
Concluding comments

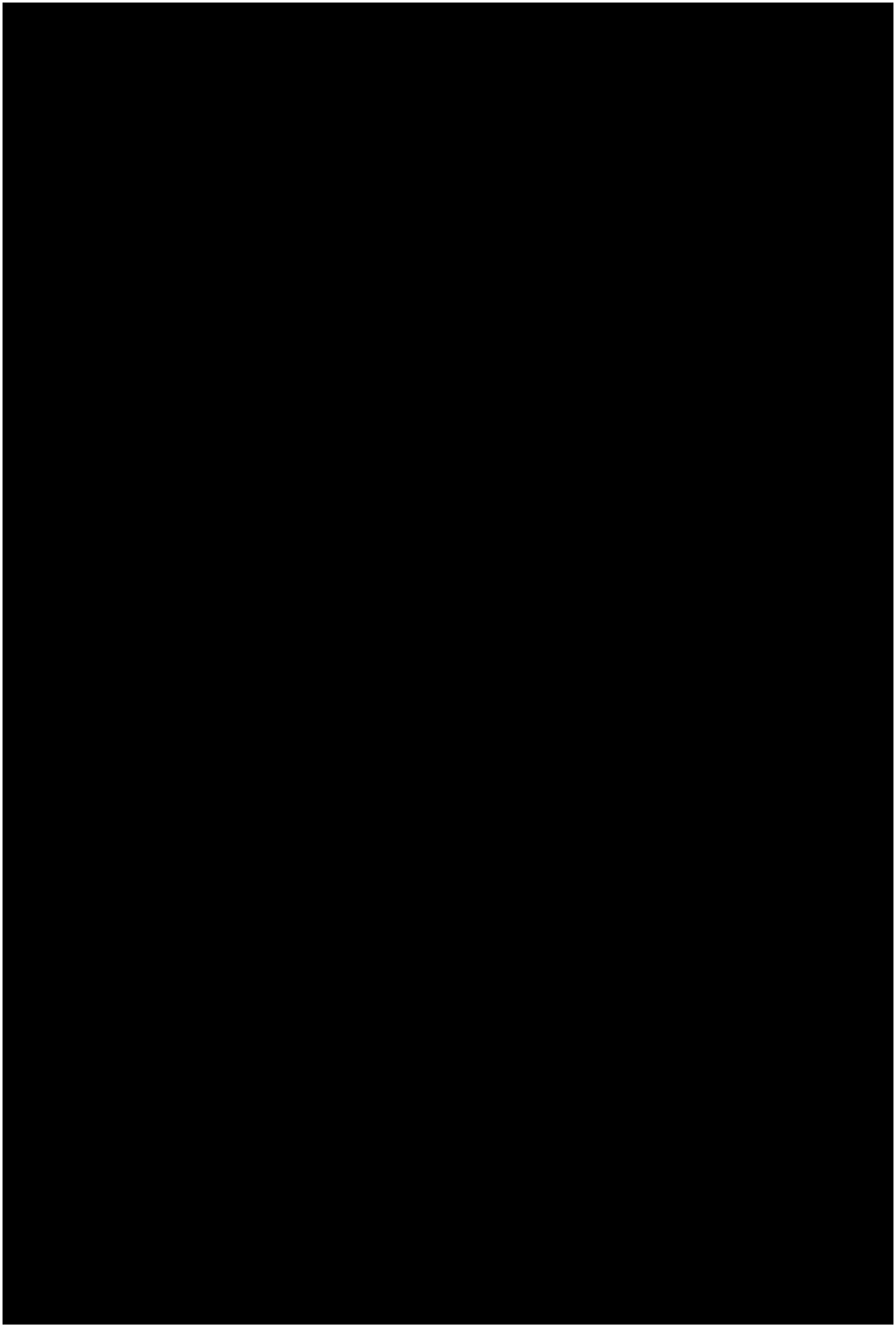
The scope of work, procurement process, and price outcome for the CB package appears reasonable in Aurecon's view and in the context of the current market environment. Risks have been contracted out or managed wherever possible under the EPC structure, with reasonable deviations accepted by MLPL.

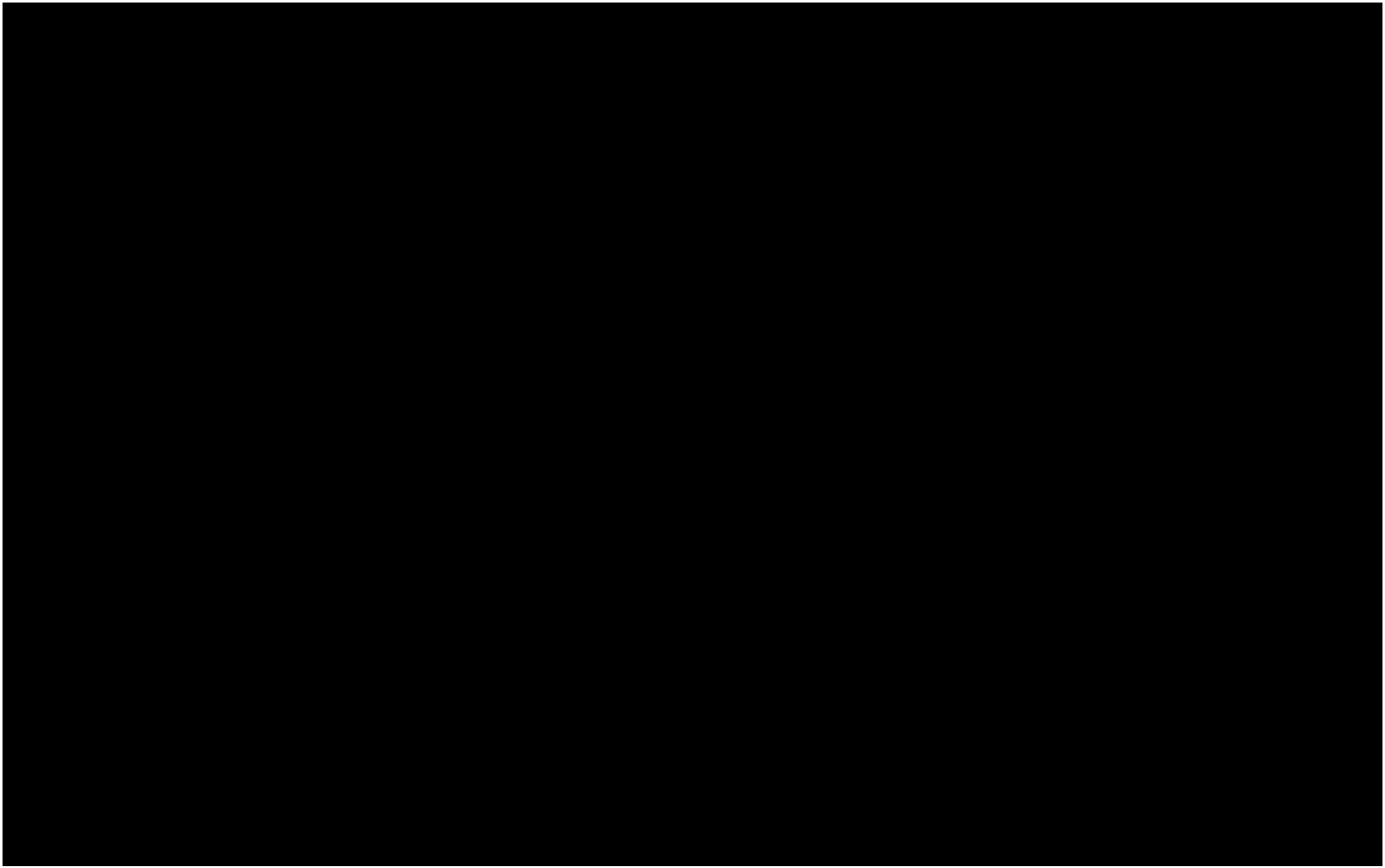
Aurecon notes that in terms of assessing the complete CB package for prudency and efficiency, some uncertainty still remains as the Balance of Work package and risk analysis is subject to further refinement. However, the information reviewed for the purposes of the current expenditure MLPL is seeking to receive approval for appears reasonable in our view.

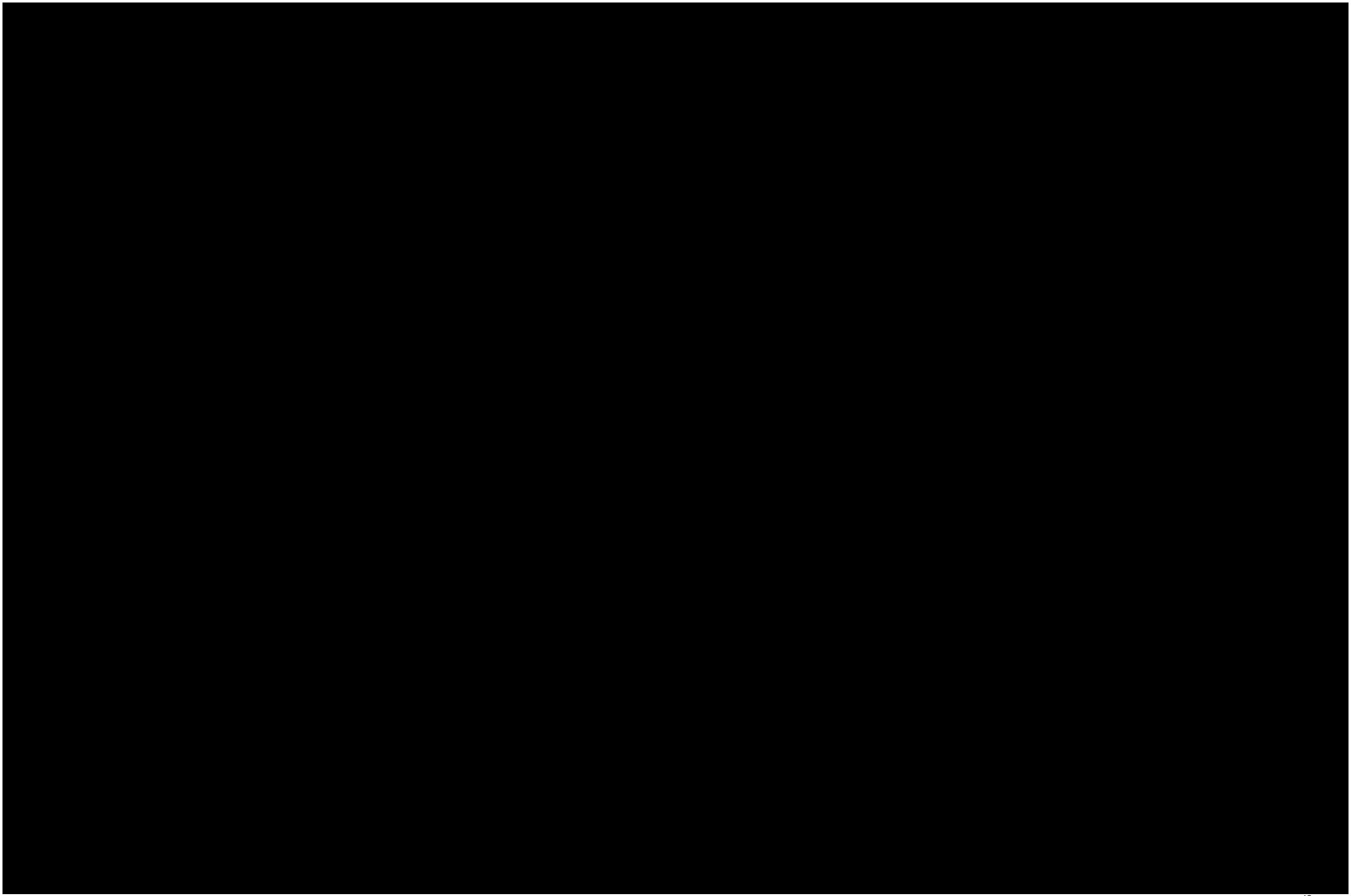
It is suggested that once the Balance of Work package is contracted and updated risk piece is completed that interface risks and other provisions relating to the CB package are re-assessed as there could be potential expenditure impacts that need to be captured.

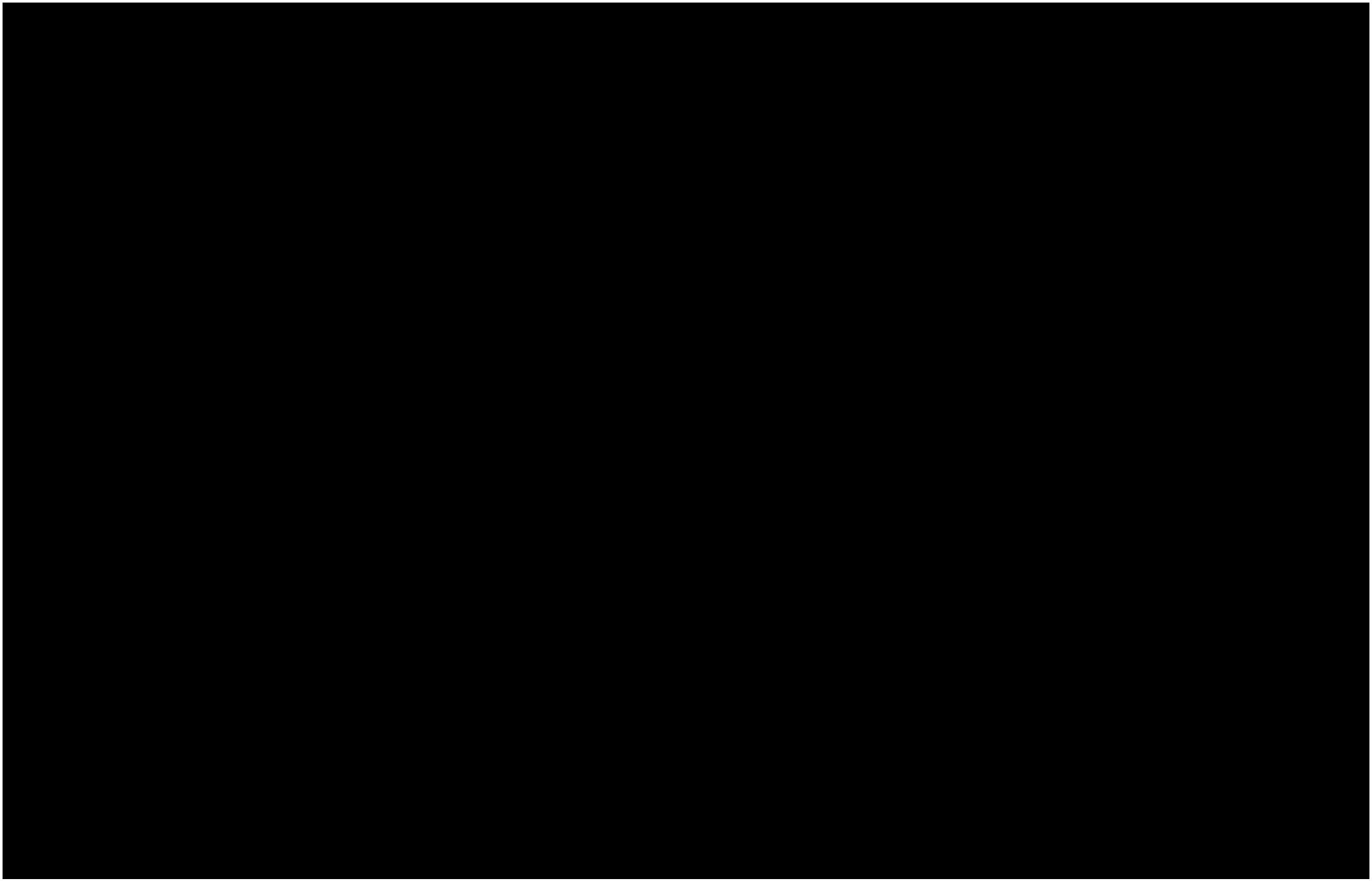


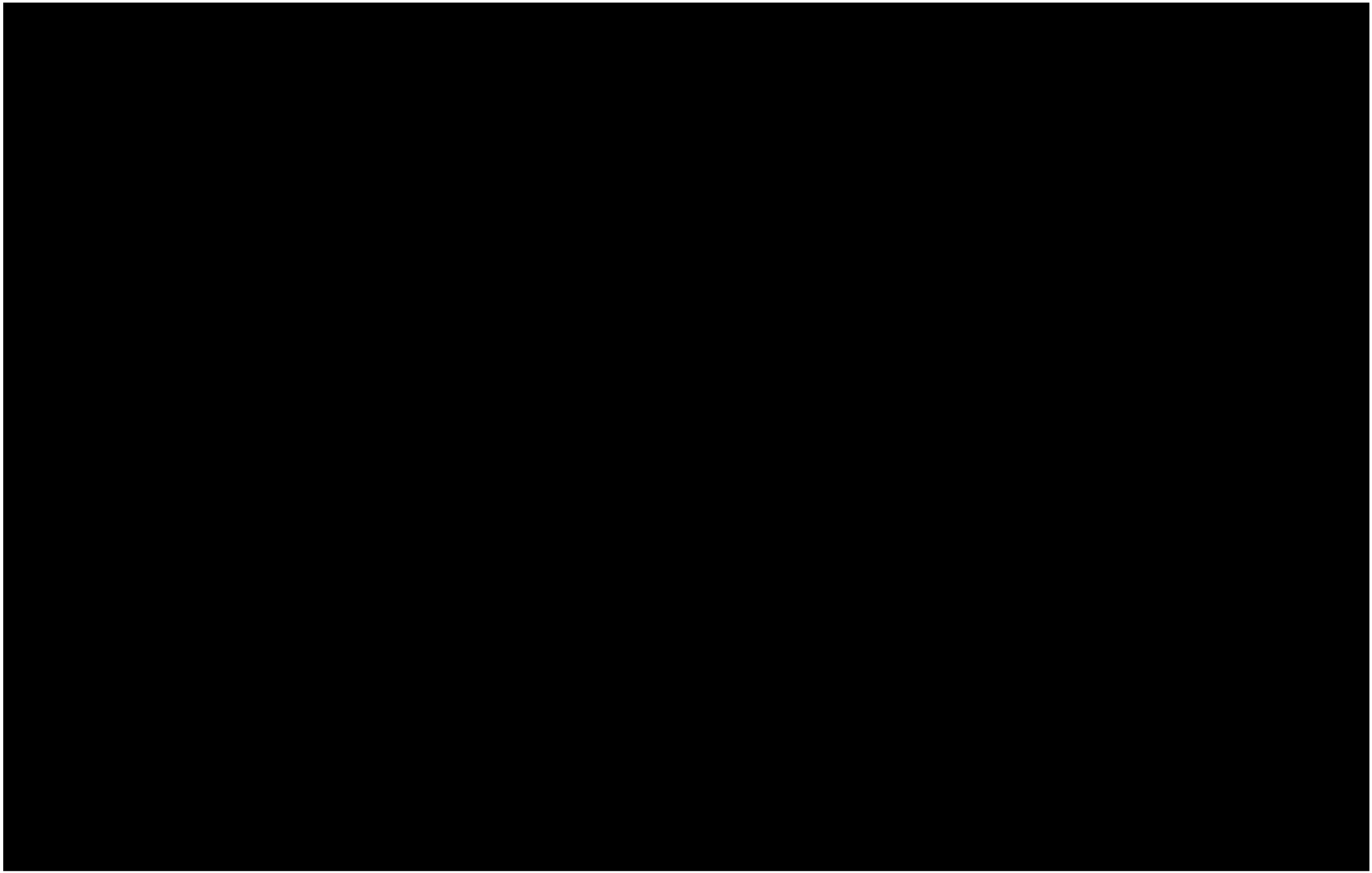


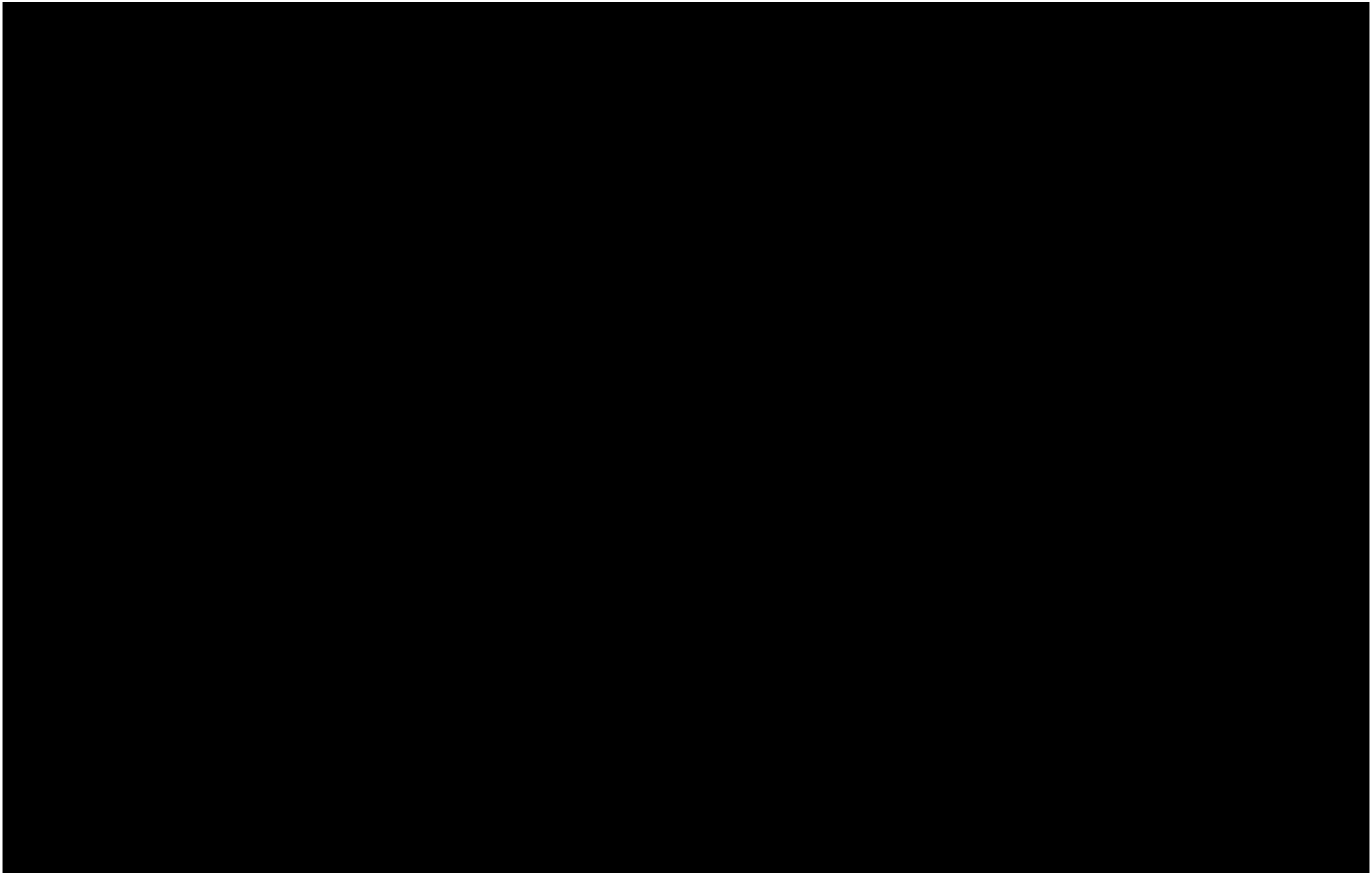


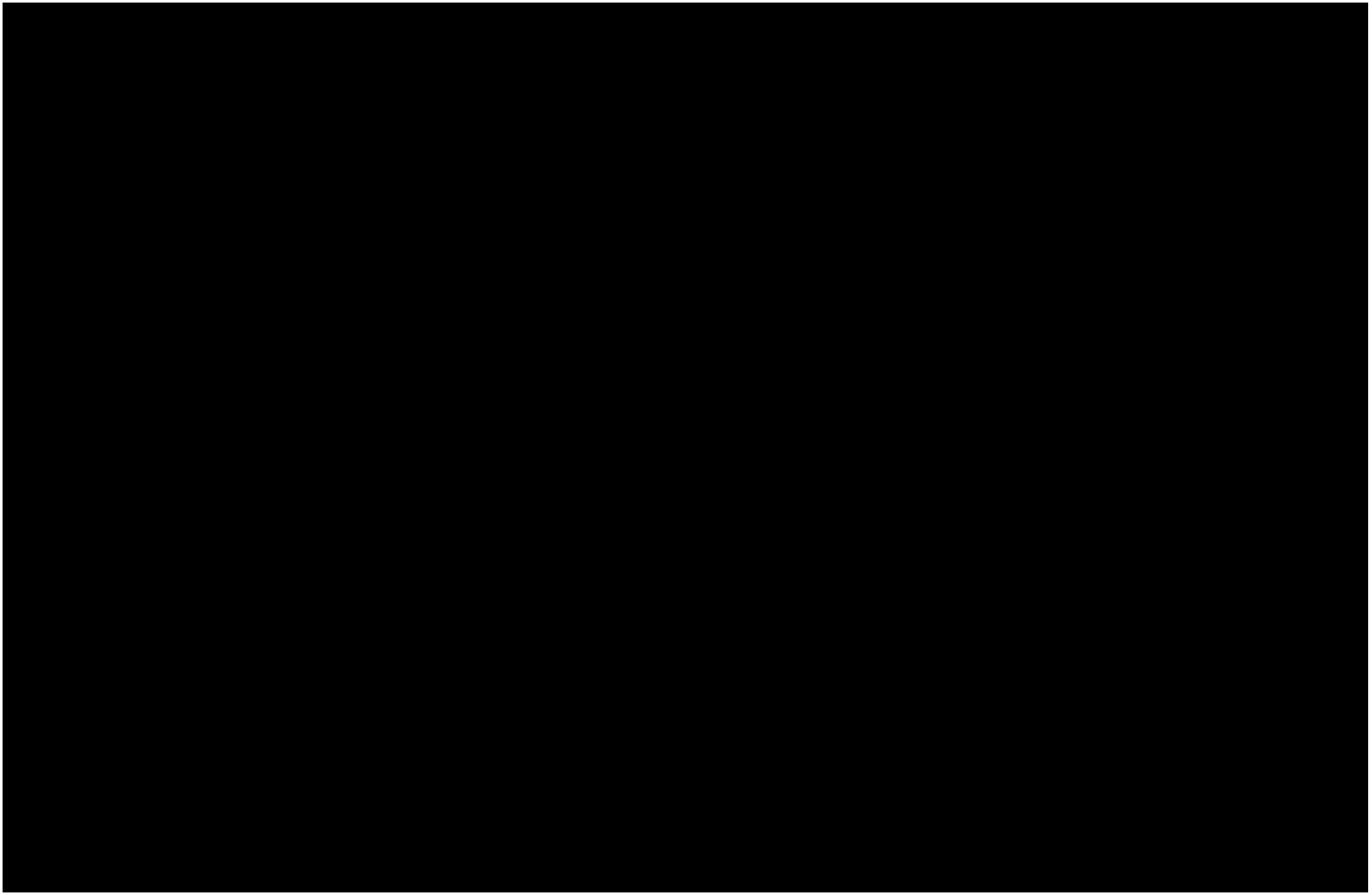


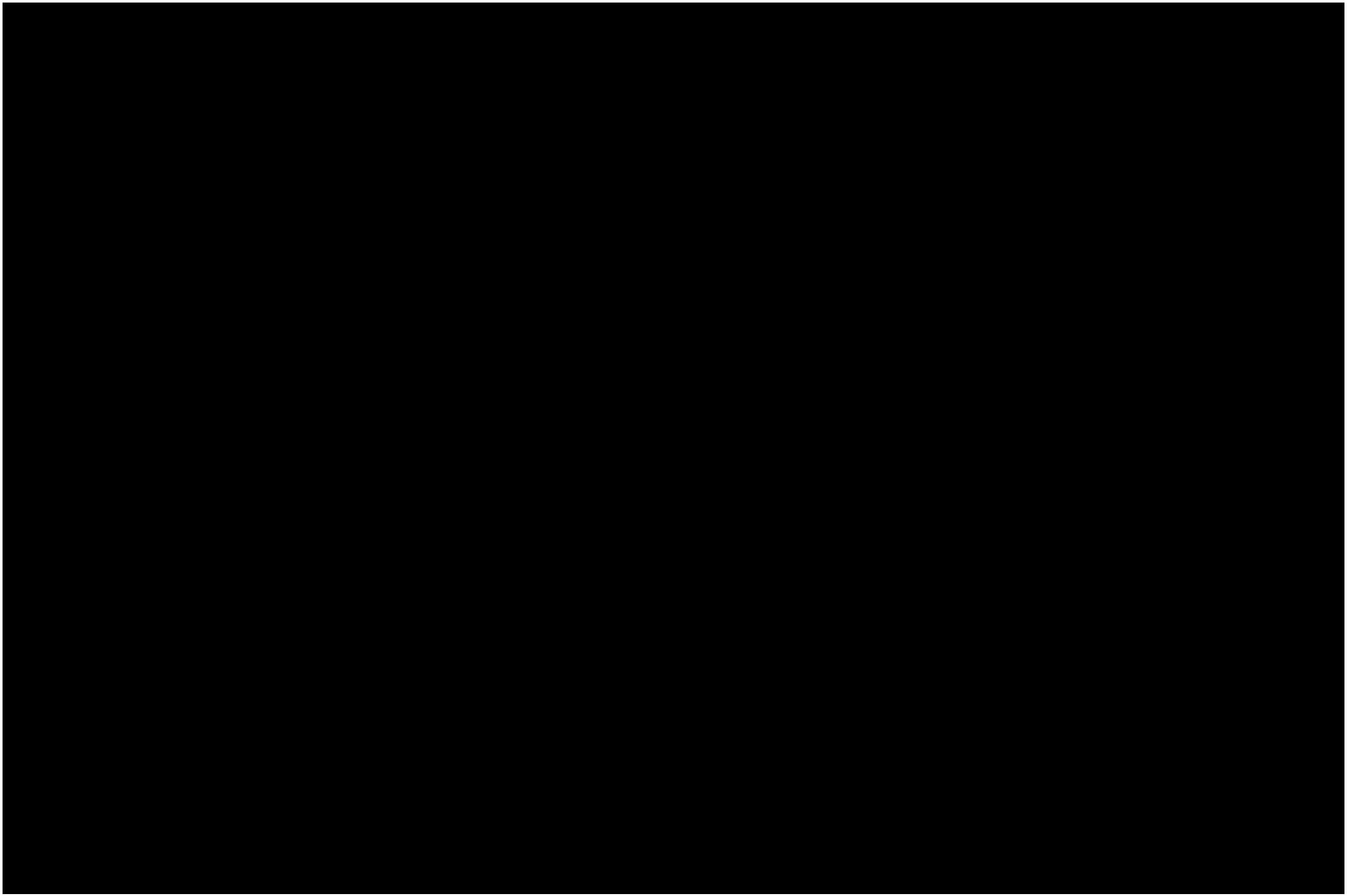


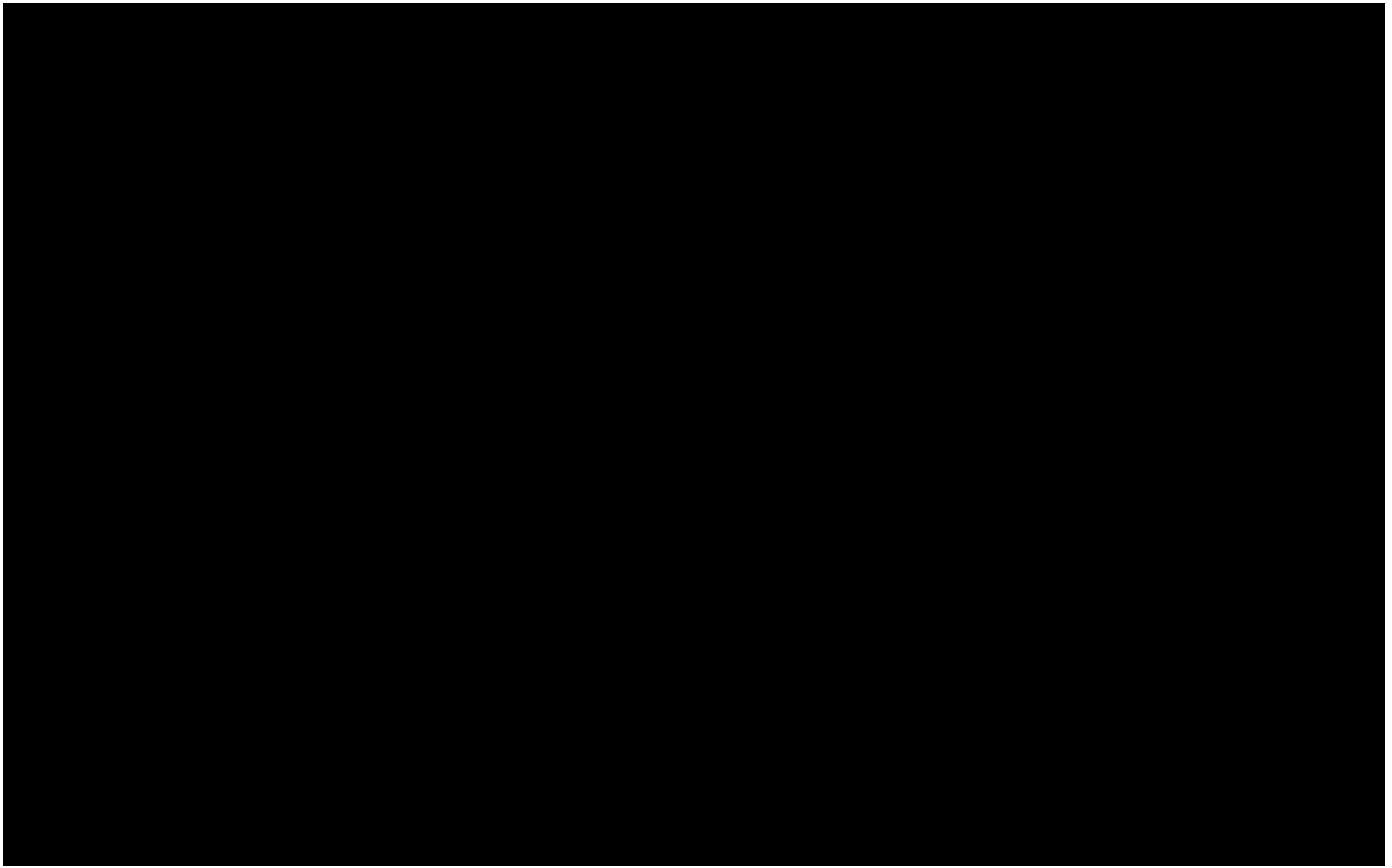


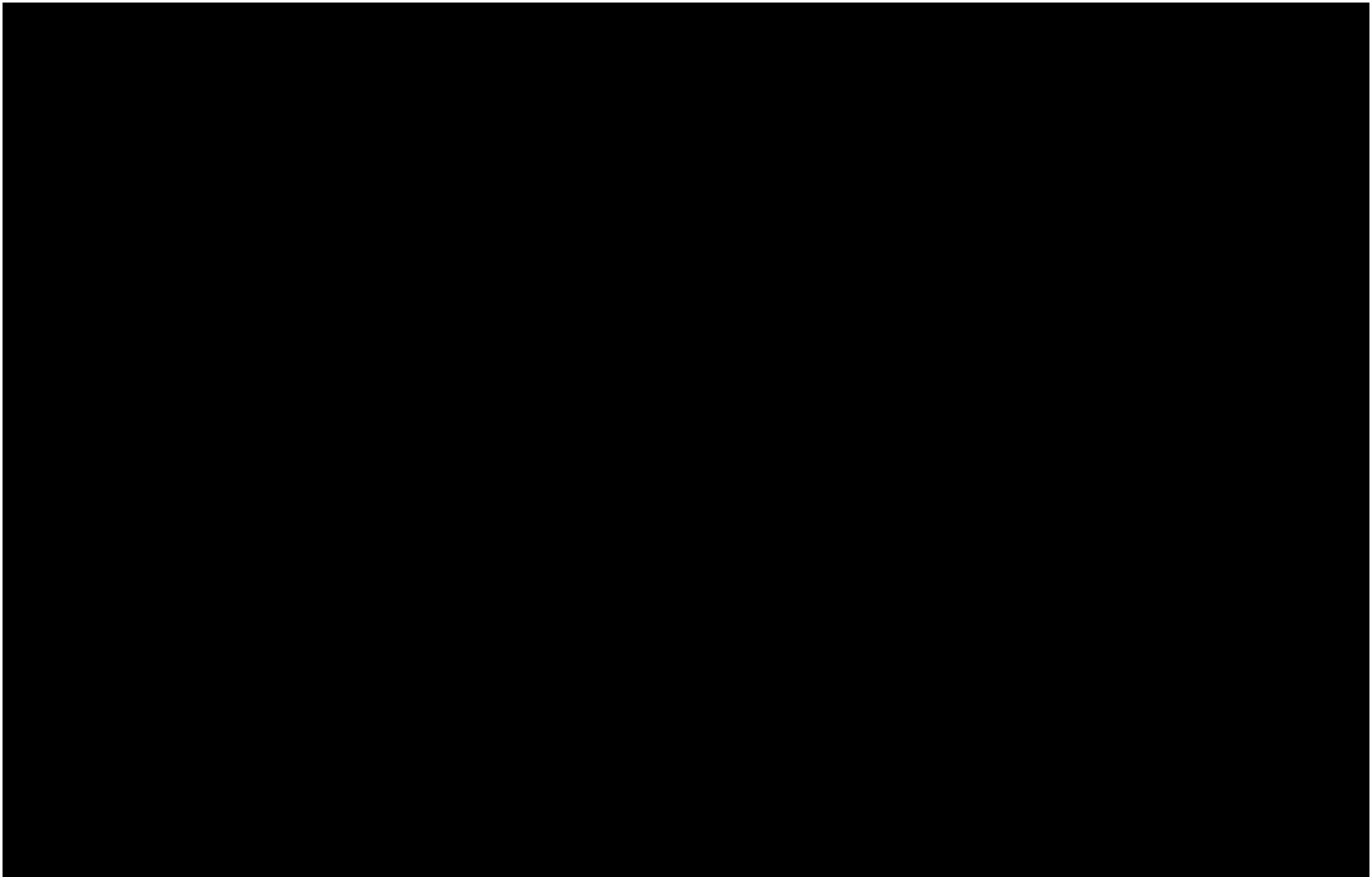


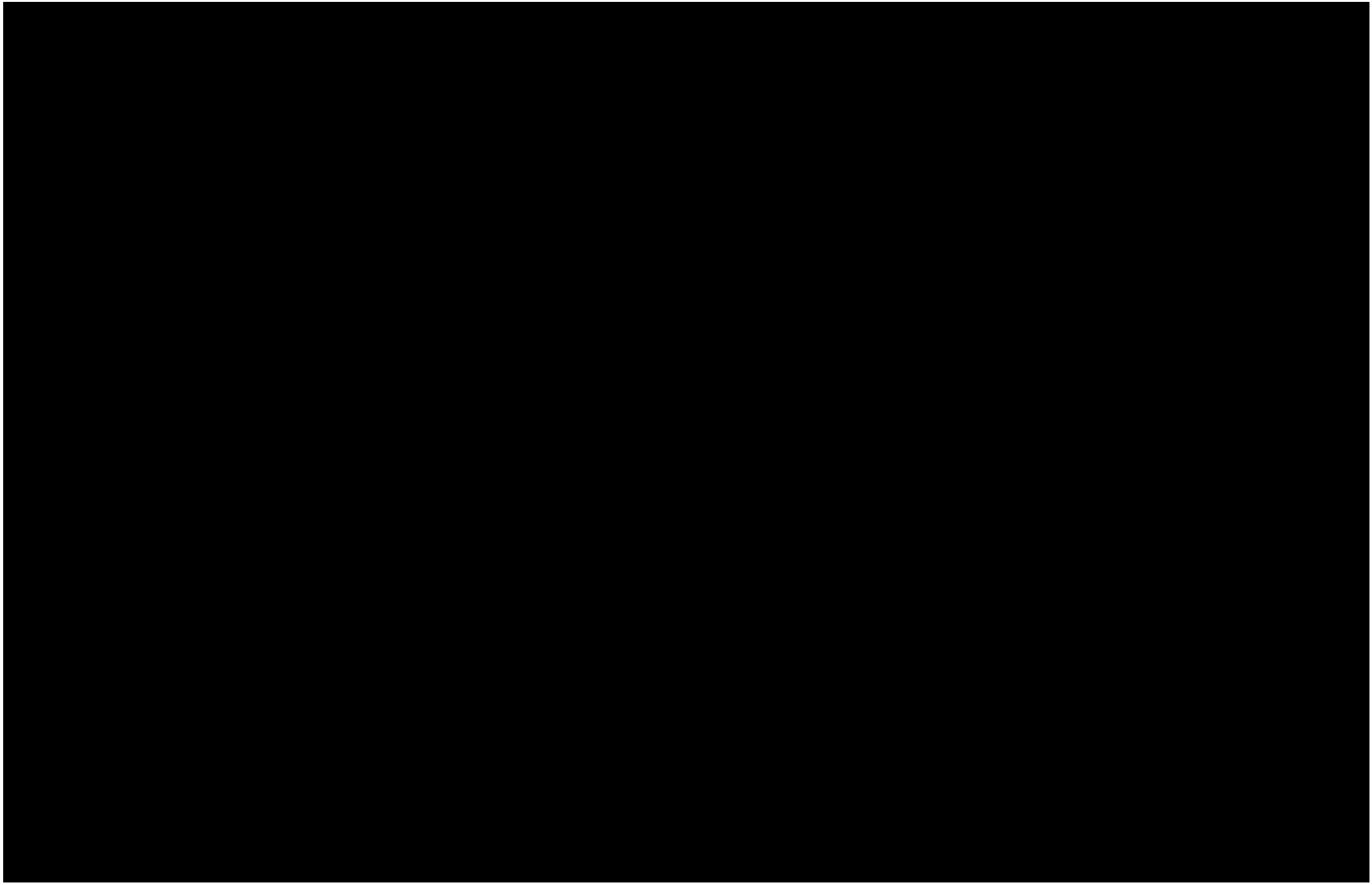


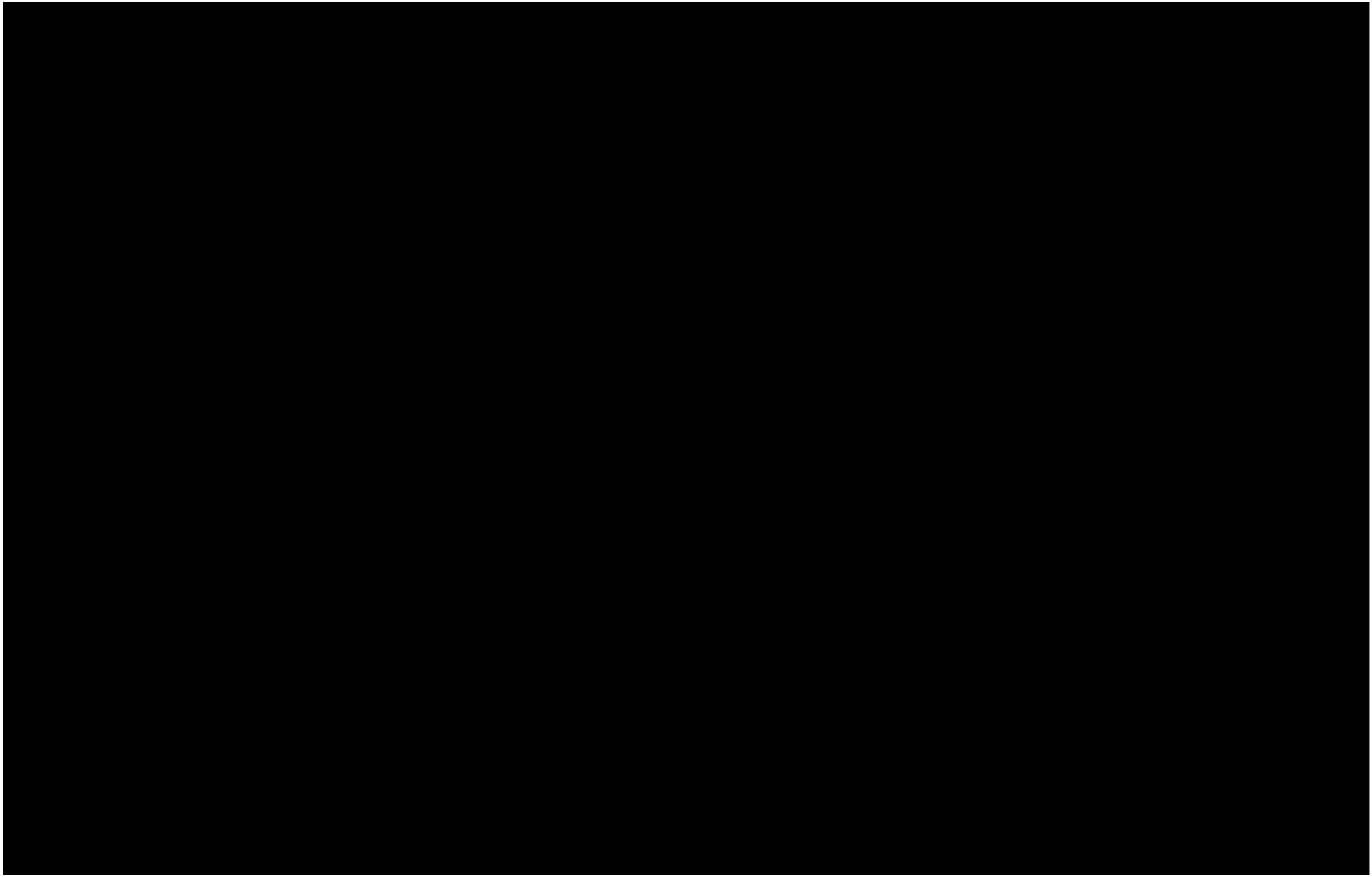


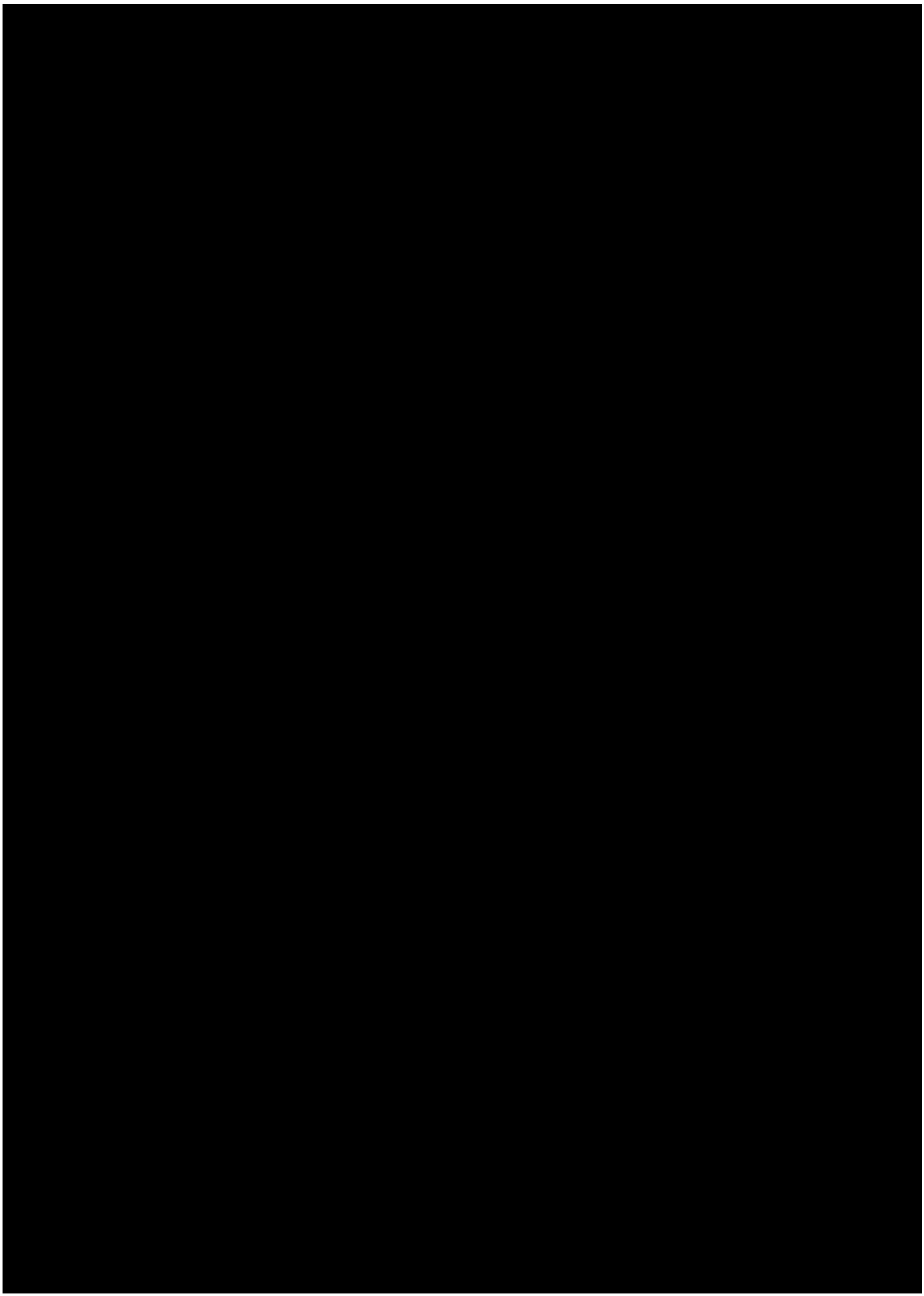


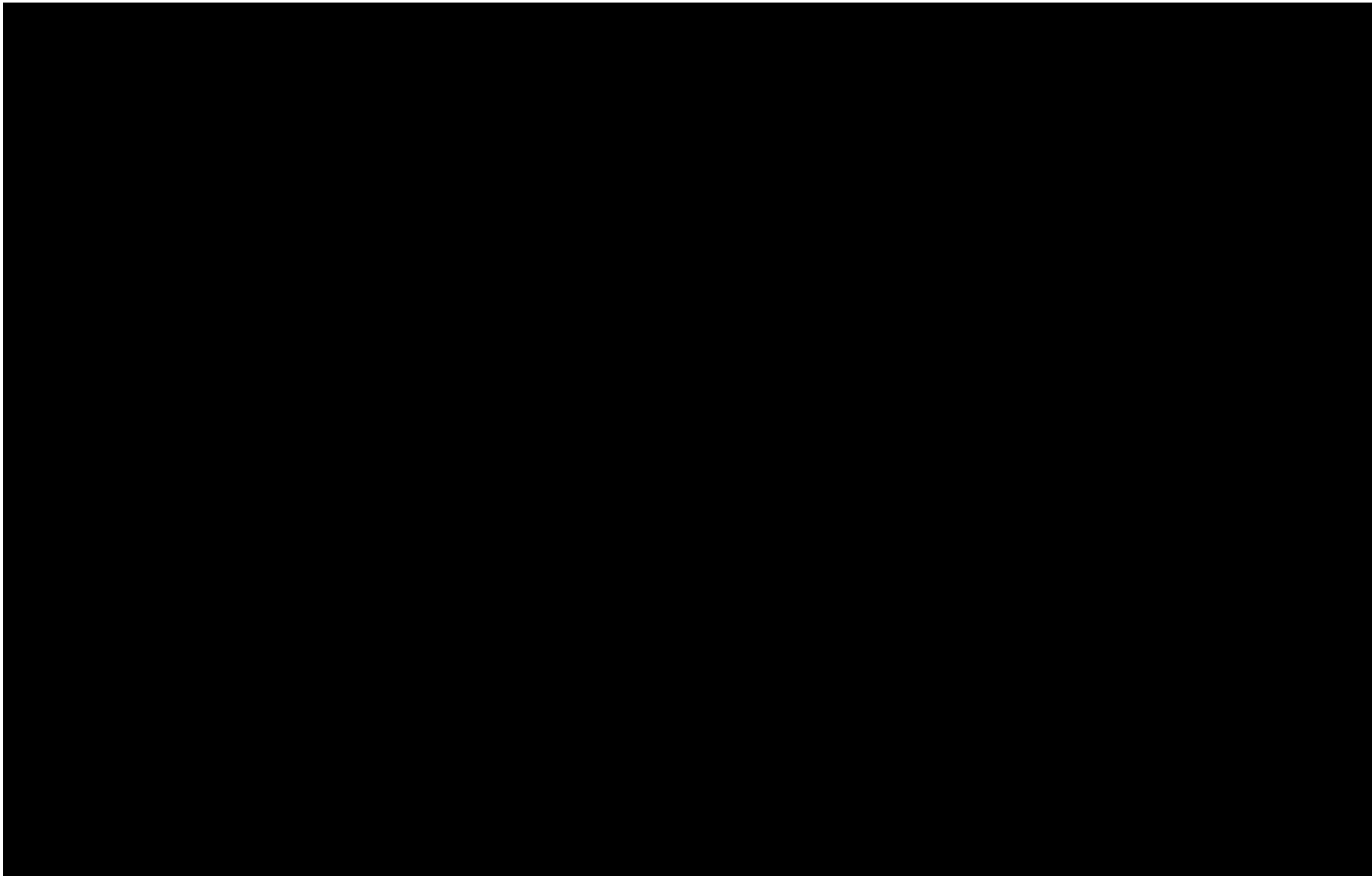


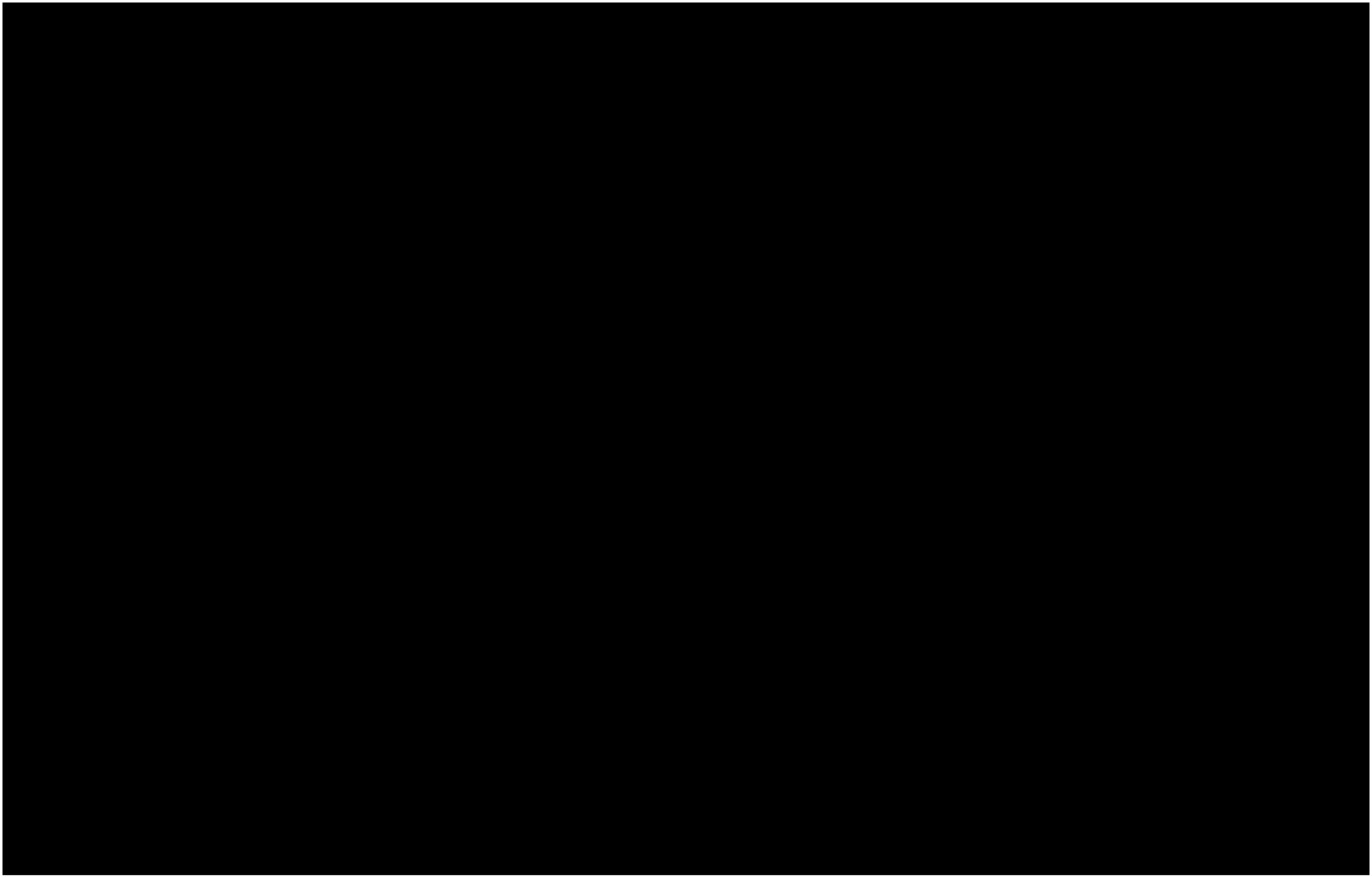


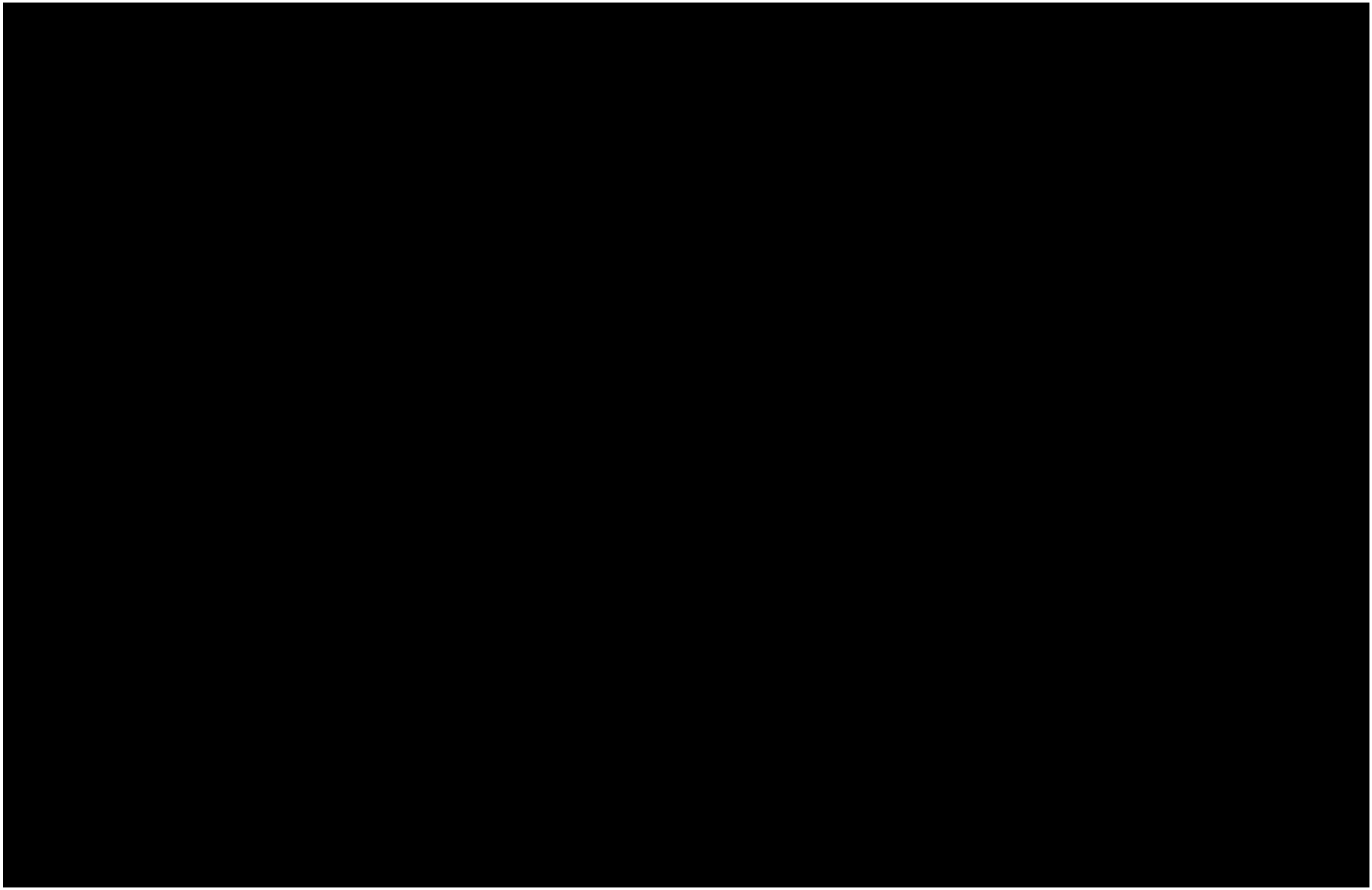


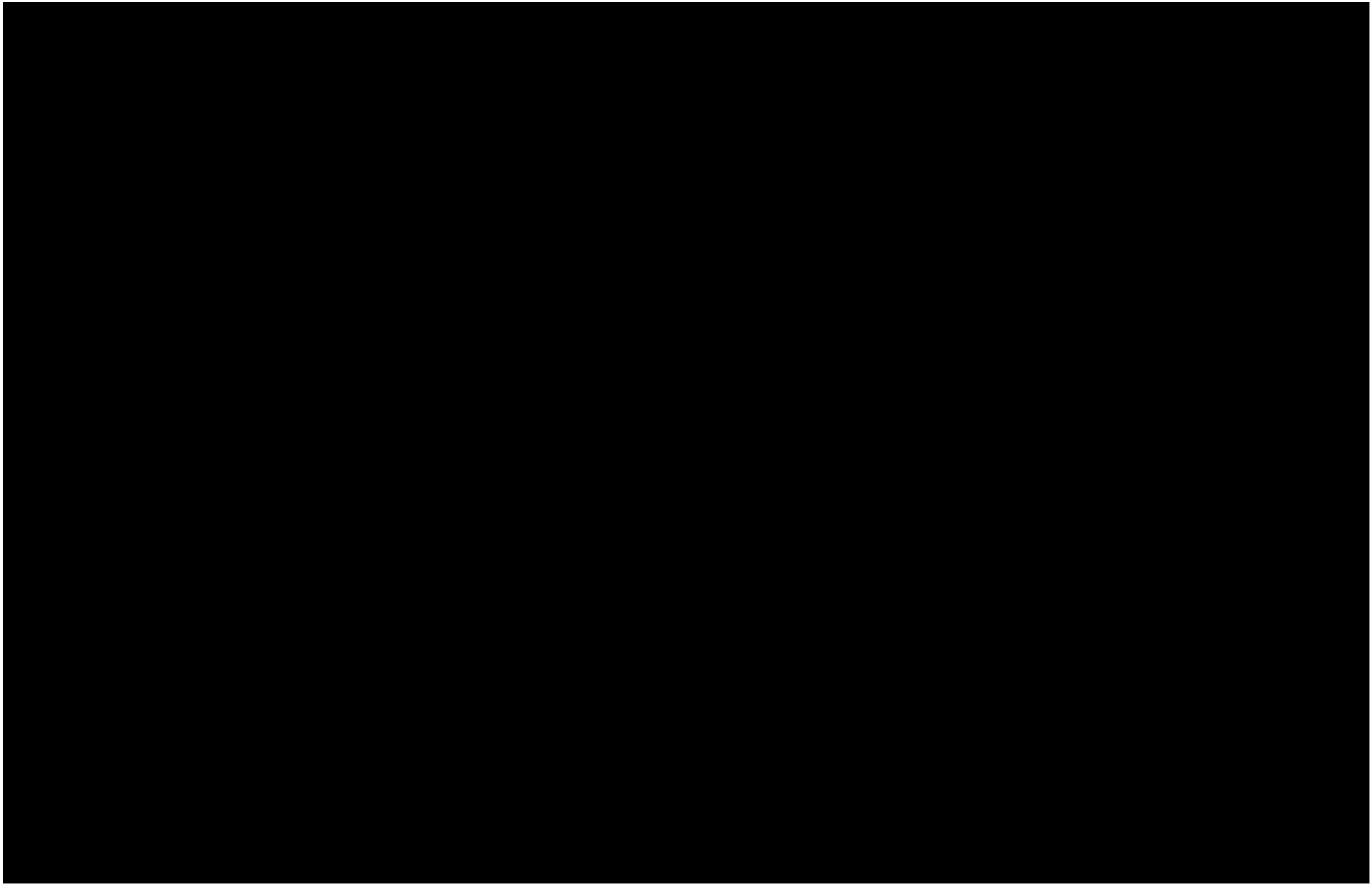


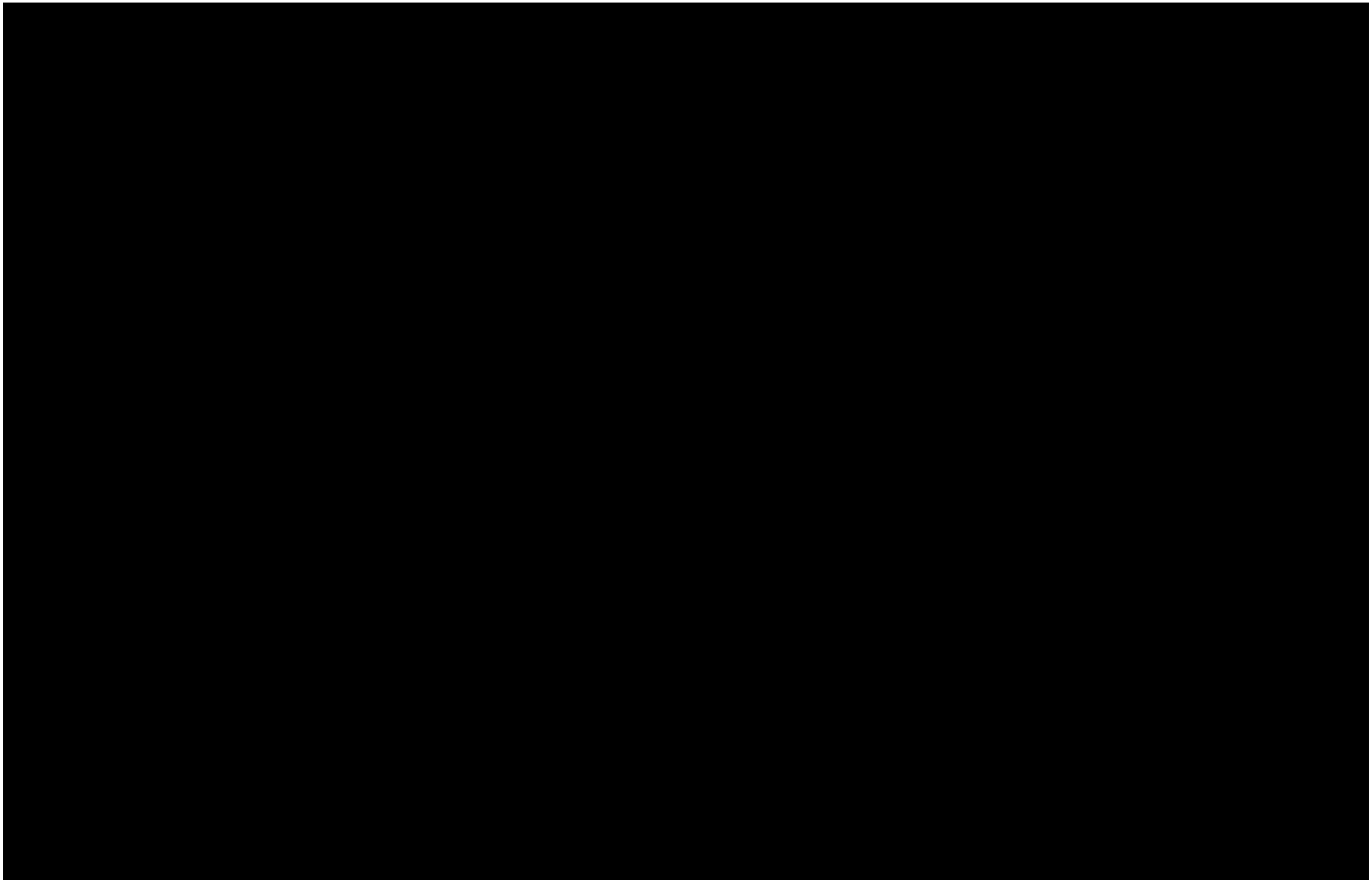


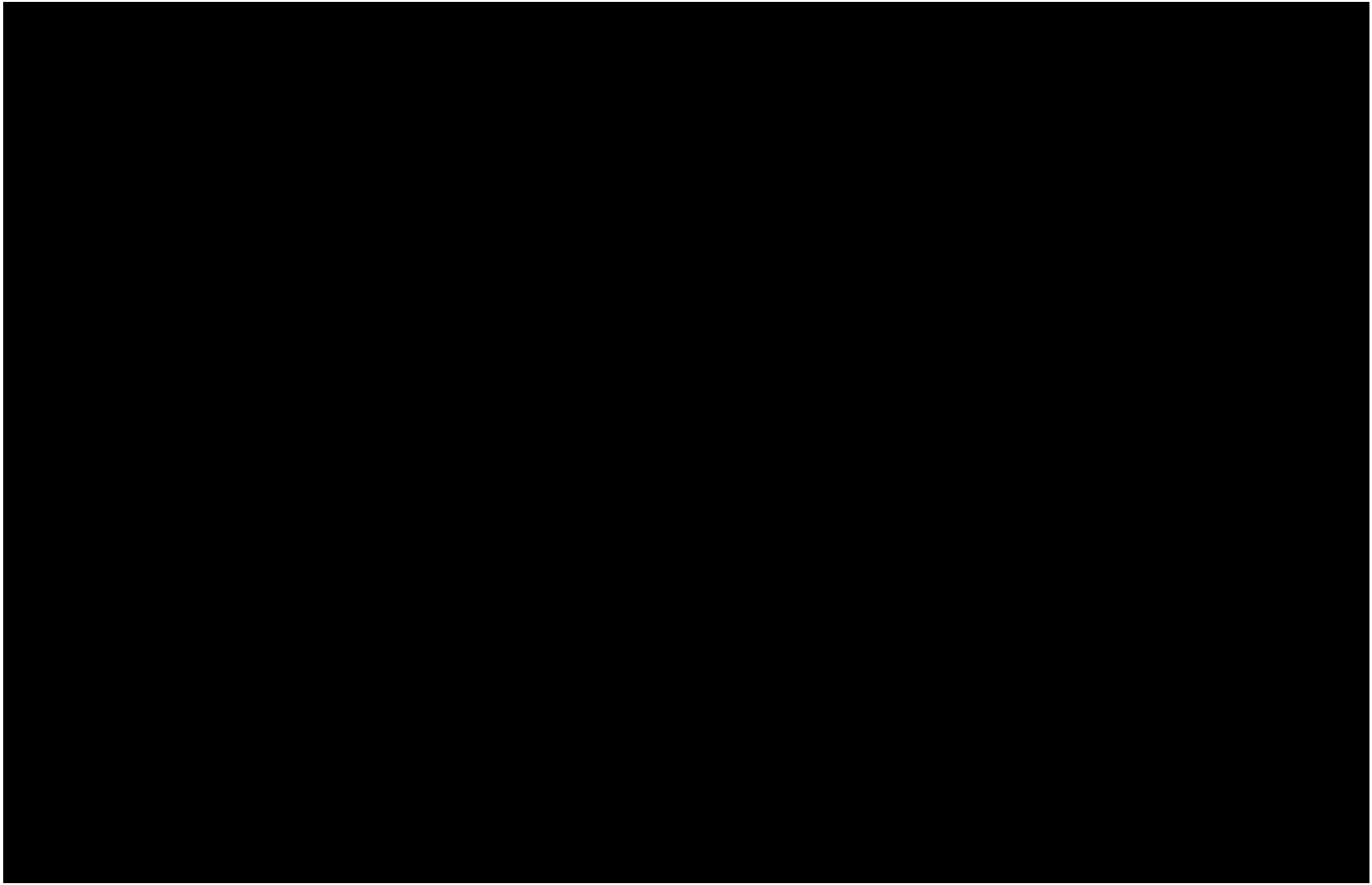


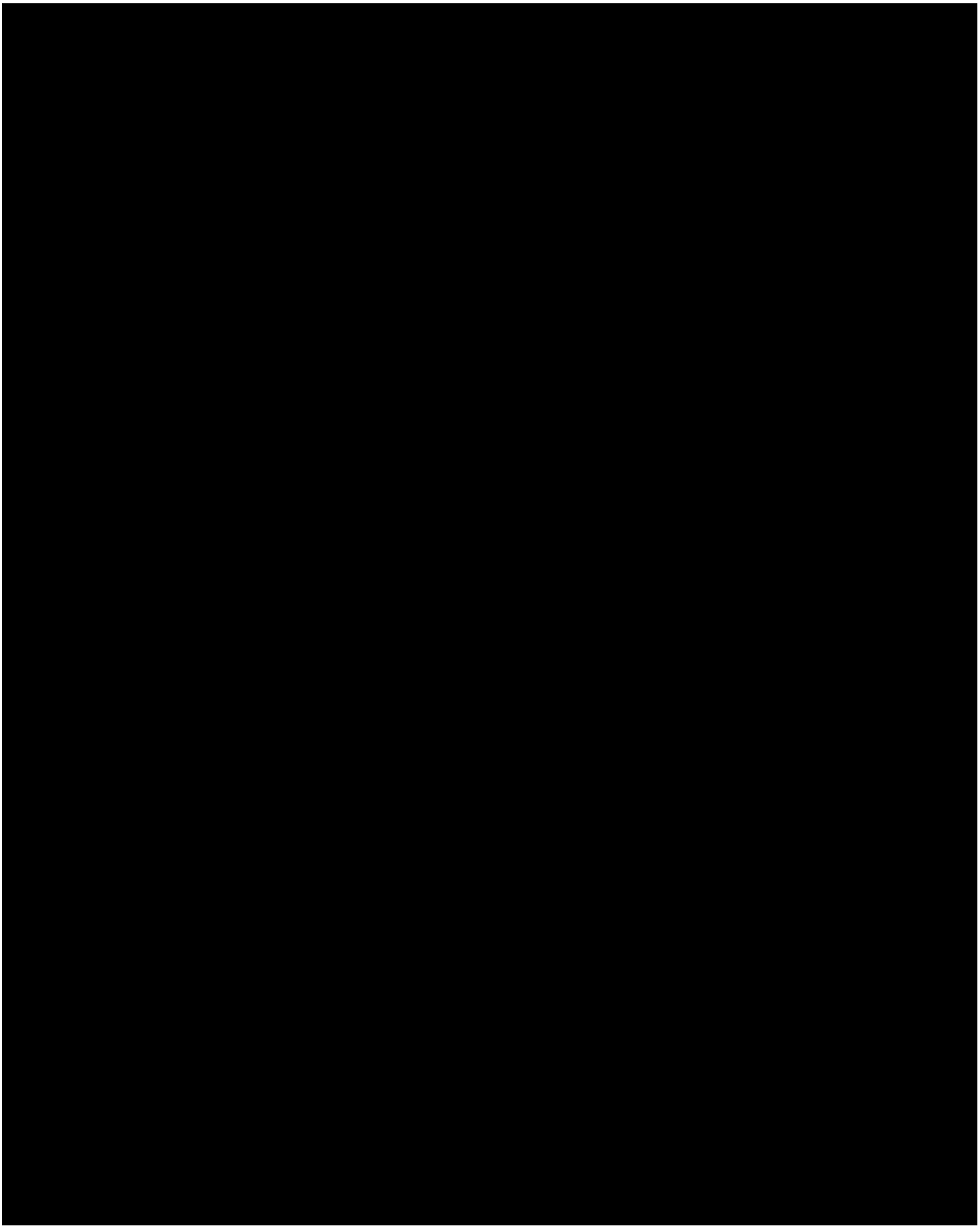


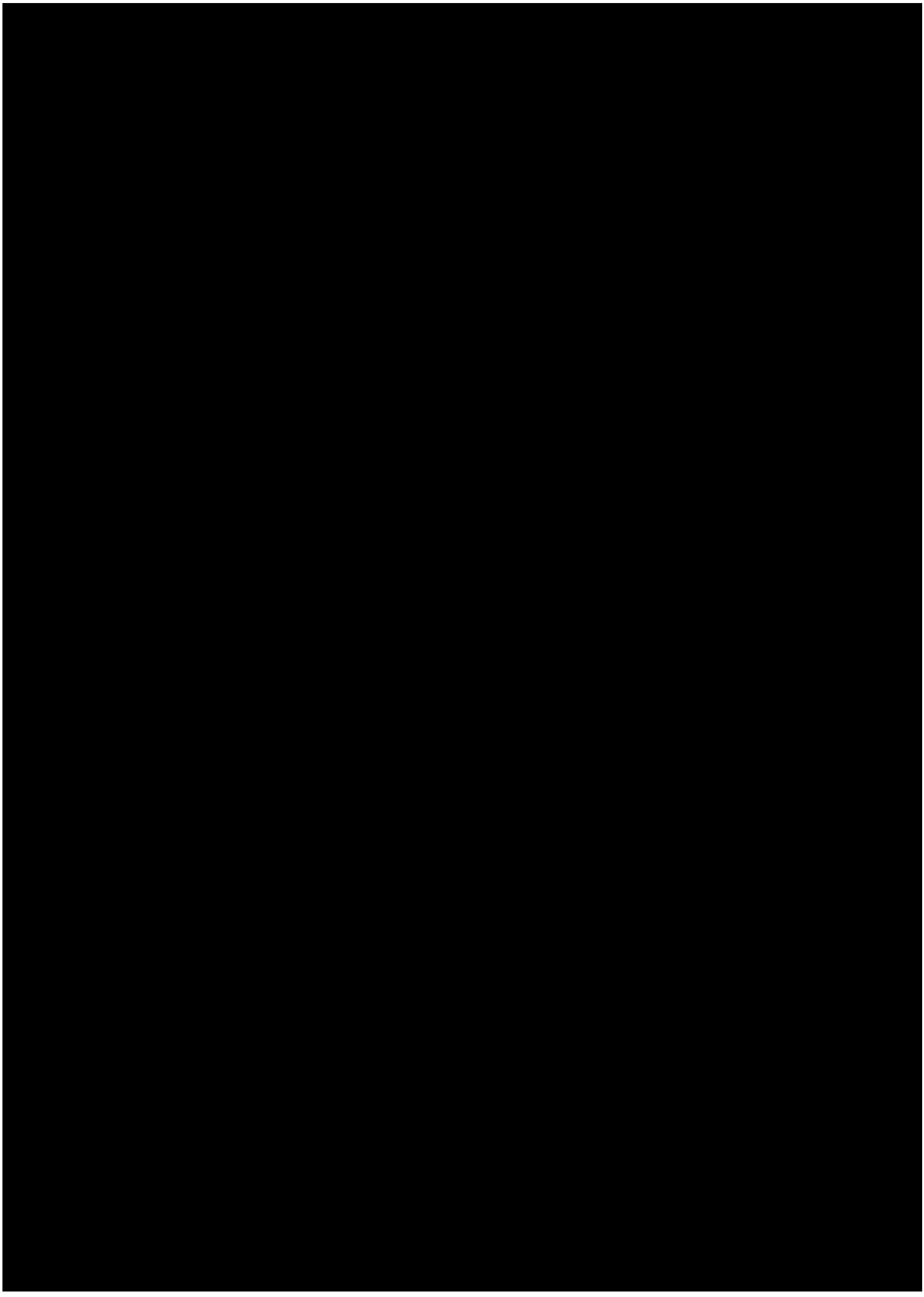


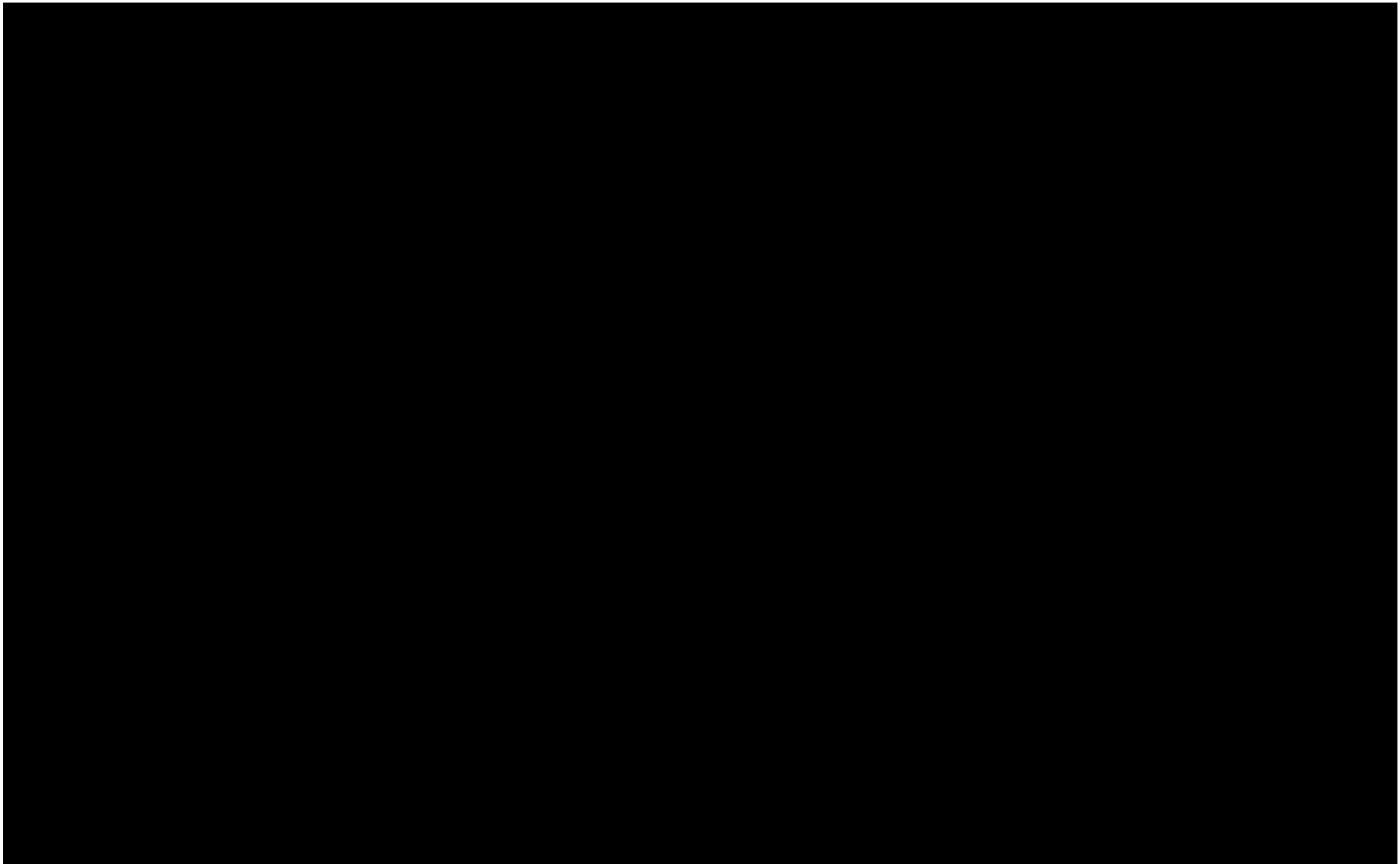


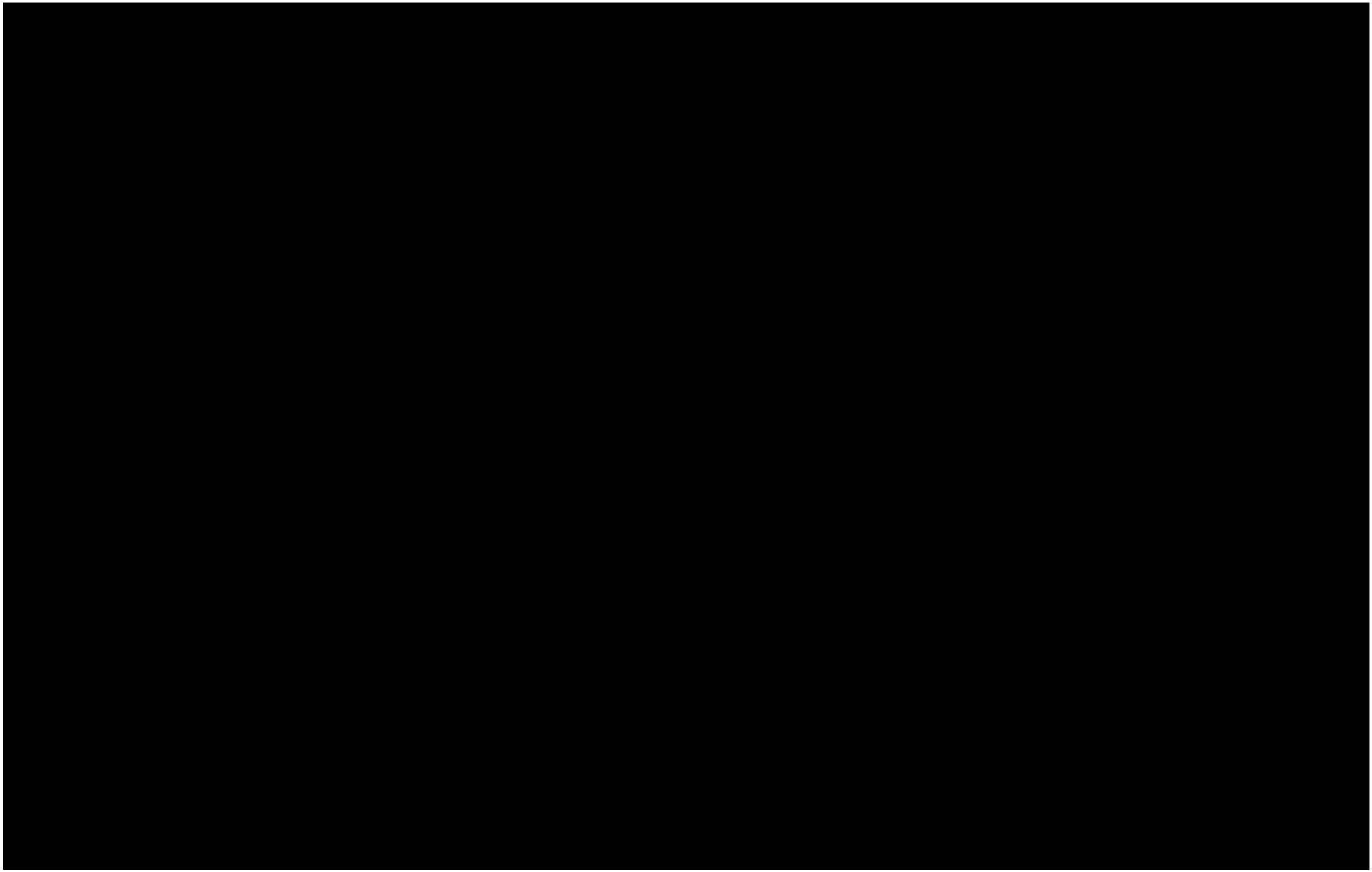


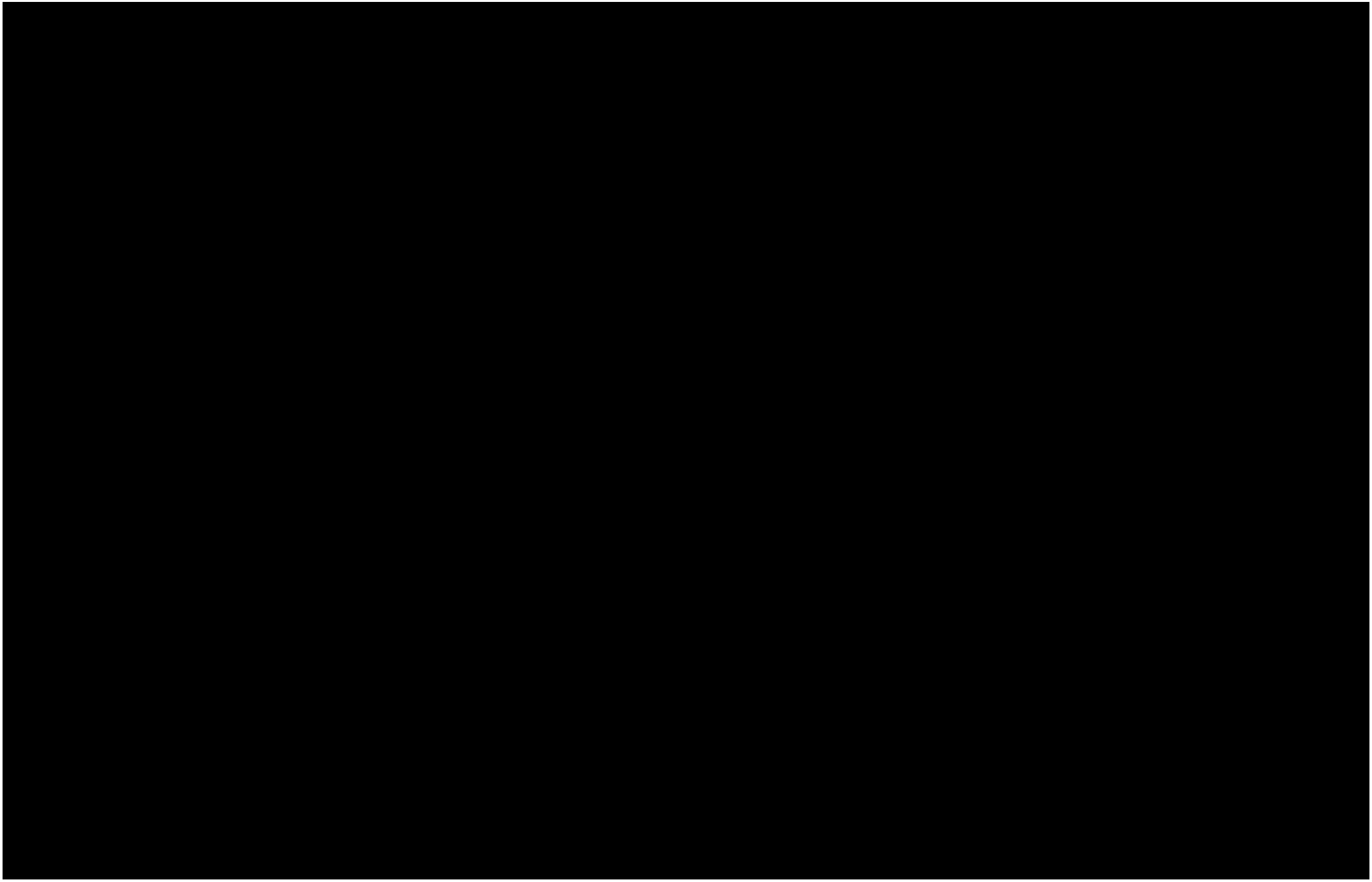


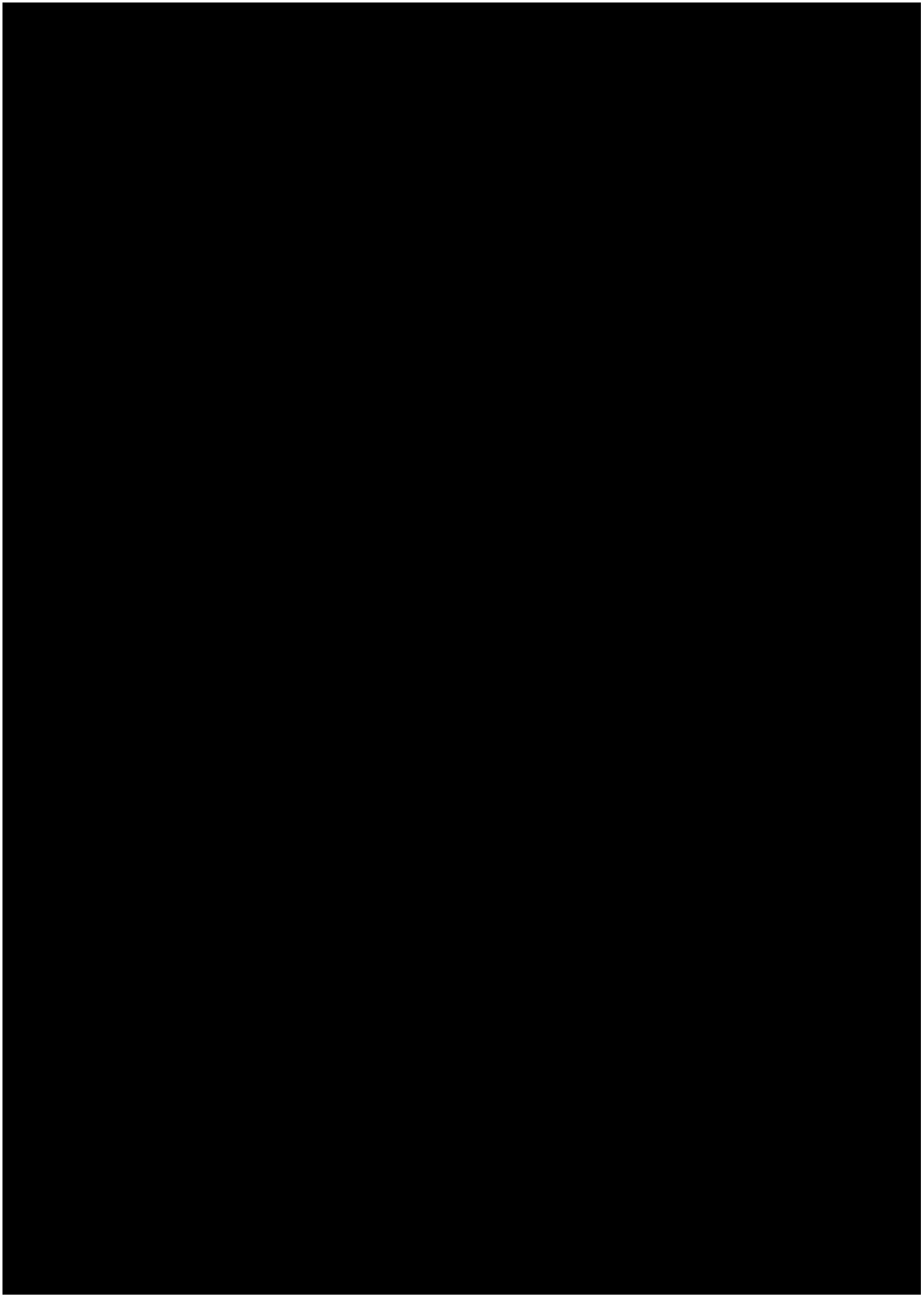


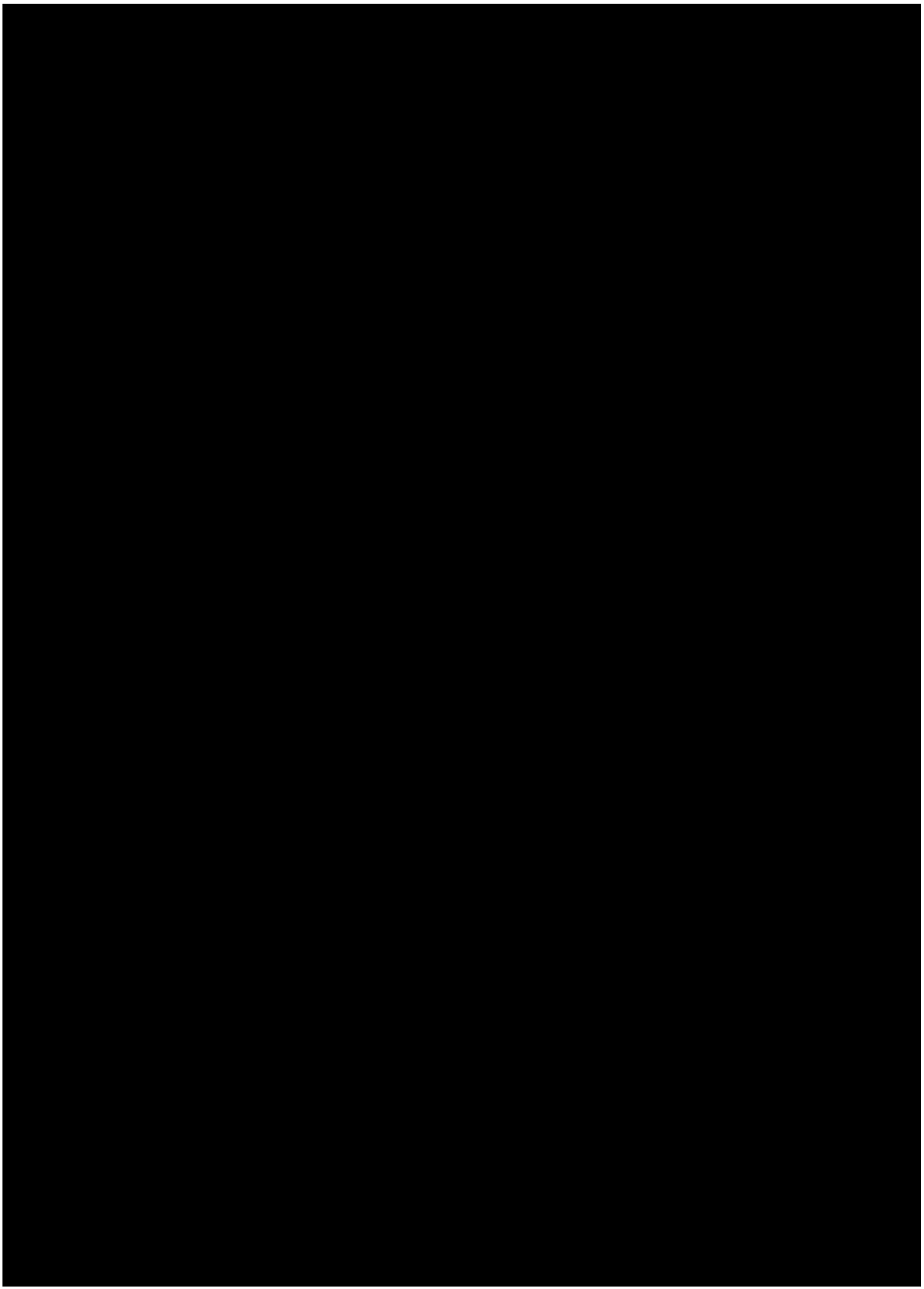


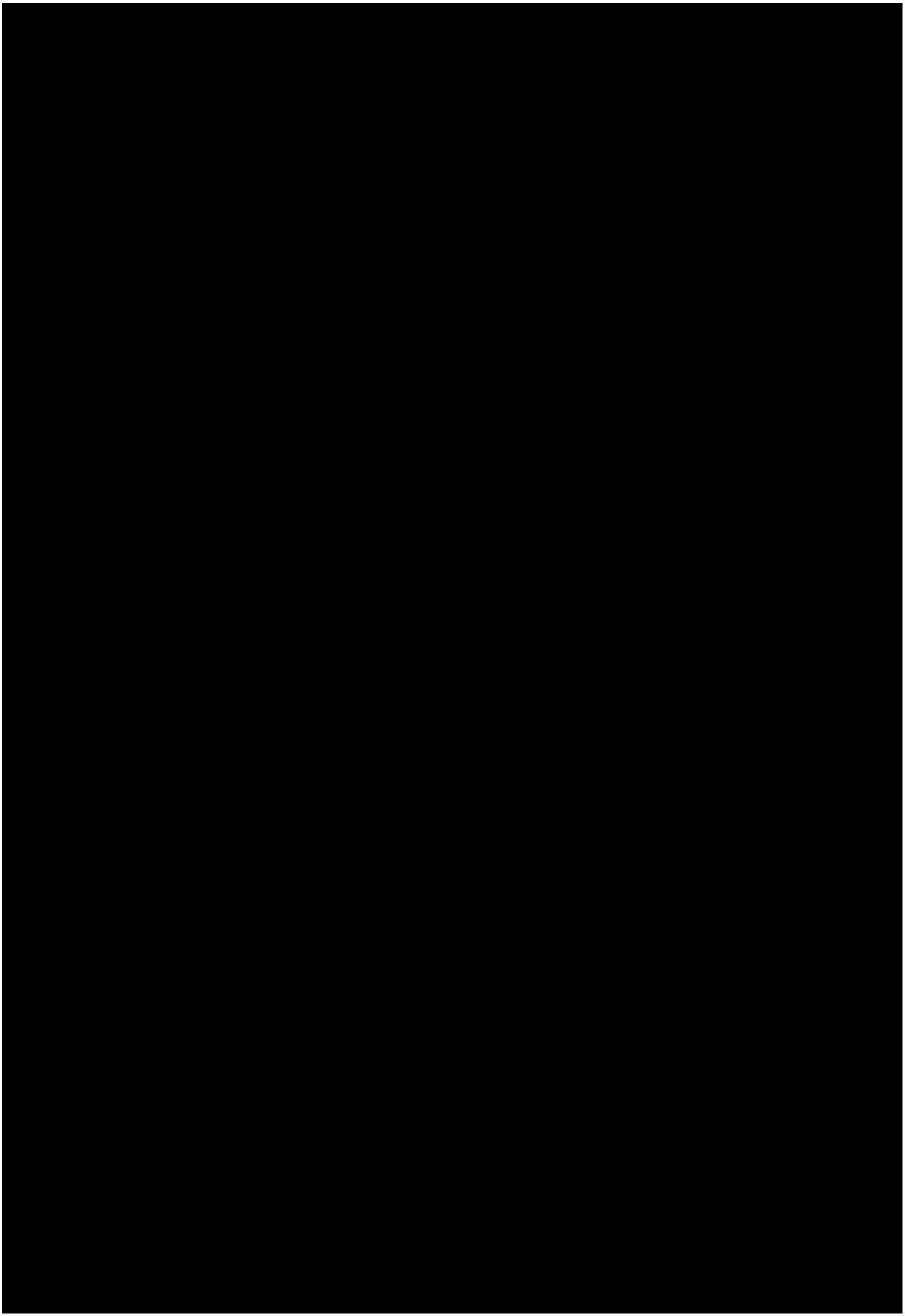


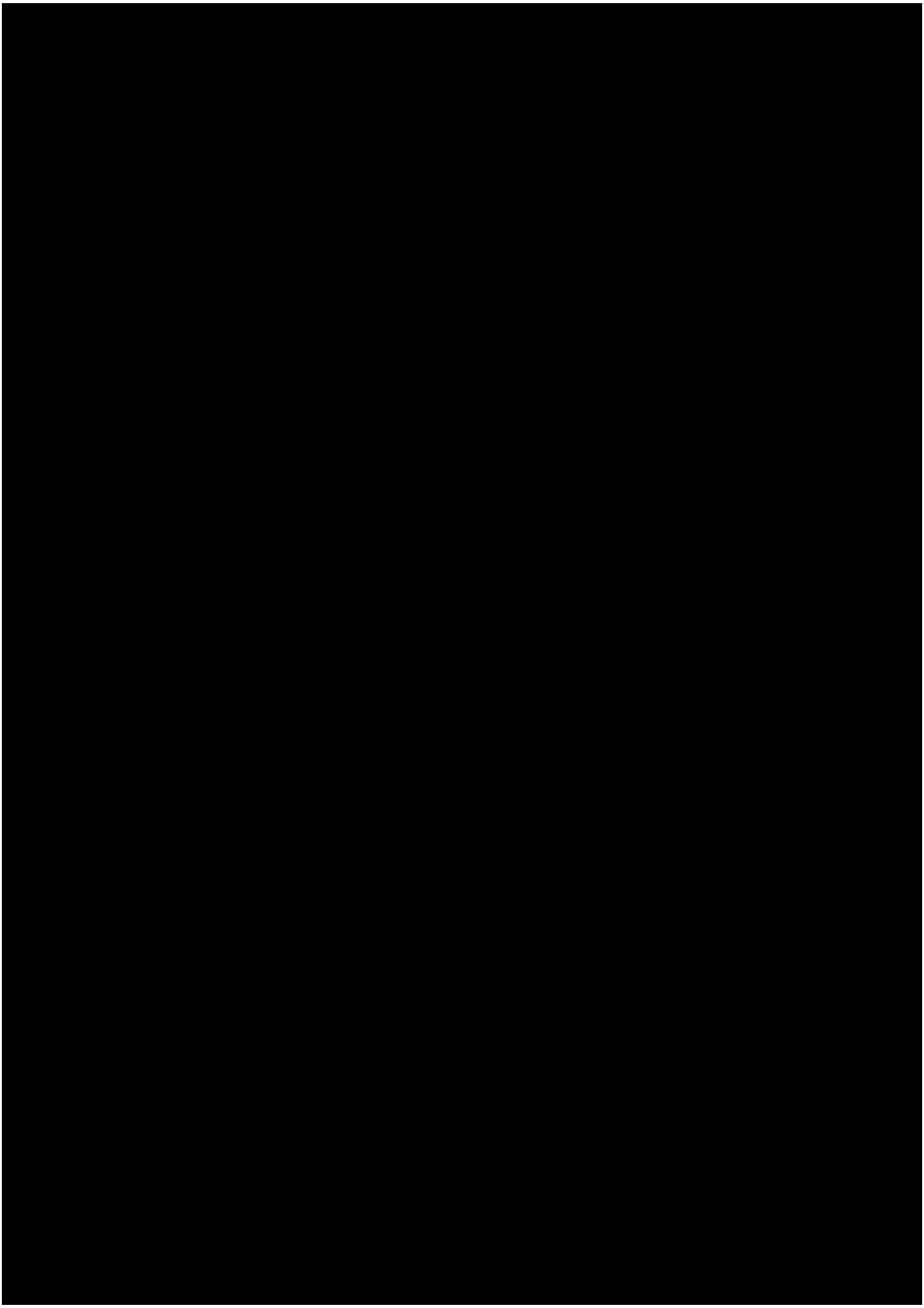


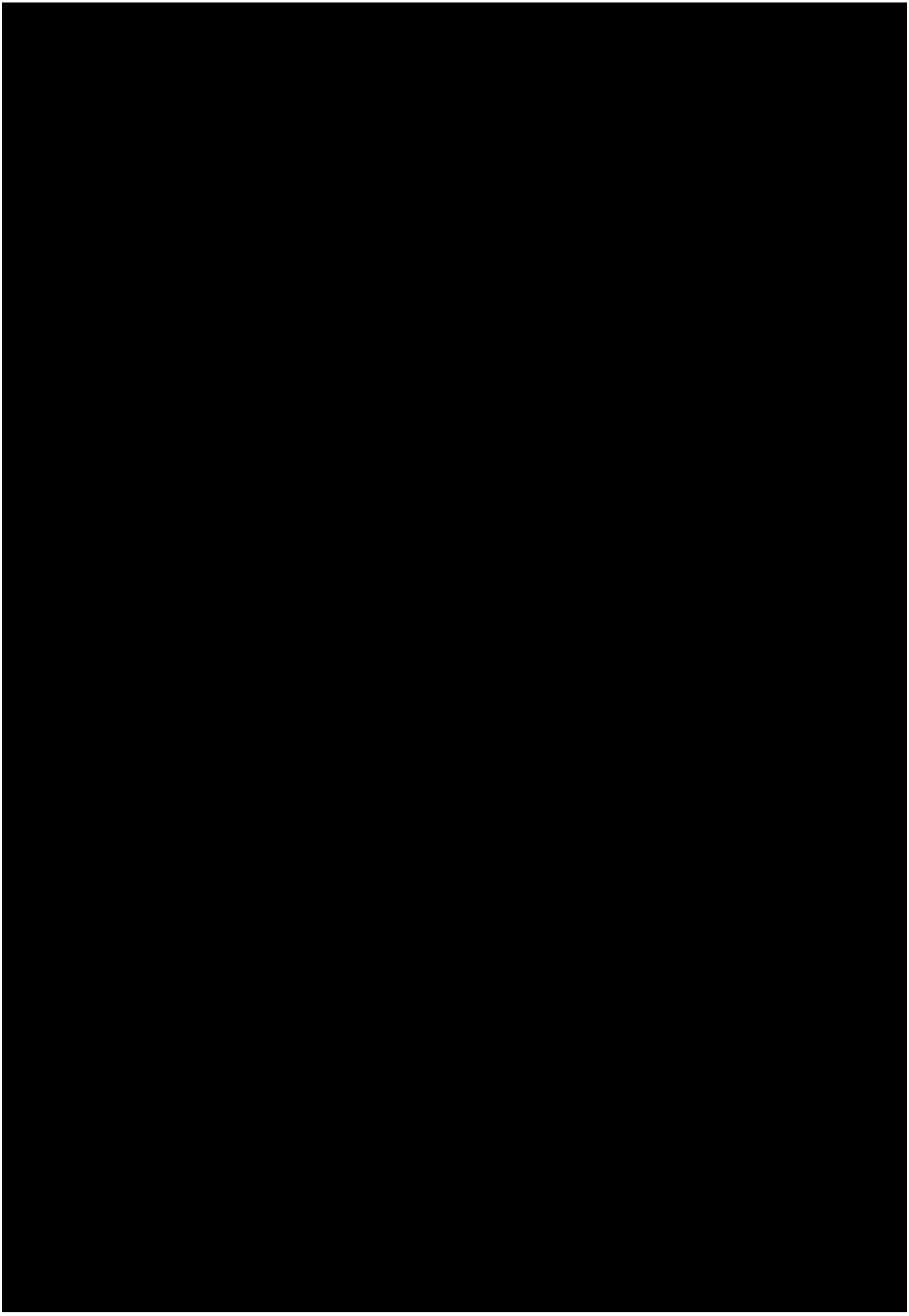


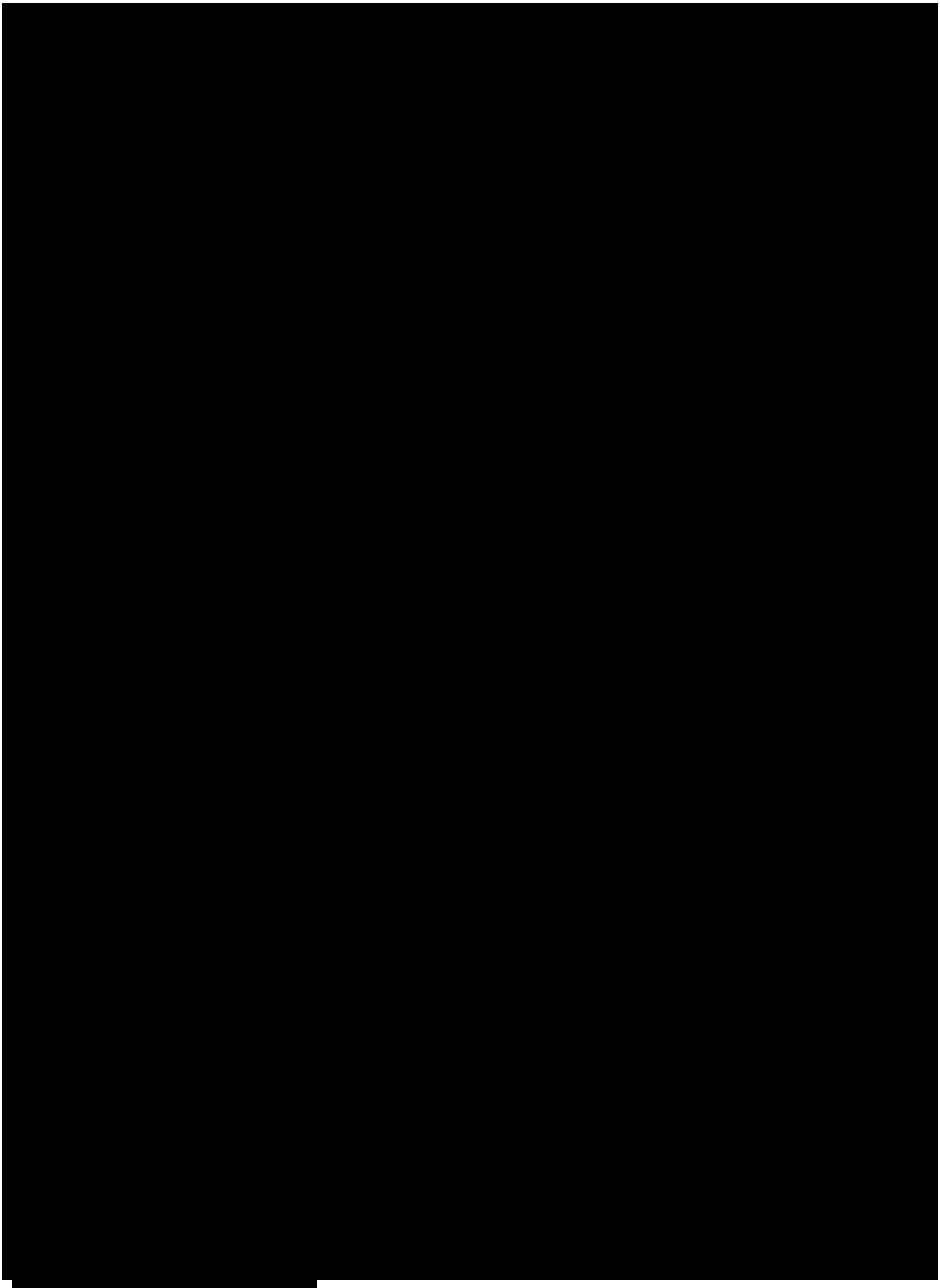


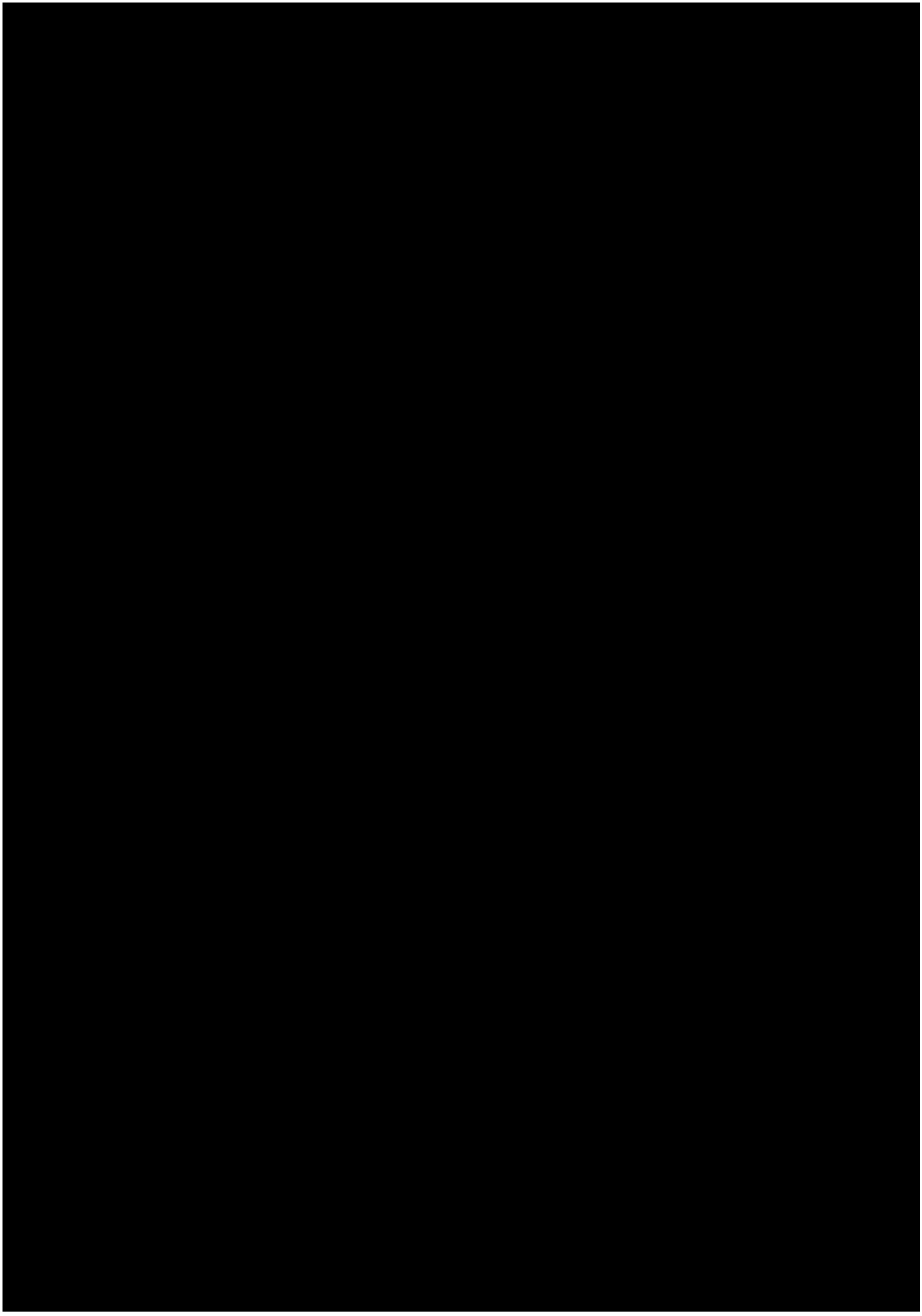


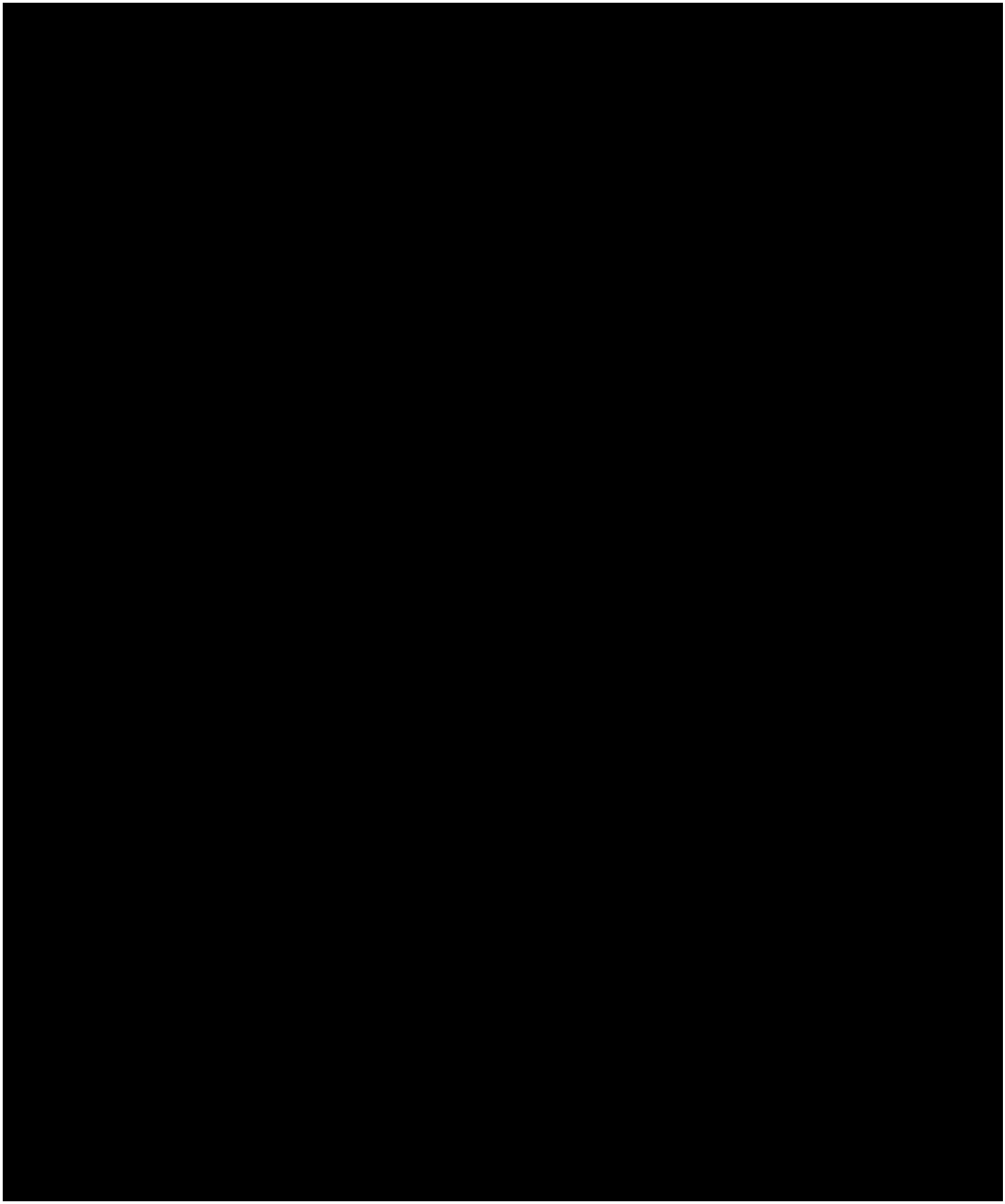


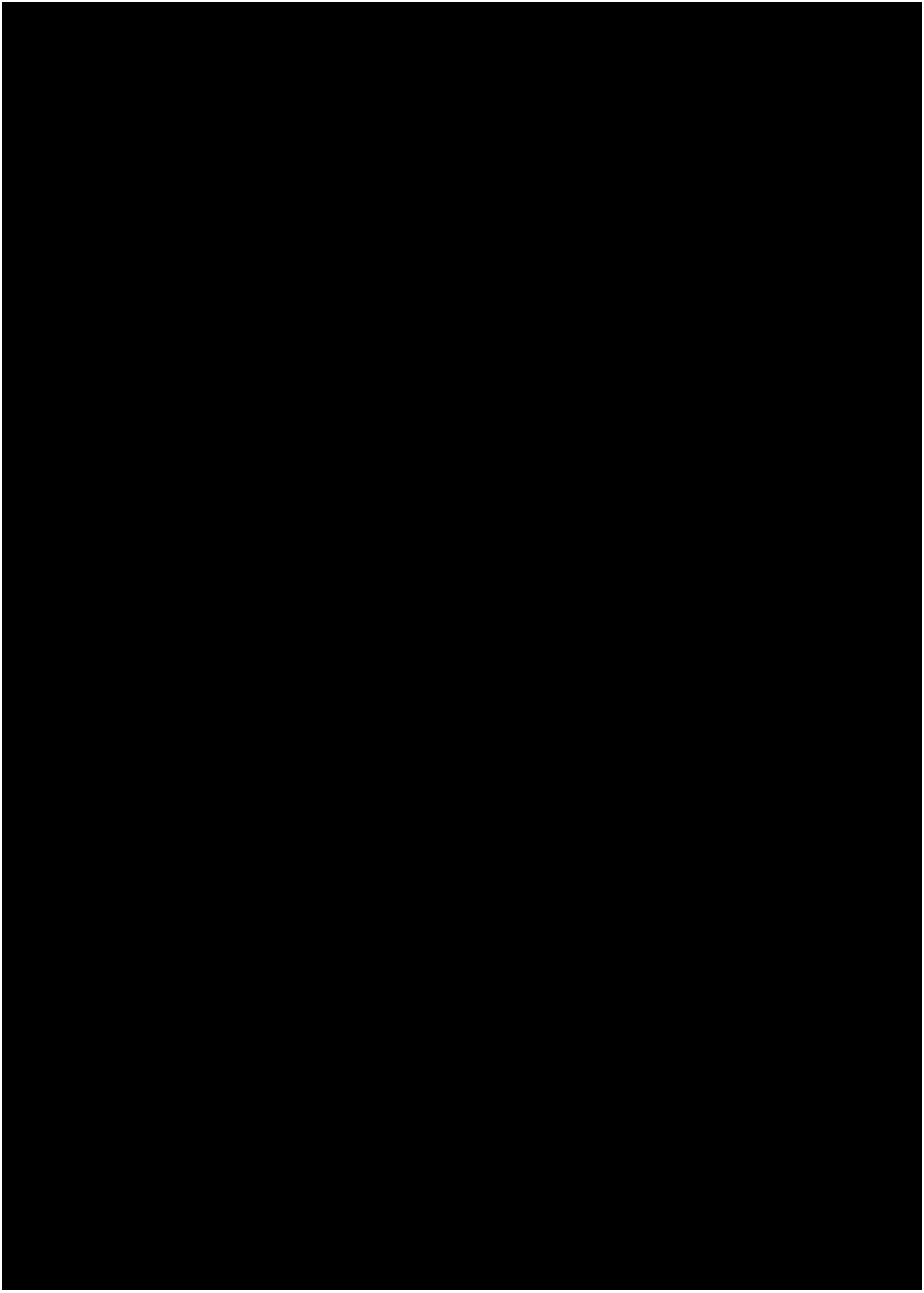


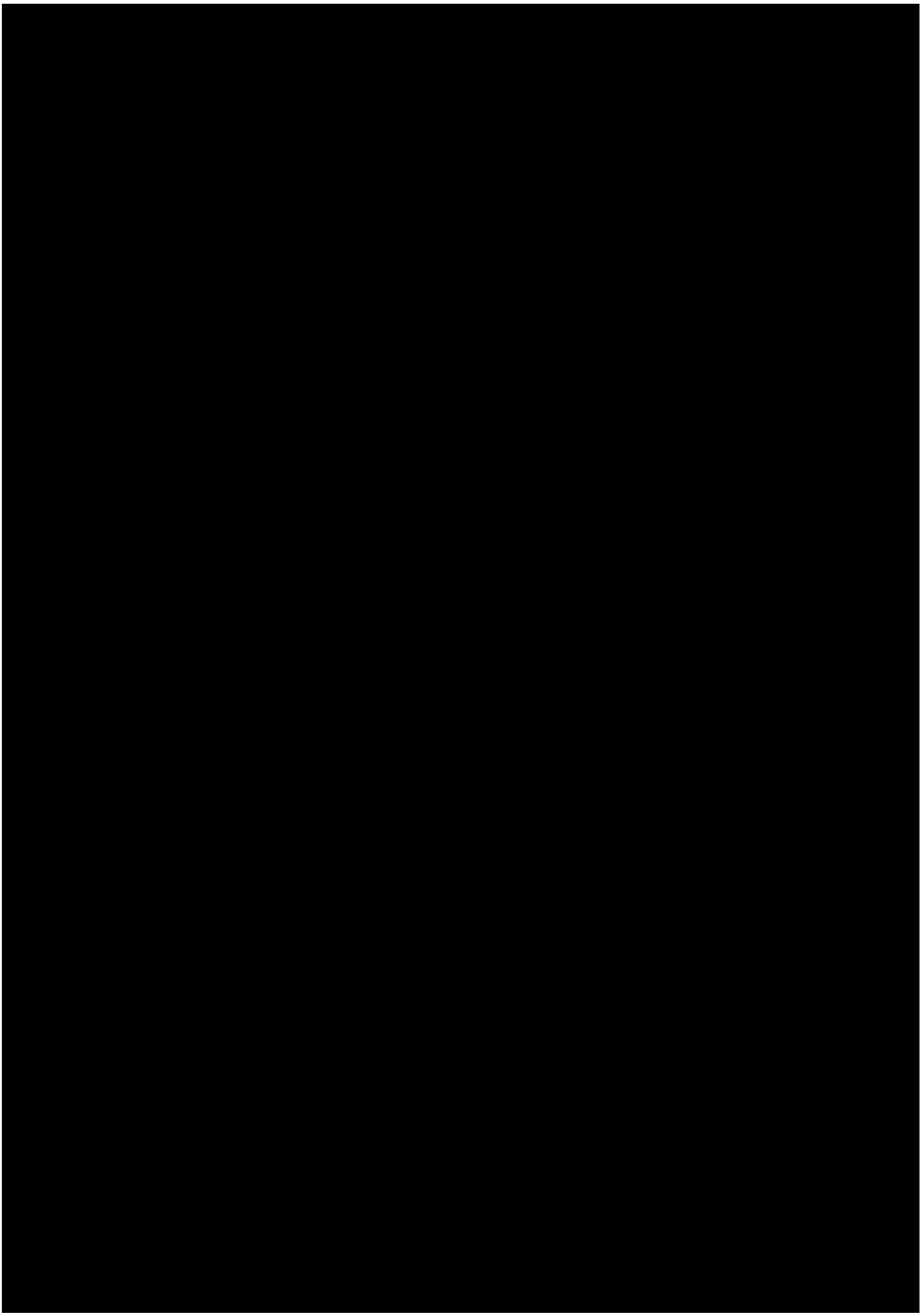


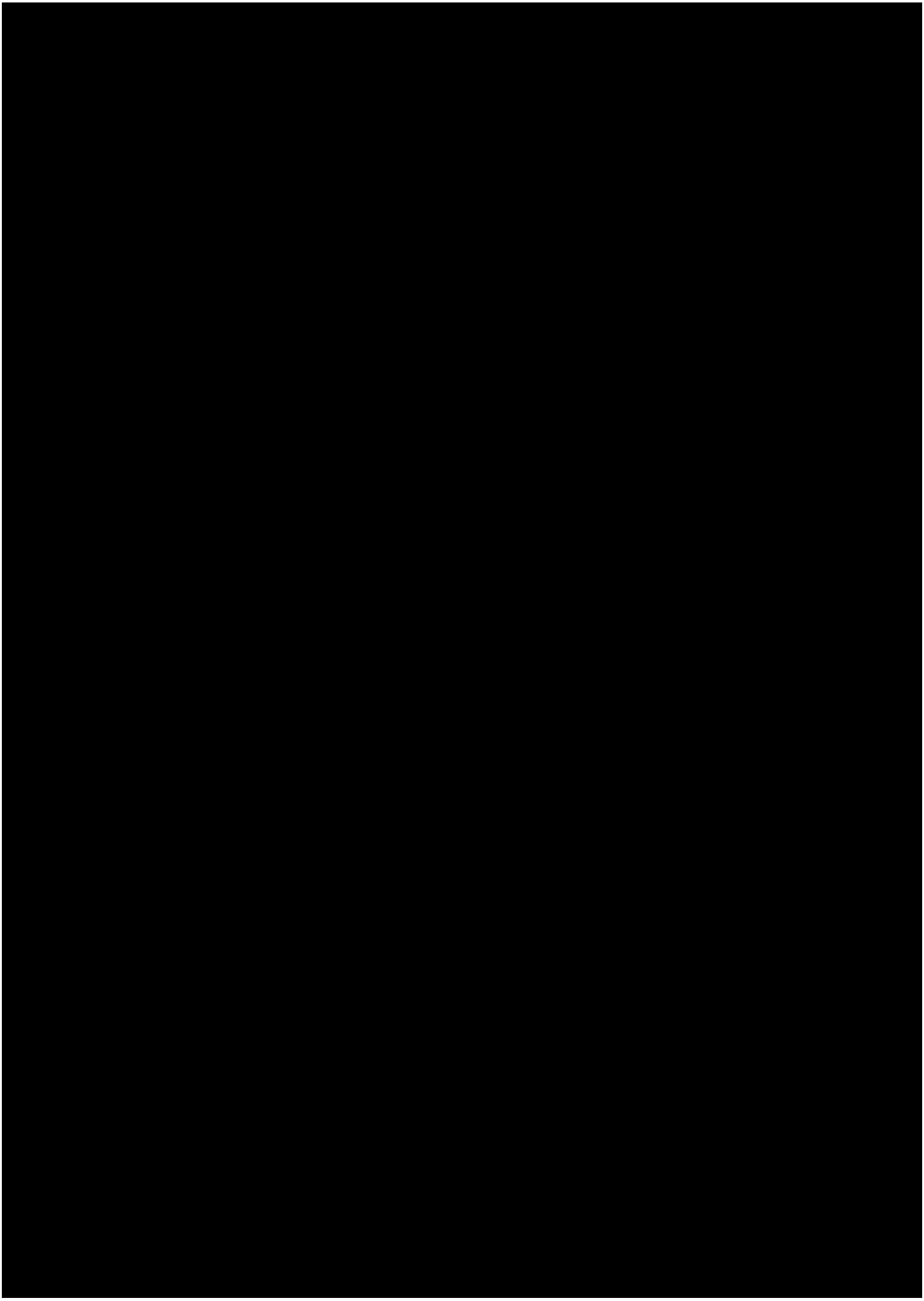


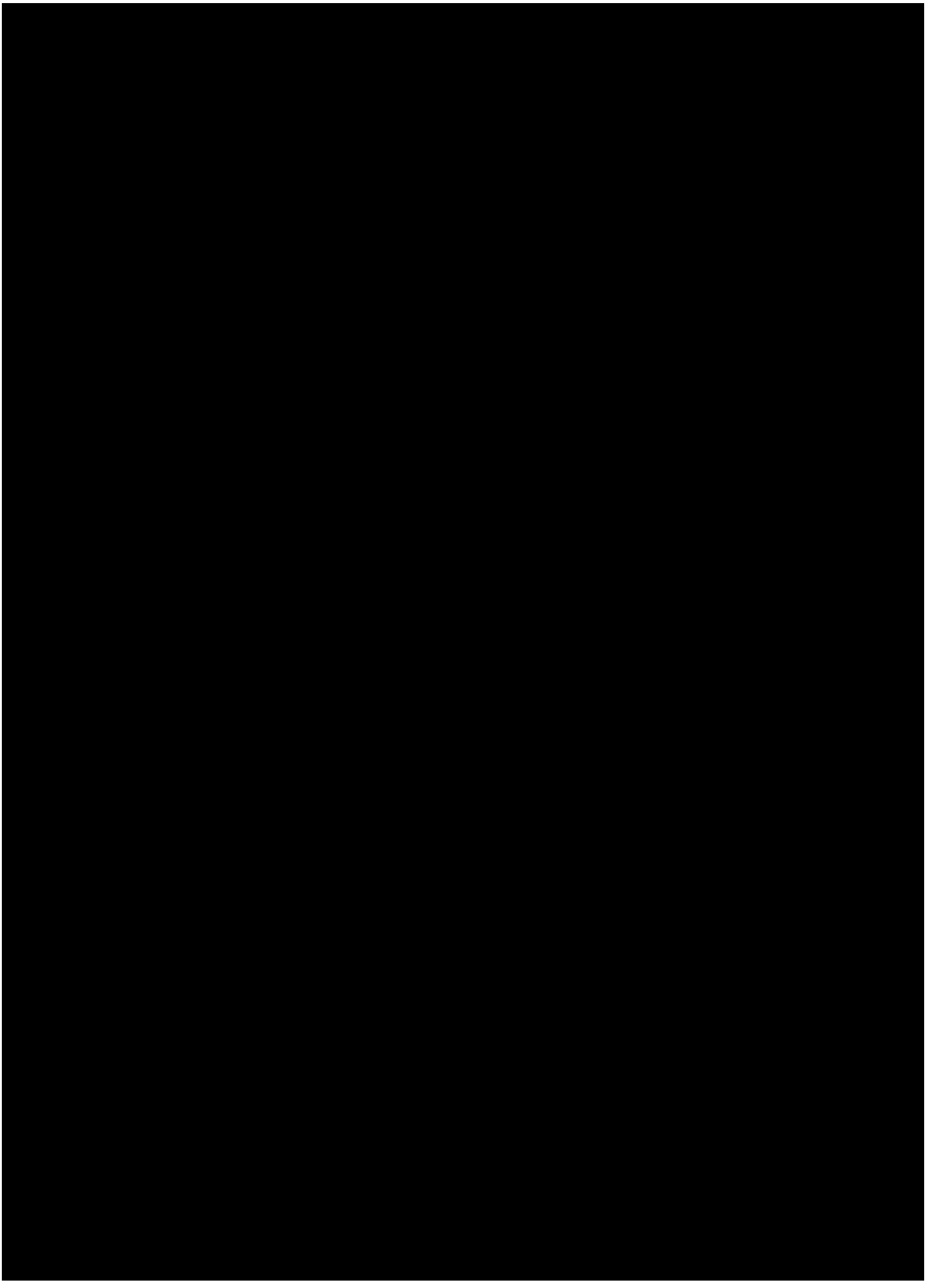


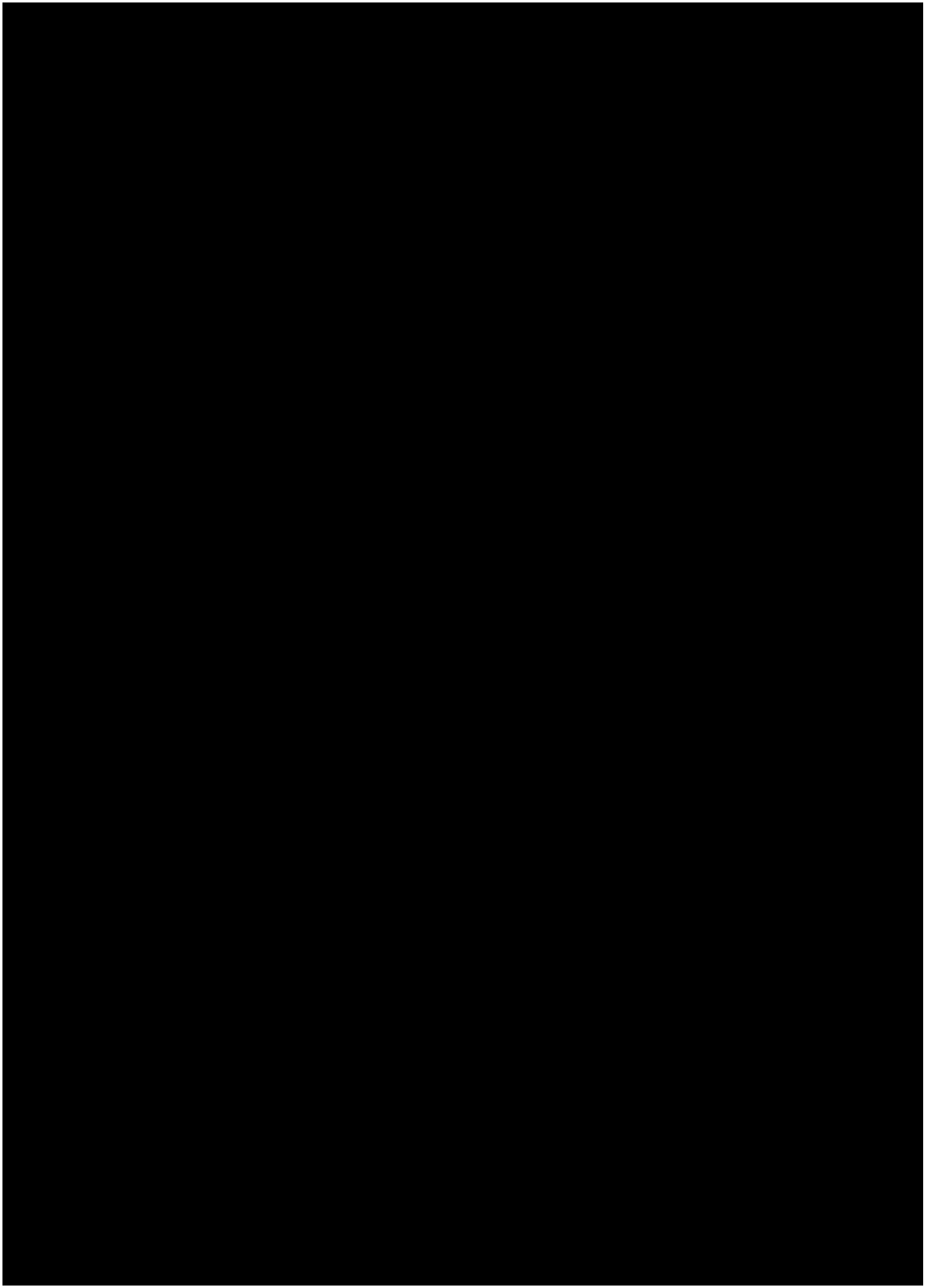


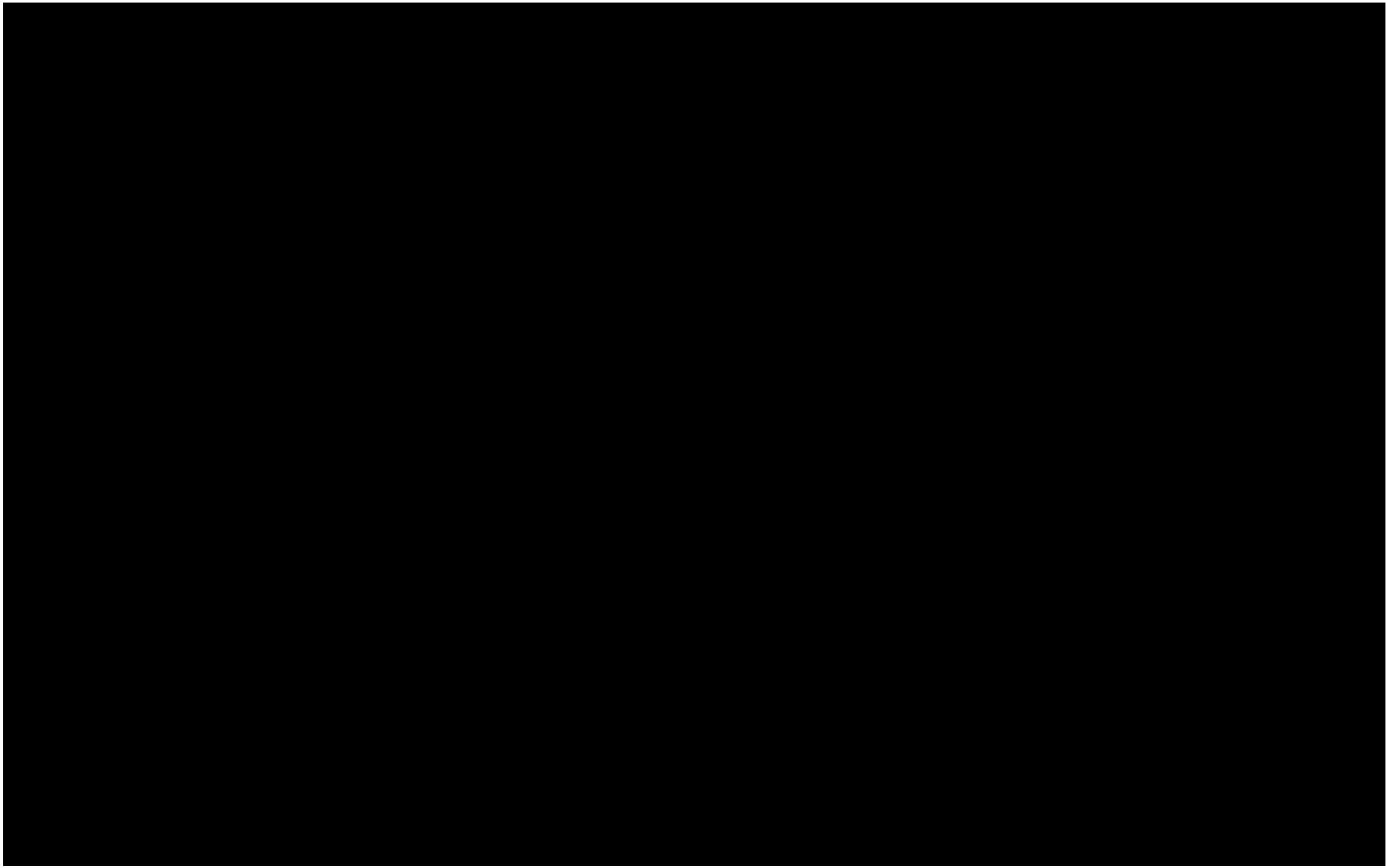


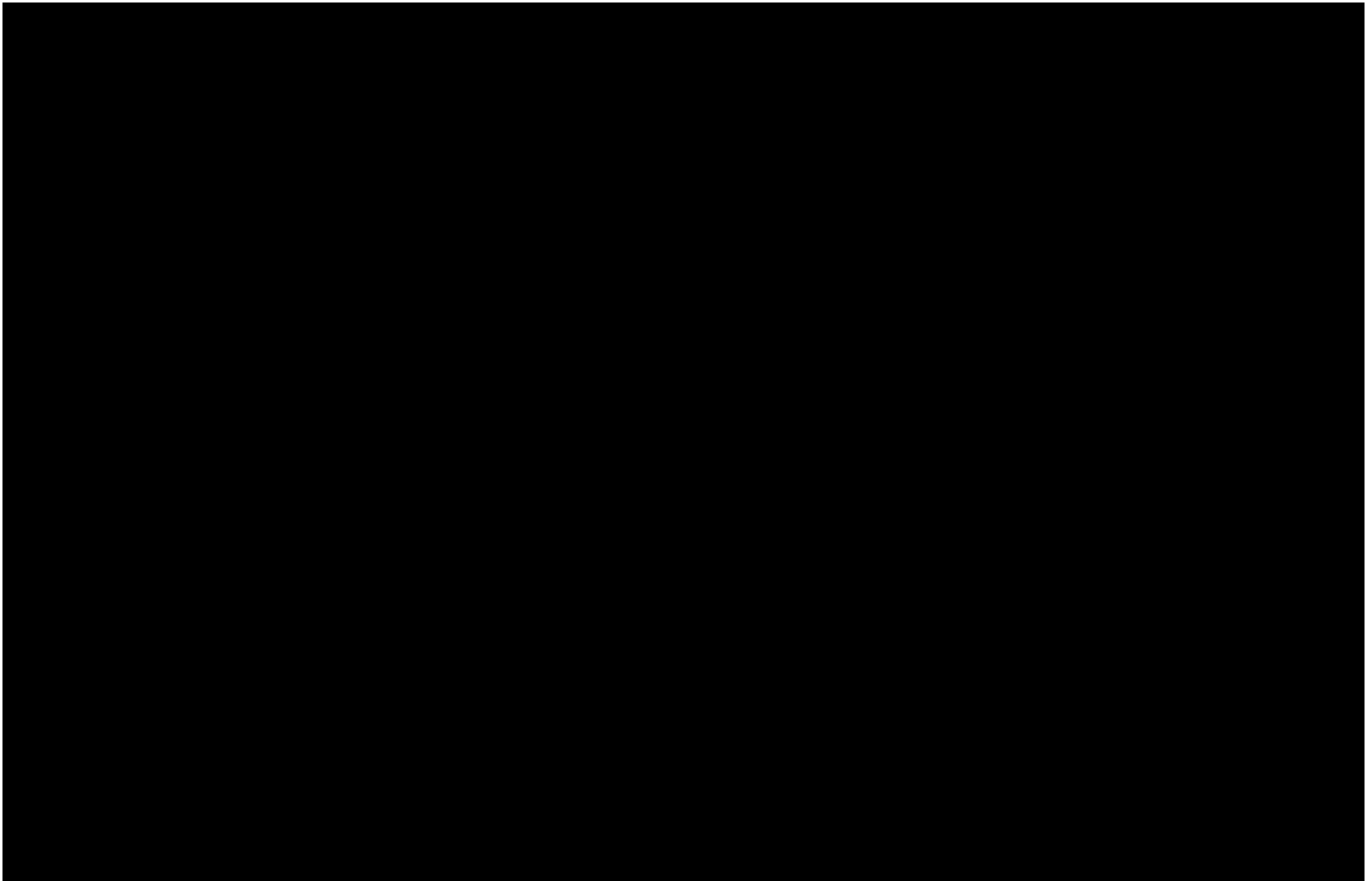


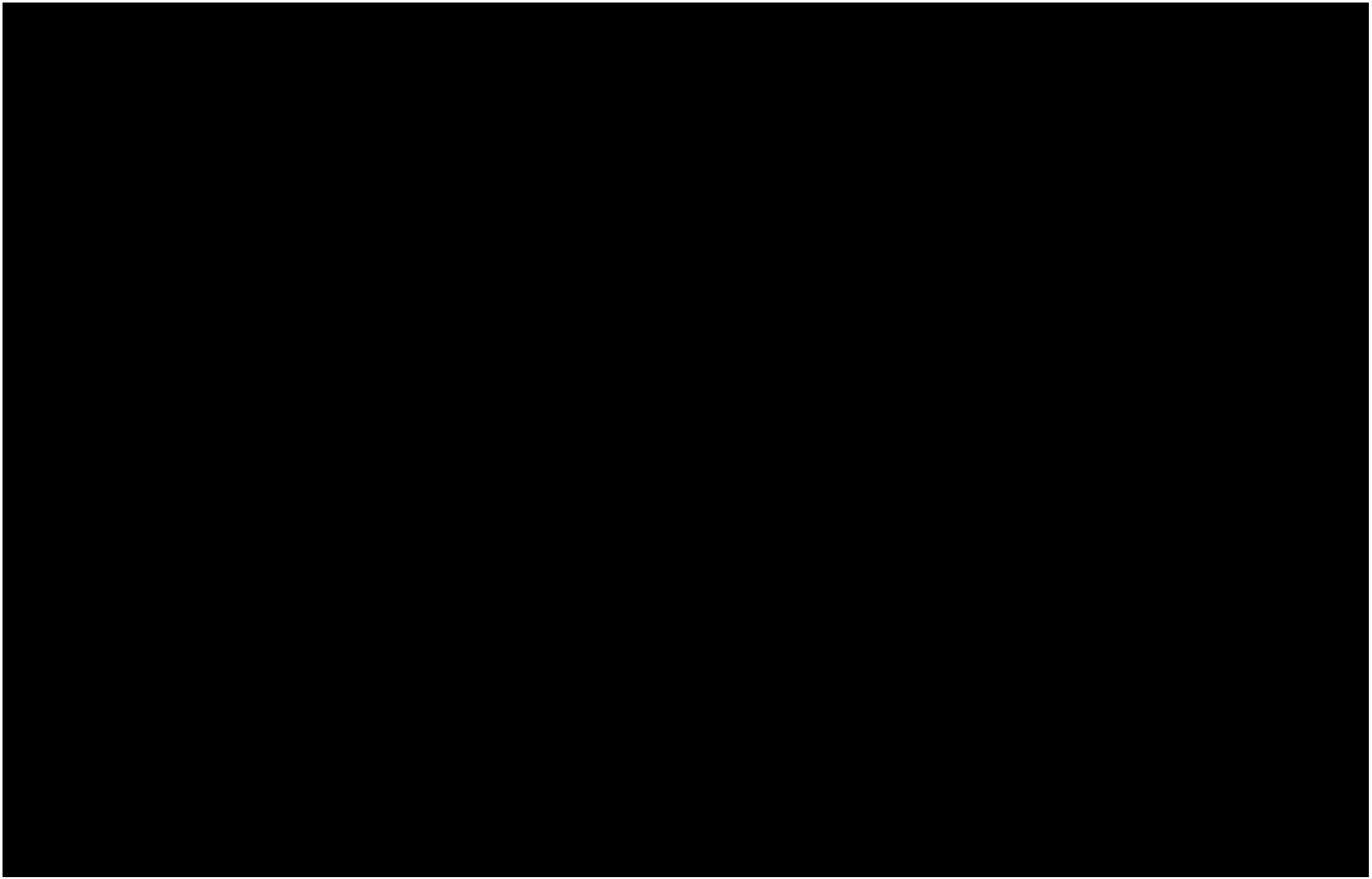


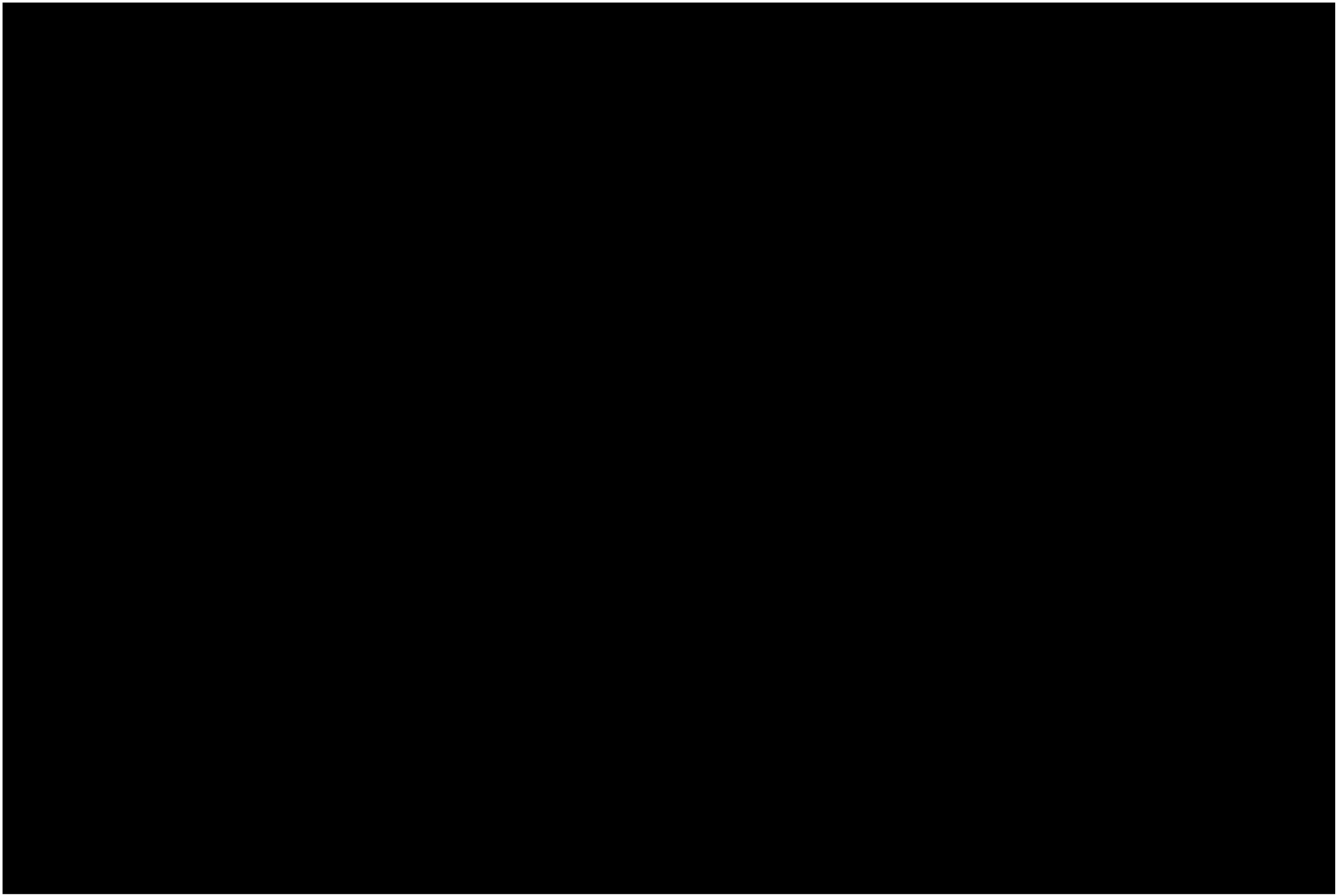


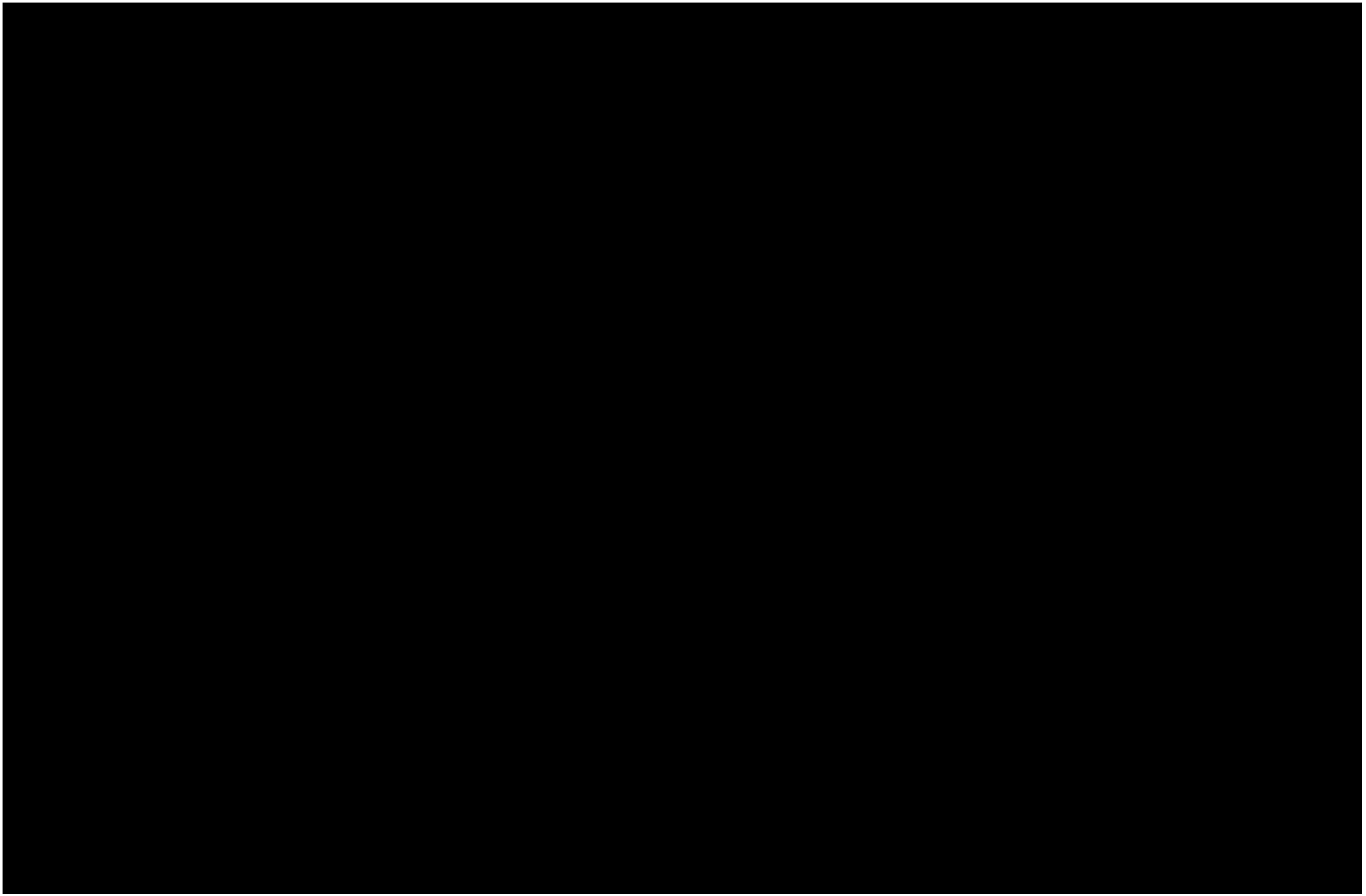


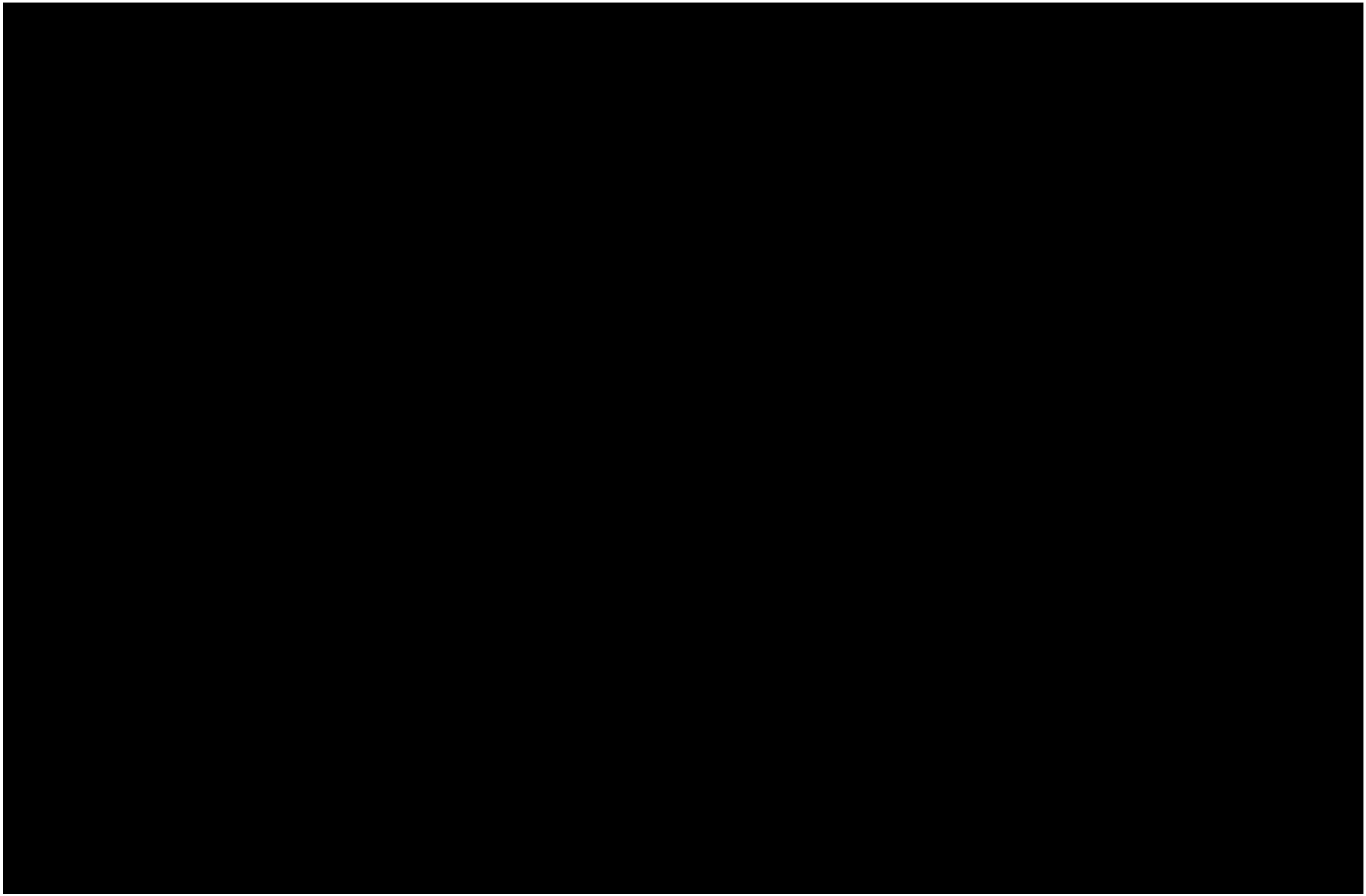


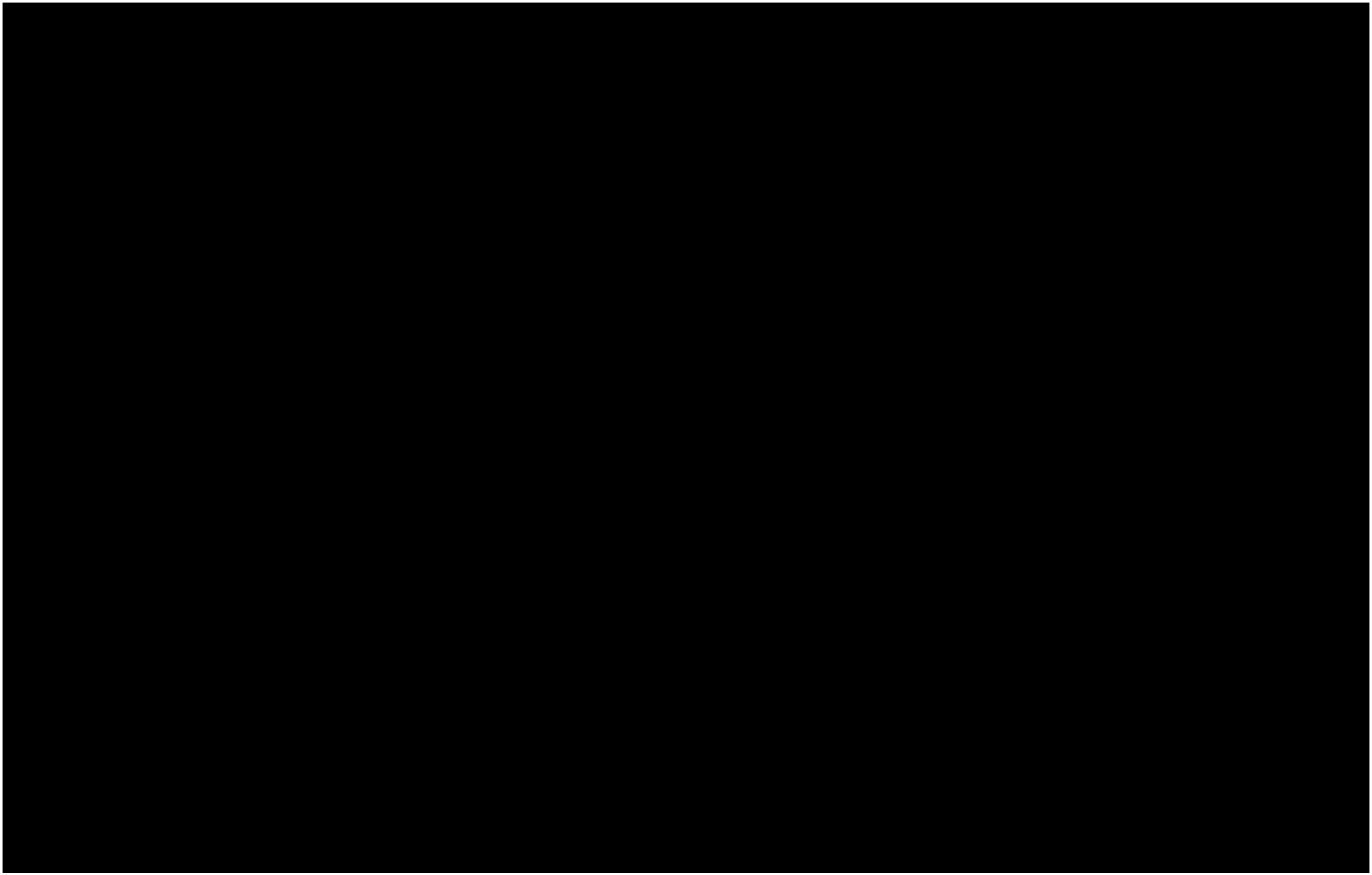


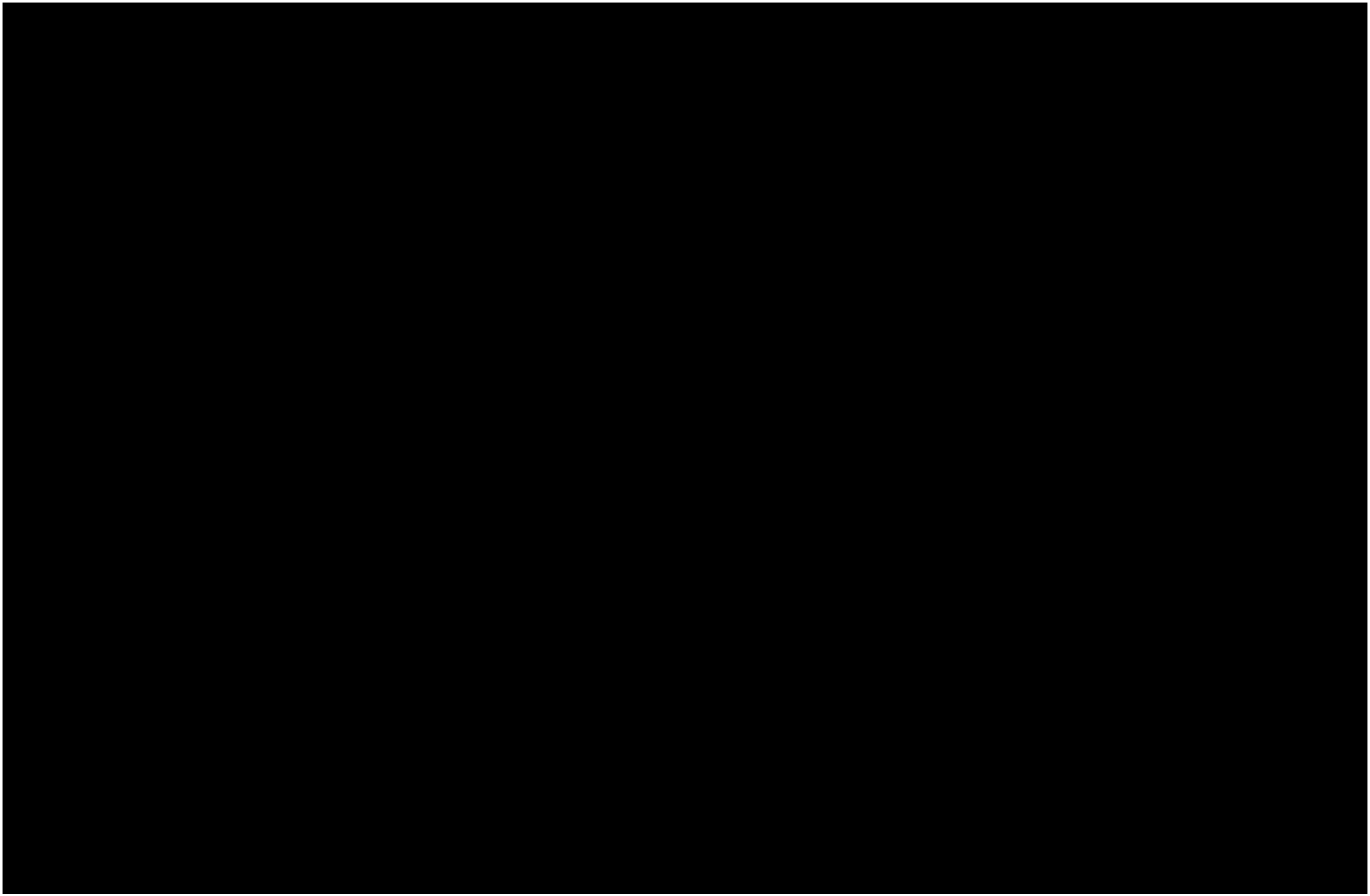


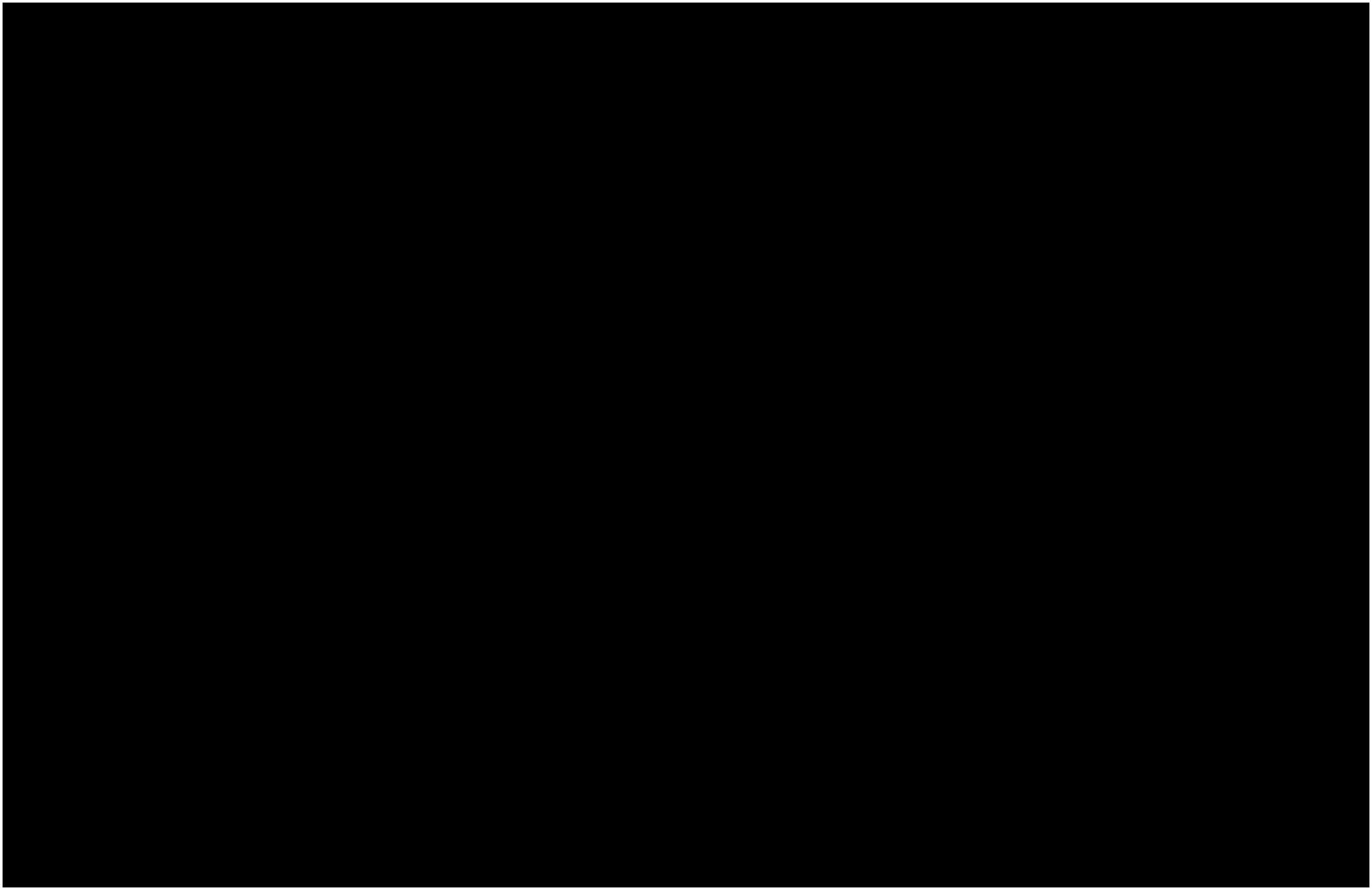


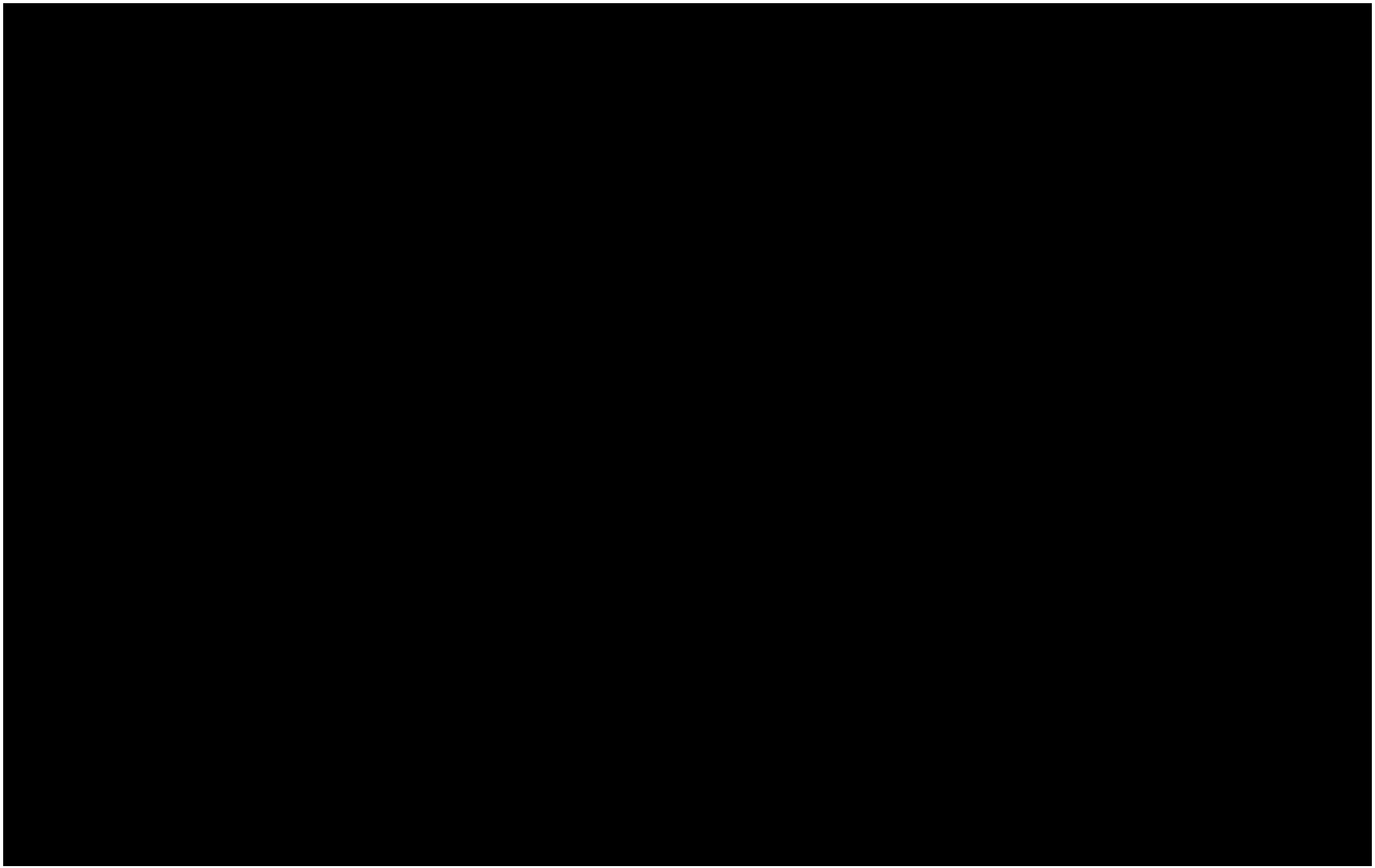


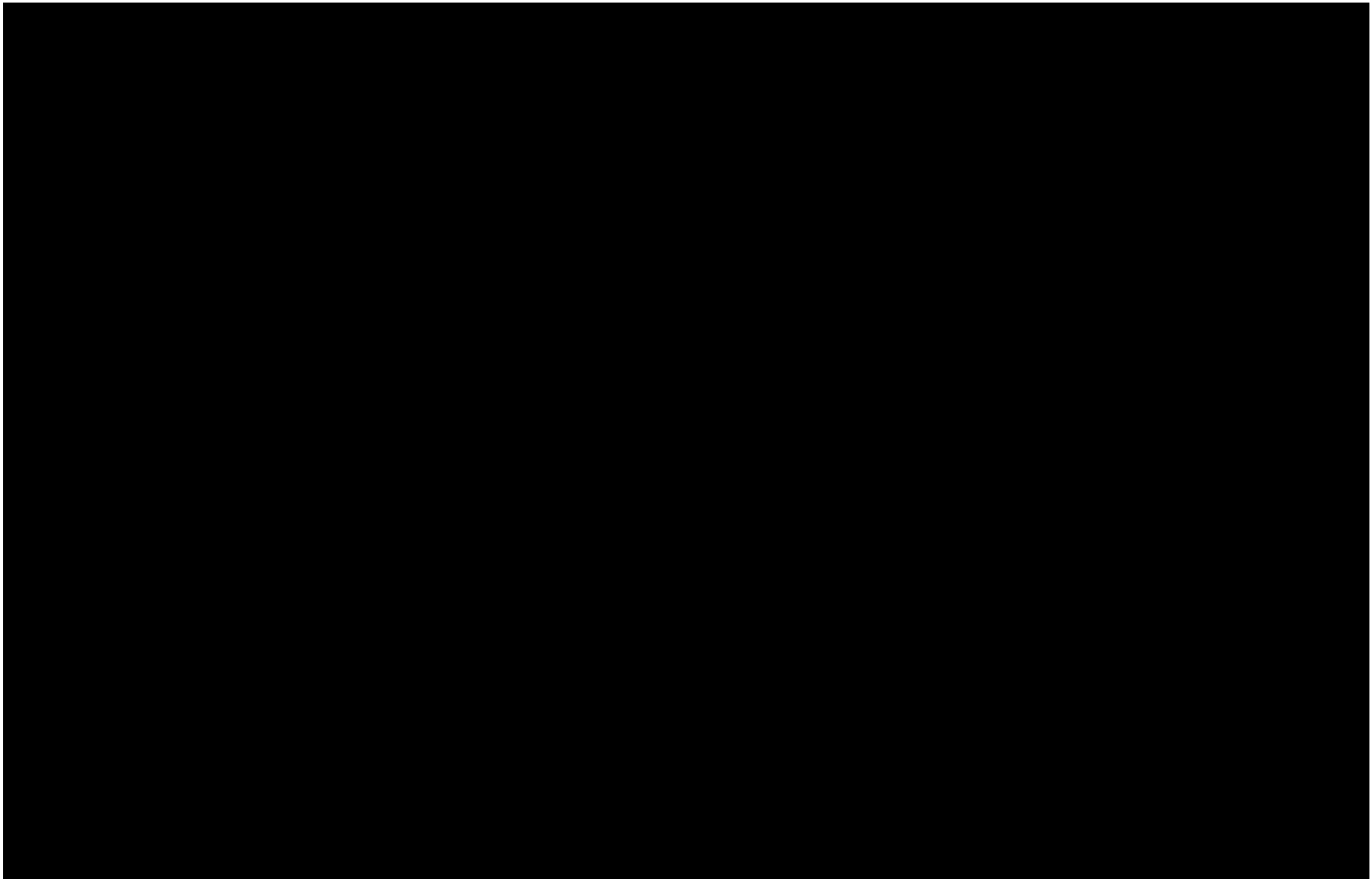


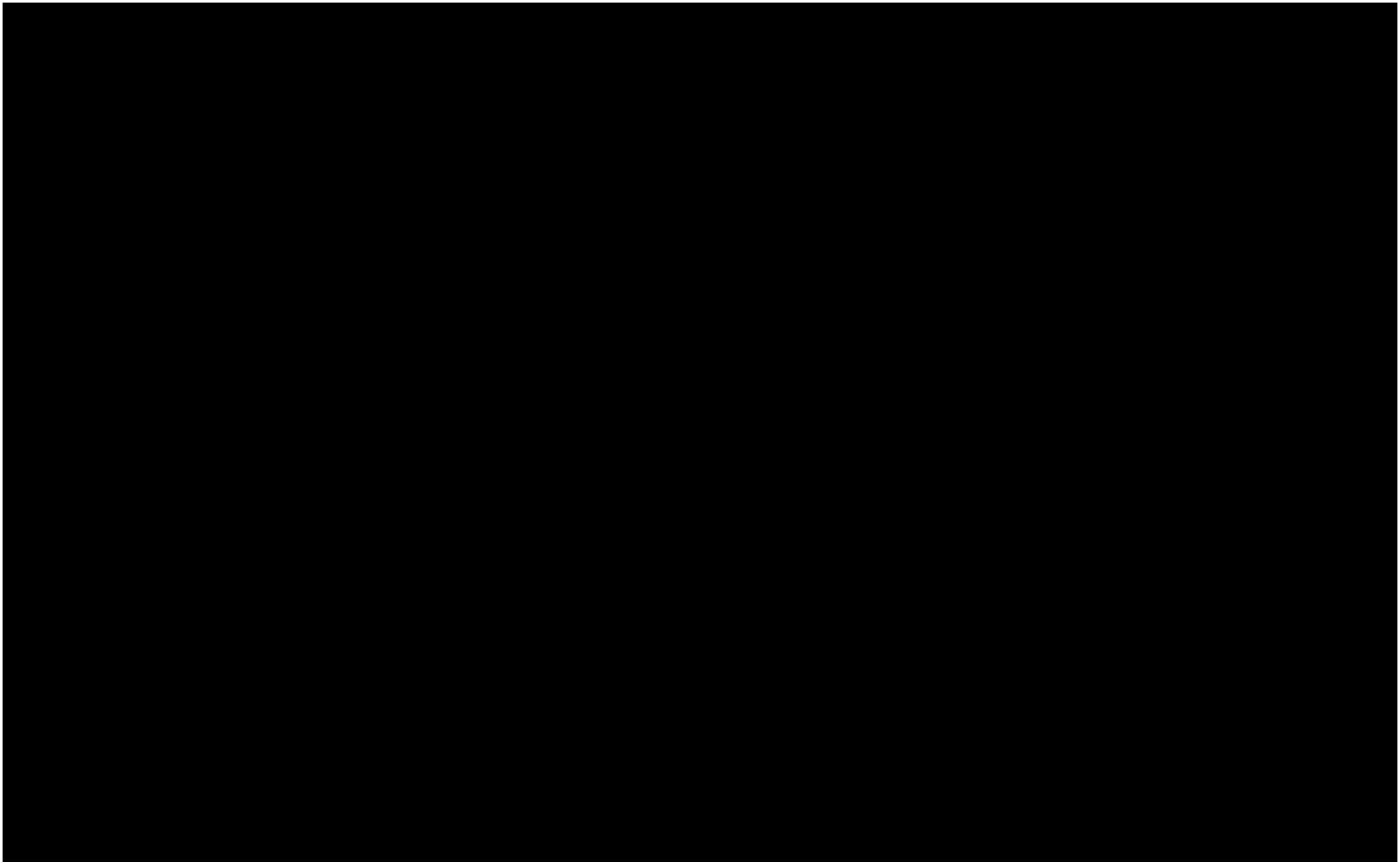


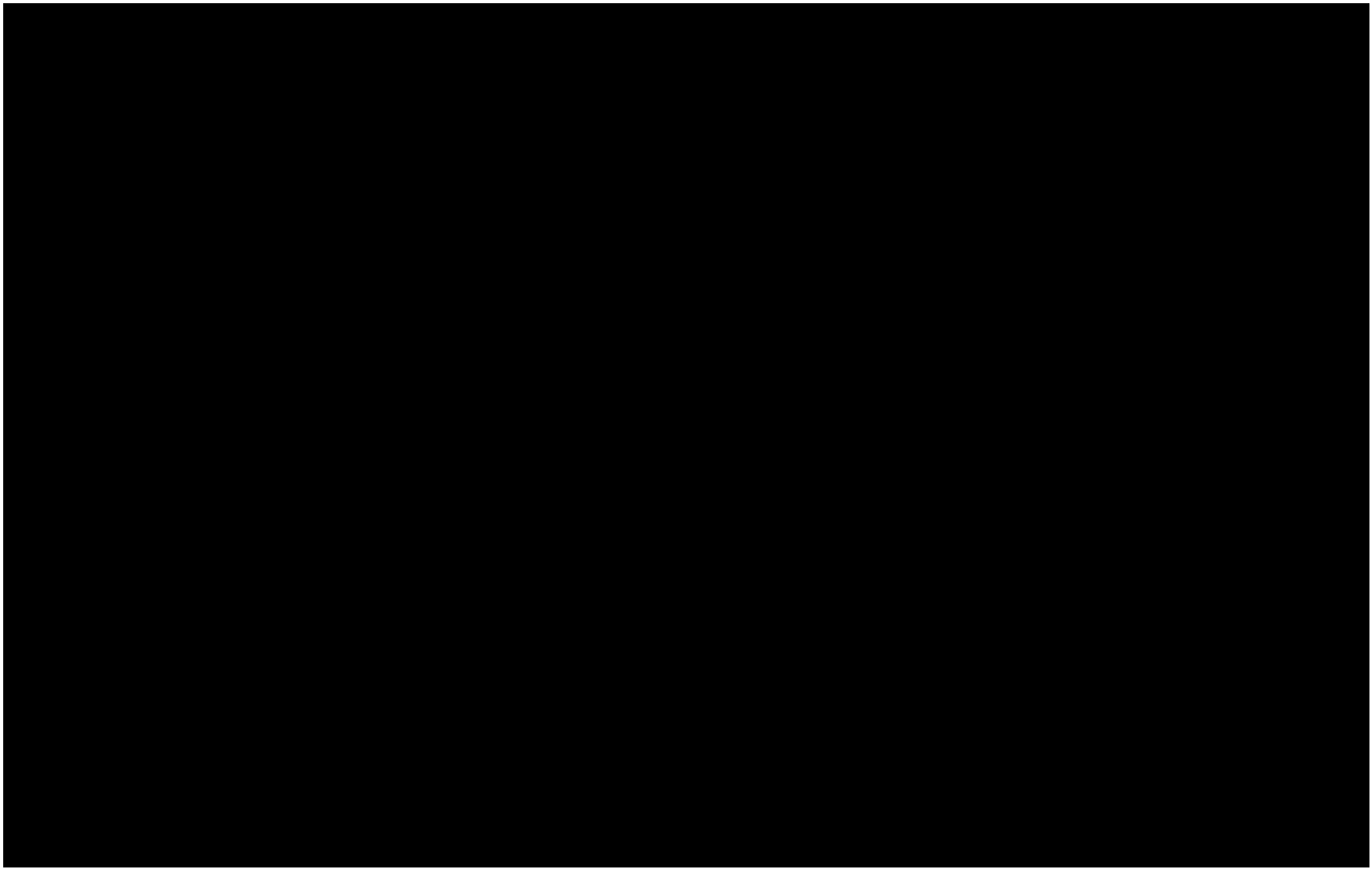


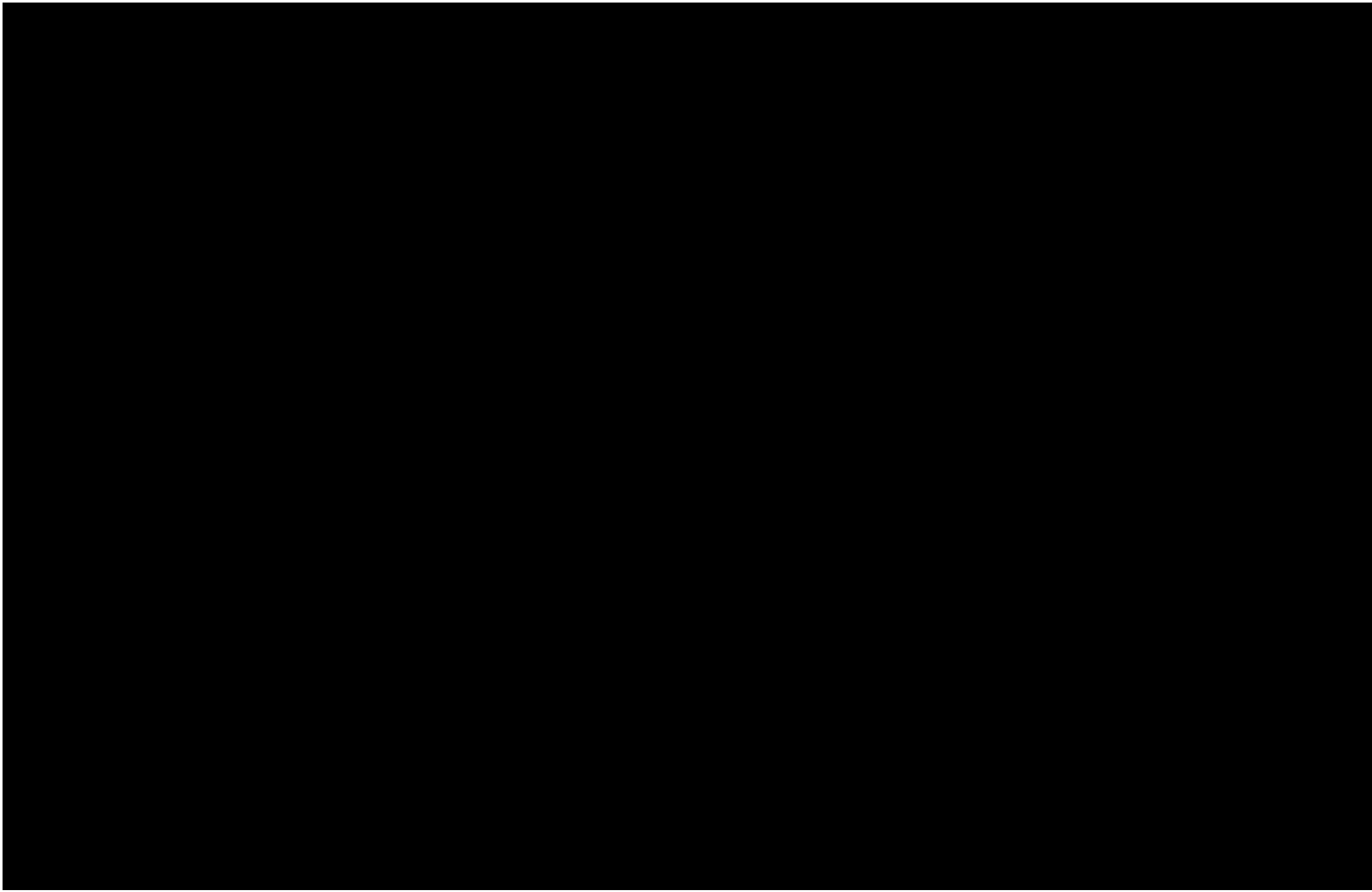


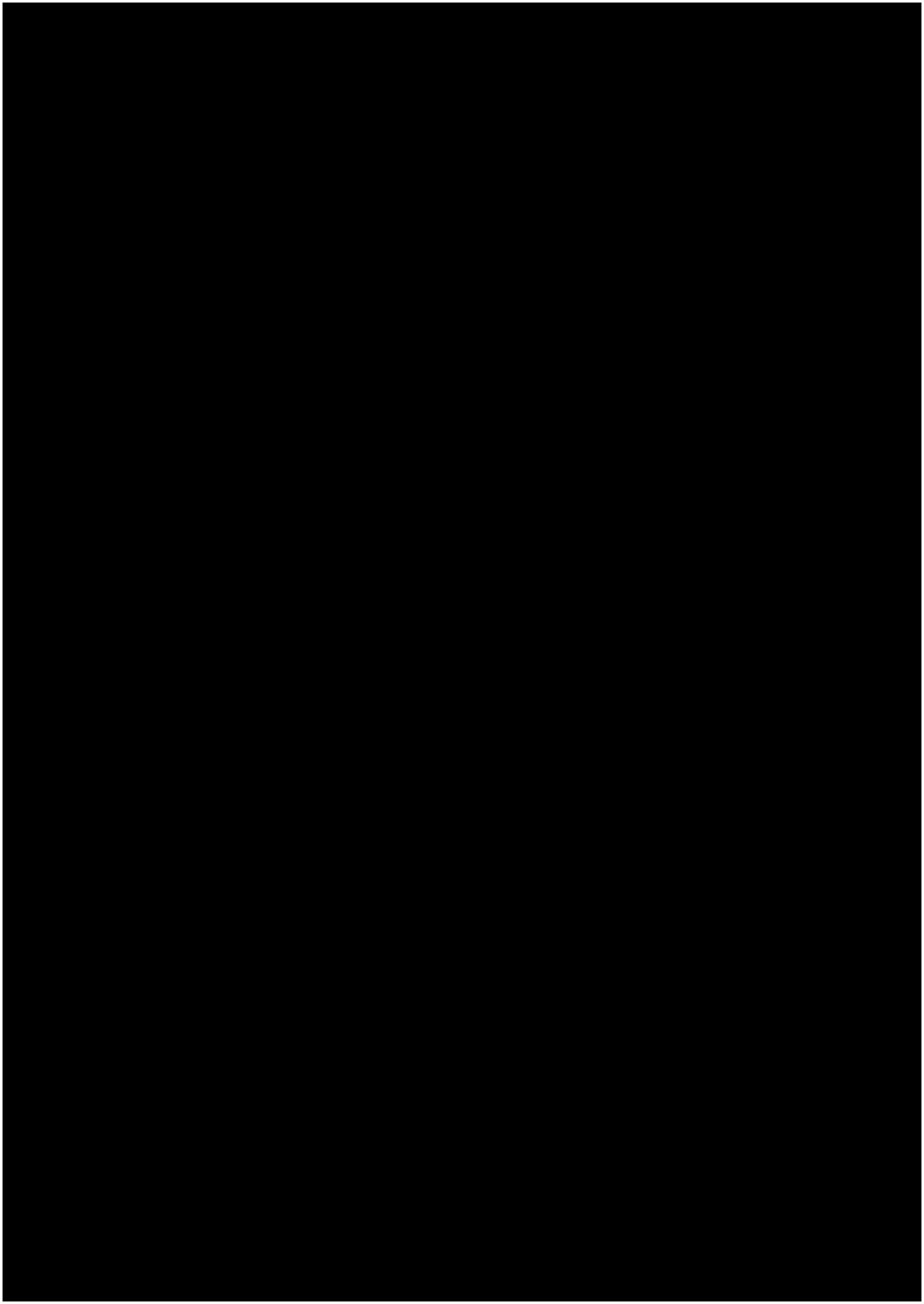


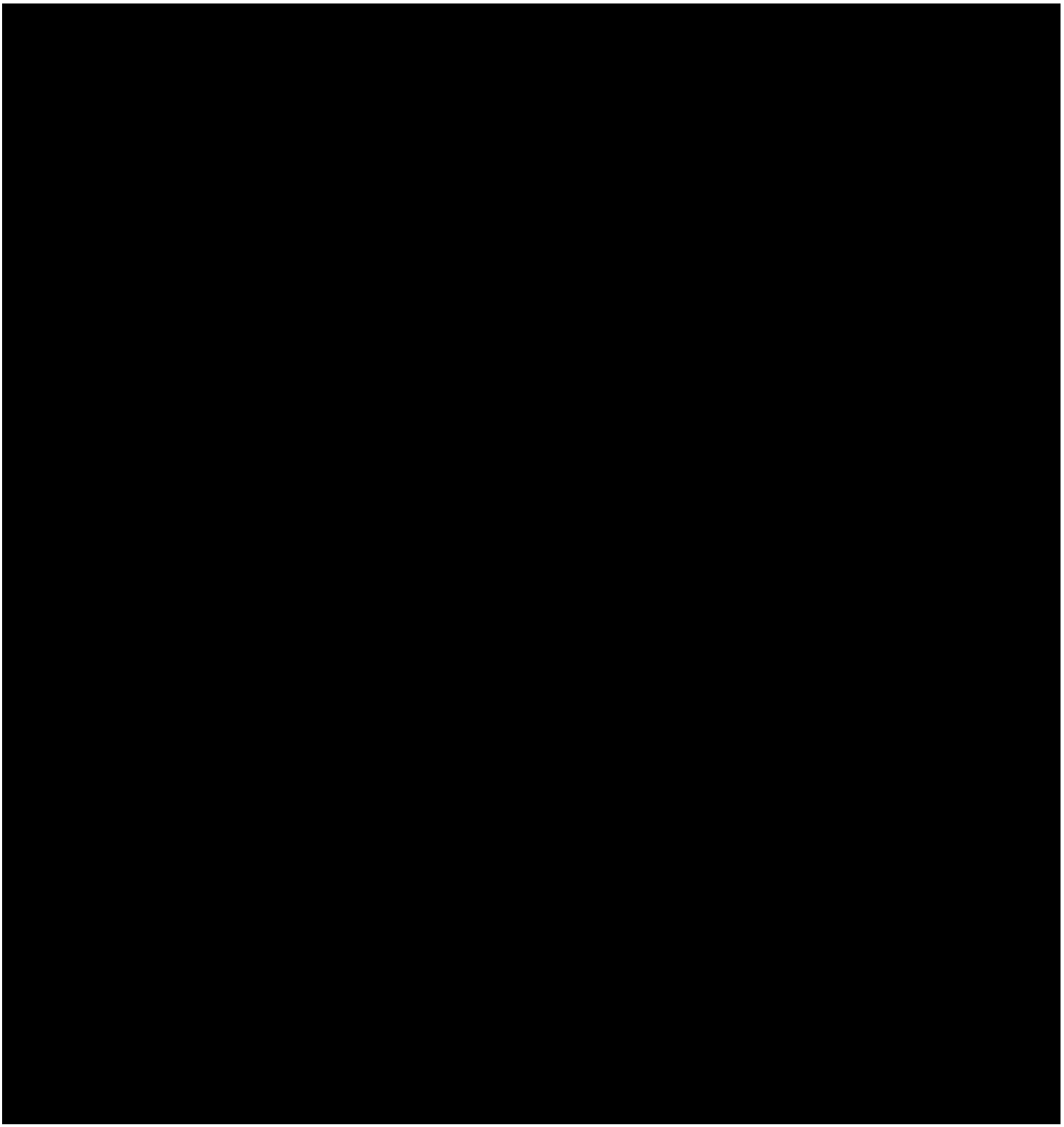


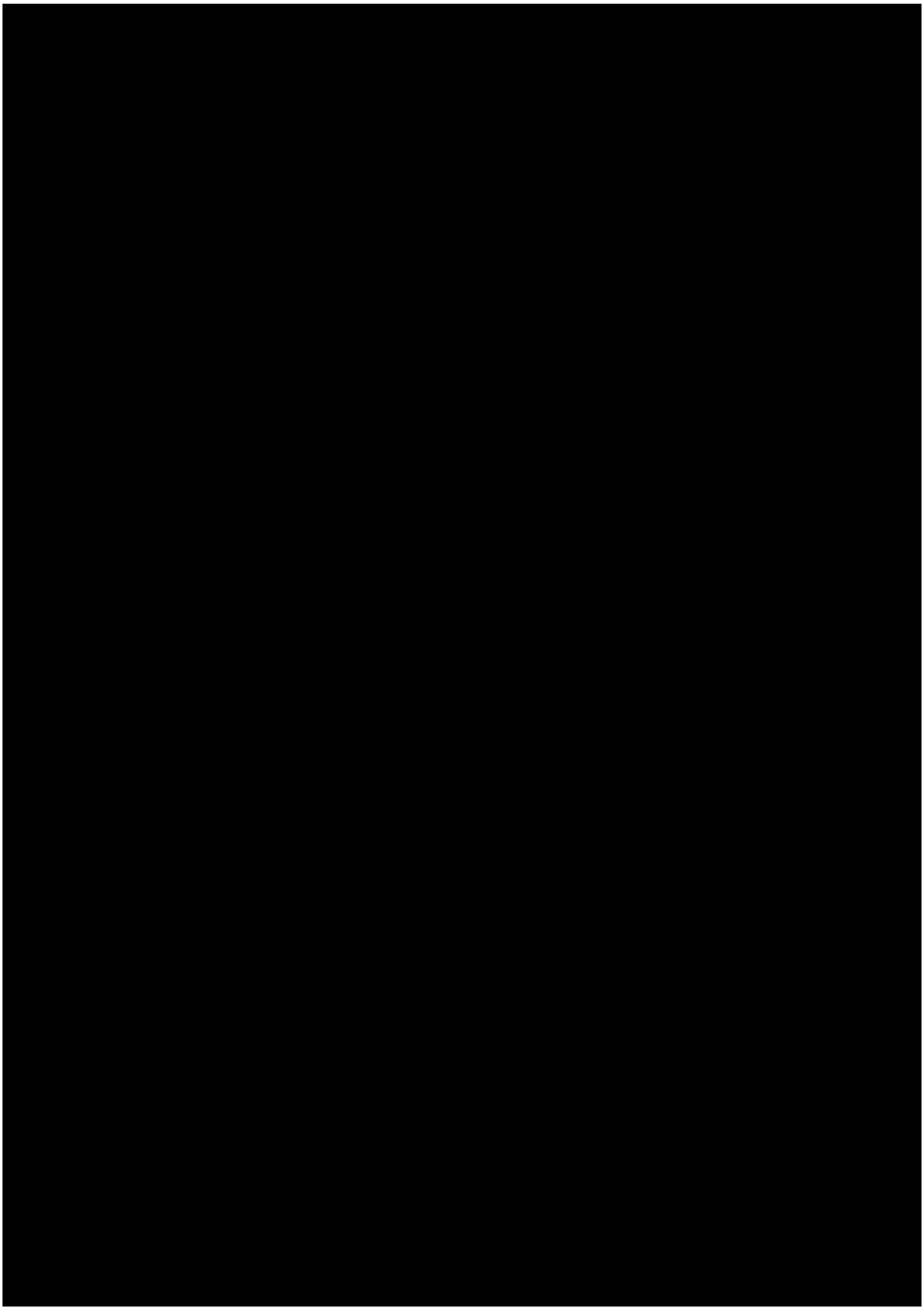


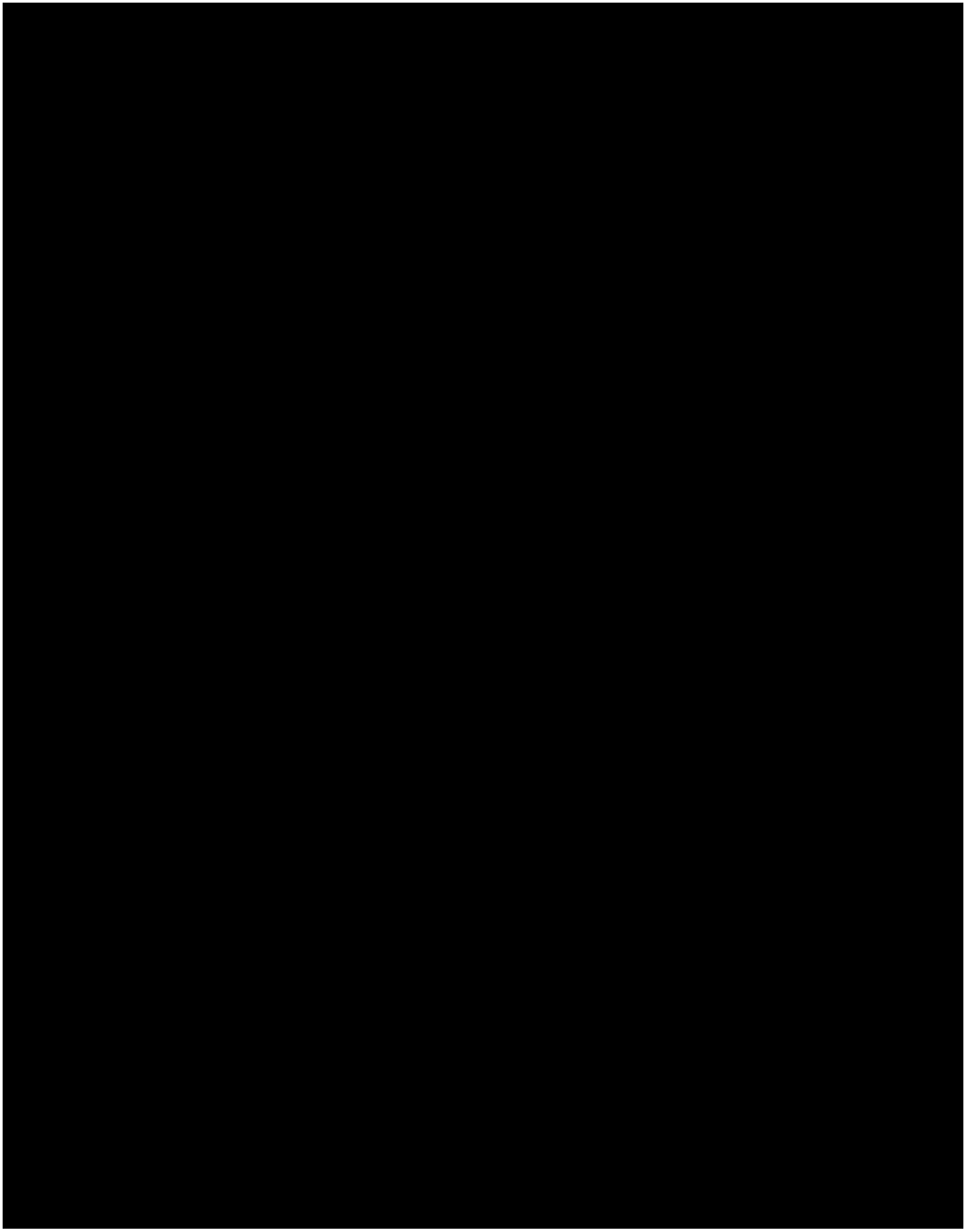


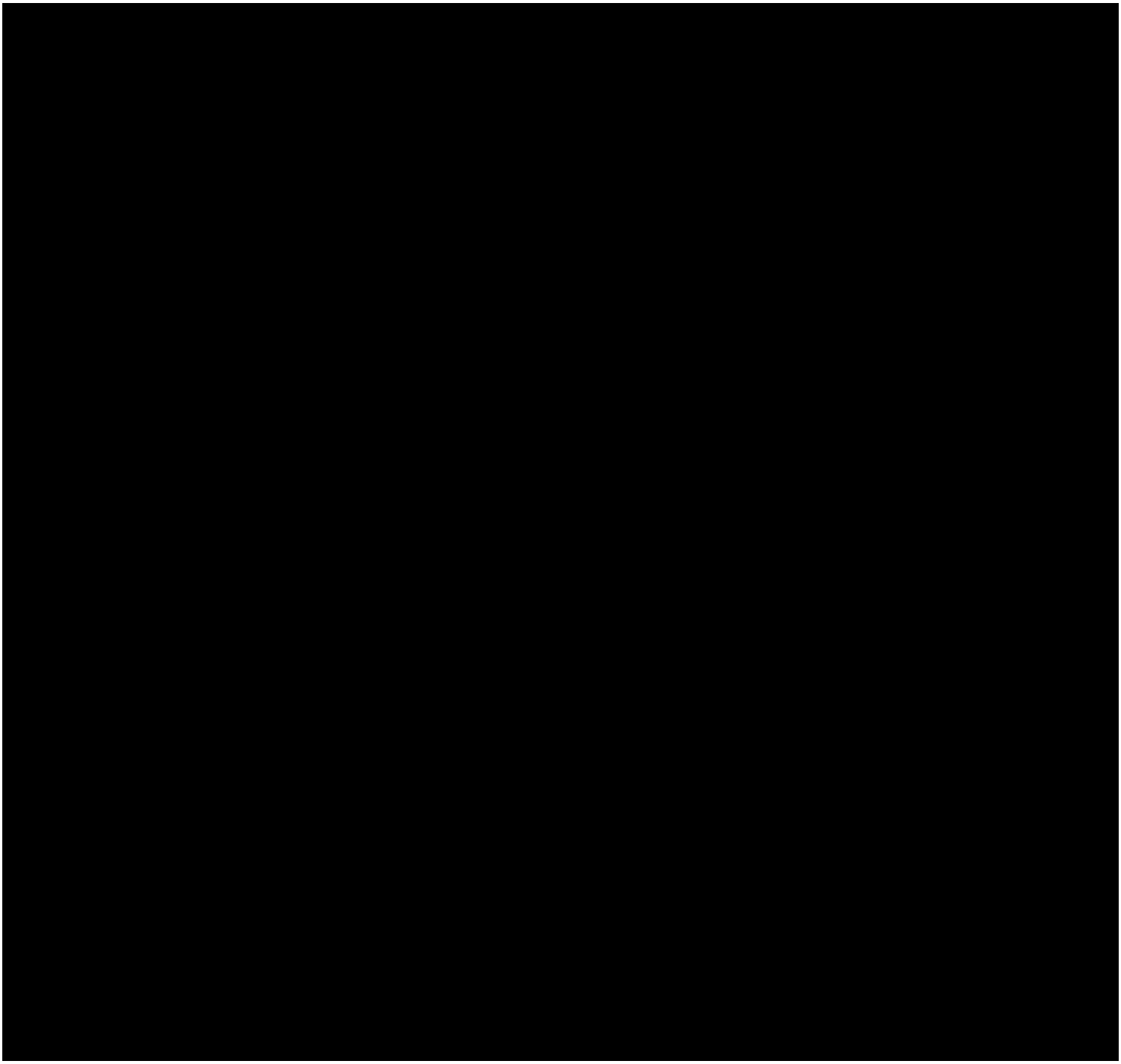


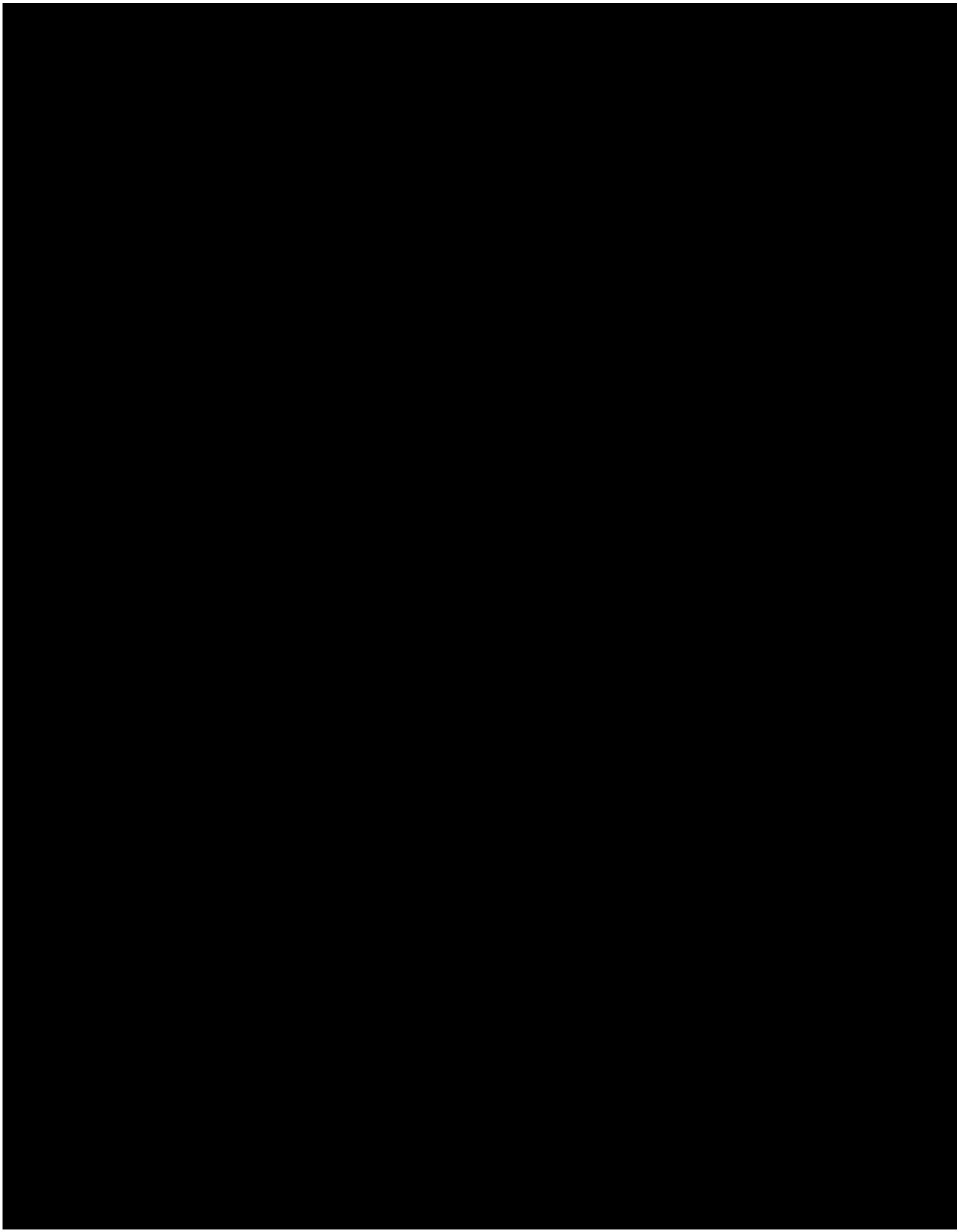












Appendix A – Reference Projects

Aurecon assessed the Project's budgeted expenditures using a set of representative reference projects, drawing on both publicly available information and our industry experience. Given the global nature of HVDC equipment and subsea cable supply, interconnector projects presented in Table 7-3 below provide a suitable baseline for benchmarking overall project costs. Confidential offshore transmission projects were then utilised to refine the costs of individual packages. Aurecon notes that the interconnector projects tend to require higher expenditures than offshore generation projects as a result of a lower appetite for commercial, contractual and technical risks.

Project specifications and references are provided in Table 7-3 below.

Table 7-3 Specifications of Reference Subsea Interconnector Projects

Ref.	Characteristics	Location	Project COD	Cable Supplier	HVDC Equipment Supplier
R1	▪ 1,400 MW, 525 kV ▪ Offshore: 516 km; Onshore: 107 km	Germany - Norway	2020	Prysmian	Siemens Energy
R2	▪ 1,400 MW, 525 kV ▪ Offshore: 560 km; Onshore: 160 km	UK - Norway	2021	Nexans	Hitachi Energy
R3	▪ 1,400 MW, 525 kV ▪ Offshore: 625 km; Onshore: 135 km	UK - Denmark	2023	Prysmian	Siemens Energy
R4	▪ 700 MW, 320 kV ▪ Offshore: 500 km; Onshore: 75 km	Ireland - France	2026	Prysmian	Siemens Energy

Overall Cost Benchmarks

Aurecon assessed the Project's budgeted expenditures using a set of representative reference projects, incorporating both publicly available data and Aurecon's industry expertise. Costs were normalised and anonymised in accordance with Aurecon’s confidentiality requirements for the referenced projects.

Normalised costs for subsea interconnector reference projects are provided in Table 7-4 below.

Table 7-4 Reference Subsea Interconnector Projects and Total Project Costs

Ref.	Publicly Disclosed CAPEX (original currency)	Total in COD$[1] (converted in AUD)	Adjusted CAPEX in 2023$[2]
R1	1,800 €m (2020 price)	2,951 (2020 price)	**3,416**
R2	1,600 £m (2021 price)	3,137 (2021 price)	**3,459**
R3	2,000 €m (2023 price)	3,279 (2023 price)	**3,279**
R4	1,621 €m (2026 price)	2,657 (2026 price)	**2,316**

[1] Total CAPEX disclosed by project owners converted into AUD using the following rates: AUD/GBP = 0.51, AUD/EUR = 0.61.

[2] Total CAPEX disclosed by project owners converted into real 2023$ based on the following inflation rates: 2020-2023 (5%), 2023-2026 (3%).

The typical package breakdown for subsea interconnector projects, as shown in Table 7-5, was defined to provide a rough order of magnitude for Project costs. While the accuracy of this breakdown is limited, it

draws from data on completed and planned projects, helping to assess the relevance of cost inputs and the completeness of the scope of work.

Table 7-5 Typical Package Cost Split for International Subsea Interconnector Projects

Package	Typical Cost Split
Cable Design, Supply and Installation	[redacted]
Converter Stations Equipment Design, Supply & Commissioning	[redacted]
Converter Stations Civil Work	[redacted]
Other costs	**Residual balance**

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