BT's response to Ofcom's consultation document

"Business Connectivity Market Review: Review of competition in the provision of leased lines"

Part B: Economic analysis responding to Ofcom's detailed proposals

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NON-CONFIDENTIAL VERSION

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Part B: Economic analysis responding to Ofcom's detailed proposals

Introduction

Part B of BT's response to Ofcom's consultation "Business Connectivity Market Review: review of competition in the provision of leased lines" (published 15 May 2015) contains our detailed economic comments on Ofcom's market analysis and assessment of costs and risks of introducing dark fibre.

A summary of BT's views and Part A (which provides our response to Ofcom's overall approach and the specific consultation questions) is contained within a separate document.

Section

10. Market Context and product definitions

SUMMARY

10.1 In this analysis we primarily respond to Ofcom Section 3 (Market Context) and in the light of our framework offer additional observations in outline on Annex 8 (product market definition overview), Annex 9 (broadband and EFM), and Annex 21 (approach to geographic definition).

10.2 This Section sets out our views of the nature of upstream and downstream products. The essence of our position is that Ofcom does not provide a suitable characterisation of the downstream market nor of the industry production chain itself. We therefore provide some detail on how upstream network components need to be assessed in a model of multiplexing and aggregation and show the role of EFM and broadband services in this light. We also bring out at a high level how geographic factors should affect the analysis of economic markets.

10.3 The explanation of the workings of the downstream marketplace should set out the general workings of this market which stakeholders can agree is a reasonable representation of the world as it is. This should include the general way in which the market works in terms of both horizontal competition and vertical production; the major customer sectors; the major suppliers; the nature of purchasing and the way competitive choice is exercised. It could reasonably include reference to any evidence or perceptions as to the effectiveness of competition, especially from the end user's perspective.

10.4 Ofcom has addressed some of these matters in Section 3; however, the overall picture that emerges does not align at all with the real world market in which BT and others operate and in that sense we believe that Ofcom present a stylised view of the market which is misrepresentative. We detail how this stylisation leads to concerns in the market boundary and market power assessments.

10.5 We also note that Ofcom commissioned two significant market surveys from BDRC, one on the general attitudes of business connectivity customers to competitiveness in the market and the second on specific issues of quality of service. We find it surprising that the results of these surveys do not form the basis of Section 3; indeed, there is very little reference to them at all[1].

10.6 Specifically, it is clear from these surveys that business customers do not perceive any market failure and do not express any particular dissatisfaction. For example, from the Executive Summary of the BDRC main customer survey, on the measure of satisfaction they report - "87% are satisfied with the service from their main supplier" and on competitive switching they report - "80% say that having all their services with a single supplier is not a barrier to switching" [2]. Yet this is the primary market context where a dark fibre remedy is being proposed by Ofcom on the grounds of some downstream market failure unresolved by the current remedies.

[1] Ofcom [3.5-3.7] makes reference to some of the purchasing characteristics of business customers. At this point, a casual reader of these paragraphs might form the misleading impression of the market research that customer encounter significant barriers to switching supplier which is not the case.

[2] Page 5 of the BDRC customer survey report. This would also appear to be despite the fact the survey appears to have largely missed the largest major business customers, especially in the finance sector which are a primary focus of competitive supply. For example, neither Colt nor Level 3 feature in the list of competitors cited by respondents. This strongly suggests that the survey must be biased towards the market sectors with even less competition.

10.7 Specifically regarding quality of service, it is clear that customers care most about reliability and responsiveness to faults but are not particularly concerned by installation lead time[3]. As we discuss in our response, the dark fibre remedy runs entirely counter to the stated customer preferences. The claimed benefit of DF is for service lead times and new service lead times (innovation) which are near the bottom of business customers' priority list, whilst at the same time dark fibre completely removes all the basic tools for achieving reliability and short repair times which customer most care about.

10.8 We provide our own position on the market context as follows:

- Focal product and enterprise segments (Ofcom [3.1-3.11]).
- The industry production chain (Ofcom [3.12-3.19, Annex 8]).
- Downstream focal product(s) (Ofcom [3.21-3.34, Annex 8]).
- Upstream focal product(s) (Ofcom [3.35-3.41, Annex 8, Annex 9]).
- Geographic nature of competition (Ofcom [3.49-3.59, Annex 21]).

FOCAL PRODUCT AND ENTERPRISE SEGMENTS

10.9 We note that this market review, as last time, starts with Ofcom's [3.1] assumption of a "focus upon … leased lines used by different end-users". However, in contrast to the previous review, Ofcom does not appear to offer a precise scoping definition to what is a "leased line".

10.10 In our view this issue of scoping definition in the last BCMR had major implications in both the market boundary analysis and the SMP assessment. We believe that in the current consultation Ofcom has recognised this in the context of the data analysis; however we do not think this has been properly reflected in the overall assessment here.

10.11 We note that since the last BCMR, the EU Commission have updated their Recommendation on markets susceptible to *ex ante* regulation, and this market is now referred to as "Wholesale high-quality access provided at a fixed location". There is some discussion of leased lines within the Commission's Explanatory Note, however, other network solutions are also included in the discussion.

10.12 Moreover, we note that even in the discussion on leased lines the explanatory note offers the following "Increasingly, leased lines are offered over Ethernet-based technologies, allowing more flexibility, normally at lower cost, and can be both PtP and PtMP." We consider that the reference to point to multi-point is at *profound* variance to Ofcom's definition of a leased line, including Ethernet based leased lines, which is restricted to "between two sites".

10.13 In our view, Ofcom has not re-addressed the real nature of the focal product explicitly nor implicitly and neither looking upstream nor downstream. The leased line should not be the focal product either upstream or downstream. These are discussed in the section below.

10.14 We note that the Explanatory Note also discusses the applicability of wholesale high quality access provided at a fixed location to mobile backhaul and LLU backhaul and that:

a) These are discussed as "outside the market for access to fixed networks";
b) "experience under the article 7 procedure has not shown that there is enough evidence to suggest that there is a generalised market failure".

10.15 We consider that there are several important economic characteristics of MNO and LLU backhaul which are quite different to business access. Some of these differences are

[3] See Figure 5.15 of BDRC report on quality of service.

highlighted by Ofcom [3.1, 3.10, Annex 11], for example the greater degree of geographic dispersion on MNO and LLU backhaul or the requirement for synchronisation for MNO backhaul. However, Ofcom generally averages its findings across all MNO backhaul, LLU backhaul, and business access as one market[4].

THE INDUSTRY PRODUCTION CHAIN

10.16 Ofcom presents a stylised presentation of the "ICT value chain" in Figure 3.1. First we note that this does not attempt to represent the production chains in which MNO or LLU backhaul sit but is limited to where only business access sits.

10.17 There is one apparently minor but in fact a very important change from the equivalent diagram in the 2013 BCMR which is that VPNs have been moved from the "managed service" box to the "end to end leased line" box, although it is not immediately clear what "VPN leased line" means[5].

10.18 In the last market review, VPNs were firmly positioned downstream of retail leased lines despite a large amount of evidence from BT that they were in fact *alternatives* to retail leased lines. We would welcome Ofcom's clarification on this issue which is important as there are ramifications of this change.

10.19 We note that unlike the previous review, Ofcom does not attempt an overly granular analysis of features of retail markets in this BCMR but proceeds virtually directly to an analysis of wholesale markets. Whilst we are supportive of this approach in general terms, it is also the case that the retail markets also have to be characterised to a reasonable degree and cannot simply be ignored[6]. This is especially important on two counts:

a) to take into account self-supply in vertically integrated CPs;
b) to correctly carry out an analysis under the principle of modified Greenfield assumptions.

10.20 While is it not necessary to fully describe retail markets, nevertheless it is still necessary to understand the parameters which affect demand side and supply side switching of the upstream service inputs.

10.21 A source of confusion in Ofcom's diagram is the lack of a clear distinction between 'role' – that is the production process itself – and 'organisation' – that is the real legal entities such as corporations which carry out a set of roles. The diagram apparently separates 'roles' on the left hand side in blue from 'organisations' on the right hand side in green. However, "ICT department of user's organization" is included as a role on the left in blue. This is an organisation and should be on the right hand side of the diagram. In this context, an ICT Department normally undertakes the same "Managed service" role and/or the "Systems integration" role as shown in Figure 3.1.

10.22 This distinction between role and organisation is particularly important in this case where there is a complex production chain and many different levels of vertical integration. The clear separation of role and organisation allows for the situation where one organisation offers different products at different points in the production chain as well as an organisation taking

[4] There is also an issue here which concerns the modified Greenfield site assumption being made and common use of upstream regulated inputs.

[5] According to our understanding of Ofcom's various definitions and noting that there were several incompatible definitions of VPNs in the 2013 BCMR.

[6] The SMP Guidelines require the starting point of the market analysis to be in the relevant downstream markets.

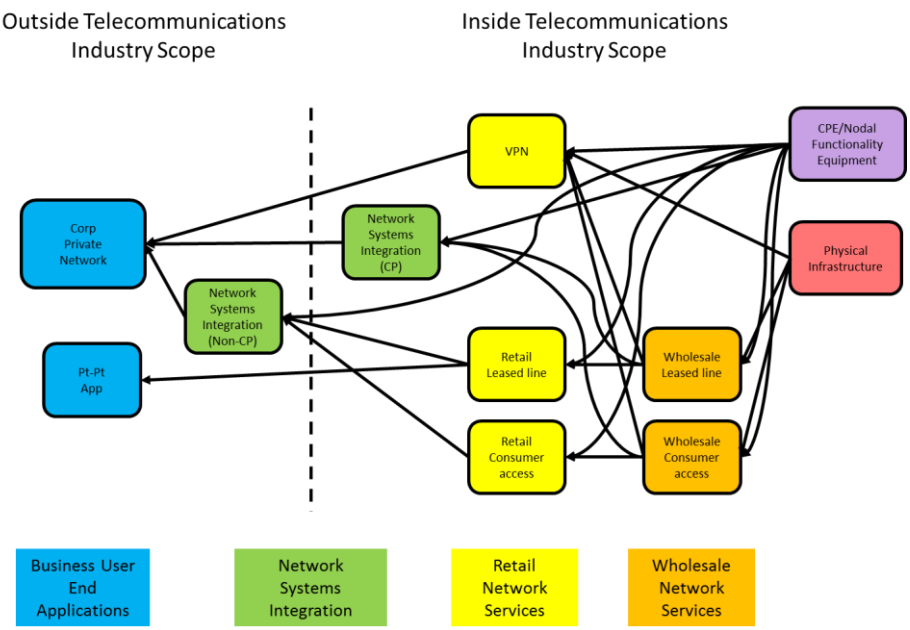
different inputs at different points in the production chain. It allows for the clear understanding of situations where the relationship between two organisations can be both complementary and competitive at the same time. There are many examples of this in business connectivity markets.

10.23 Two examples are as follows. First, a business customer insources the design, building, and operation of their own customer private network. The business will normally regard CPs as complementary suppliers; however, it may well also regard the insourcing department as being in competition with CPs, including CPs which may be currently supplying the insourcing department with network services. Second, a CP which owns infrastructure in some geographies and seeks supply of access service in other geographies and which is simultaneously in competition and complementary supply with other CPs in equivalent positions.

10.24 Figure 1 below gives an alternative more detailed elaboration of the production chain but which only illustrates roles. The many different models of vertical integration can then be mapped onto these roles independently. The only exception to this highlighted distinction showing only roles is those roles which can only be carried out by CPs (in particular they are eligible to purchase regulated wholesale services) and roles which are may be carried out by organisations which are not CPs.

Figure 1

Industry production chain



10.25 This figure starts with the downstream roles within the end user business to which business connectivity services are an input. The majority role is customer private networking i.e. the private voice networks and corporate data networks (for example an intranet) which most organisations rely on.

10.26 A key observation in understanding this figure is that the 'non-CP' systems integration role could be undertaken by an independent organisation or could be undertaken internally by the business customer themselves.

10.27 The primary characteristic of a private network can be simply stated. Private networks provide connectivity between the end points of the private network and only between these end

points. The essence of the private network is the secure boundary between end points on the inside and end points on the outside.

10.28 There are a variety of ways that a private network can be created, largely differentiated by which organisation takes on the role of creating and operating the customer private network. The four main options are:

a) the business organisation itself,
b) a systems integrator that is not a CP,
c) a systems integrator that is a CP and creates the private network with dedicated nodal functionality equipment, and
d) a CP using common/shared nodal functionality equipment i.e. a VPN.

10.29 There are some other applications/roles which are not customer private networks and the end application itself is not networked and requires permanent point to point connectivity and which is shown in the Figure. Examples include certain telemetry (e.g. monitoring of water reservoirs), certain data backup applications, etc. However, these are very much a small minority of downstream customer requirements.

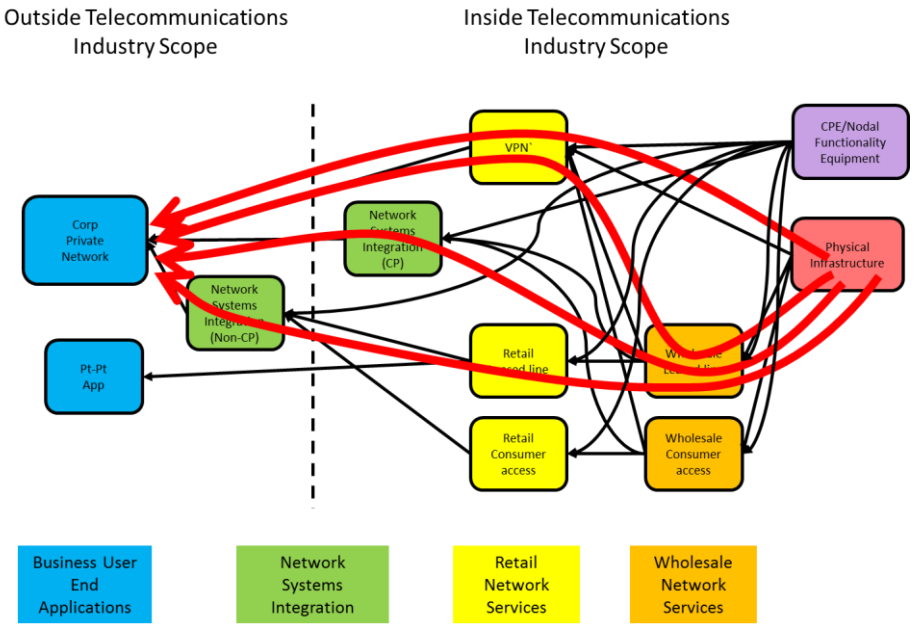
10.30 In contrast, Ofcom [Figure 3.1] simply identifies the final role as “Business user” and this is indicative of the very brief attention that is given to the business user applications/roles in analysis the consultation document. However, the specifics of the business applications/role is critical in determining the strength of indirect price constraints on upstream services and this broader picture needs to influence the analysis of upstream market boundaries and consequential SMP assessments.

10.31 Figure 2 below shows four different production paths which each lead to an equivalent customer private network (CPN):

a) The supply of a VPN service by a CP with its own infrastructure;
b) The supply of a VPN service by a CP using wholesale access ;
c) The supply of a systems integration solution by a CP; and
d) The supply of a systems integration solution by a non-CP which could be internal supply by the business customer (where the business customer insources the systems integration role).

Figure 2

Different production paths creating substitutable retail products



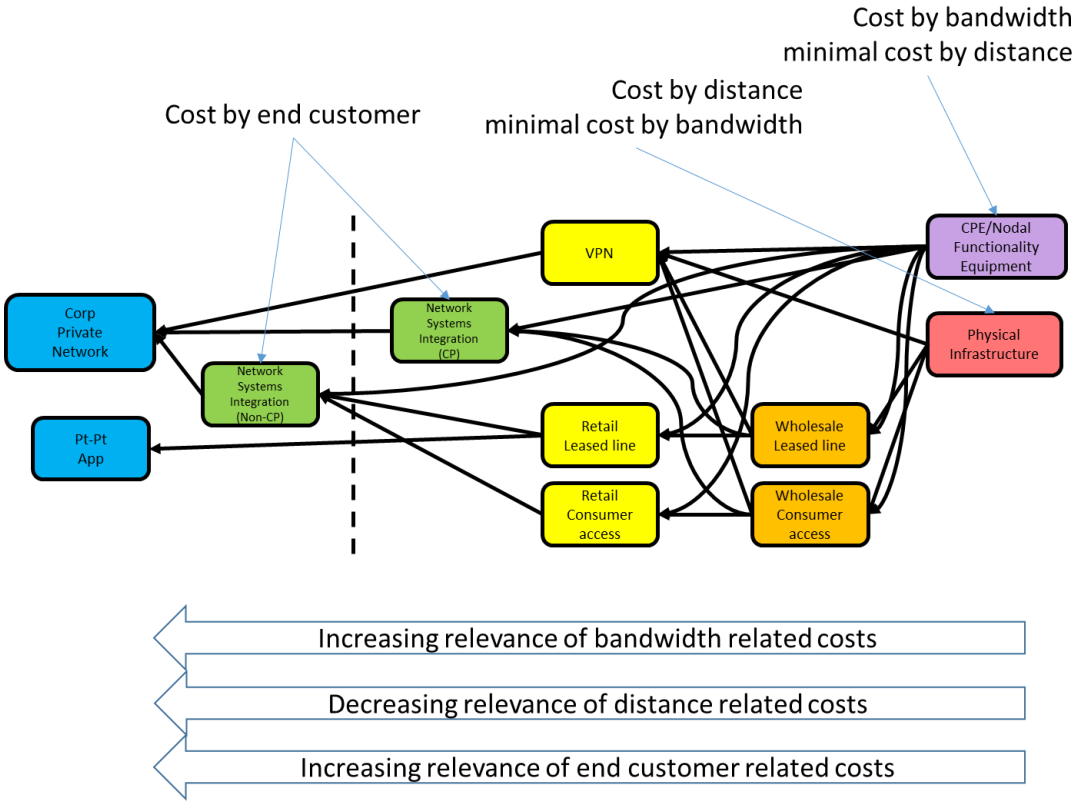
10.32 These four production paths all create products which meet the end user requirement of multi-site and are substitutes for each other, either by demand side switching or by supply side switching.

10.33 By comparing supply by a non-CP systems integrator with supply by a CP systems integrator, this clearly suggests that not only are CPNs/VPNs price constraining on retail leased lines and vice versa, but retail leased lines are also price constraining on wholesale leased lines and vice versa. Indeed, the only material difference between retail leased lines and wholesale leased lines is whether or not the customer is a CP. As we have argued before, a distinction between retail and wholesale based simply on whether or not the customer is a CP would appear to be both economically sound and perfectly practical. It would also accord with what CPs have suggested to Ofcom in the data consultation for example.

10.34 An additional feature which is apparent from this presentation of the production chain is the way in which the additional elements of cost change the *structure* of pricing down the production chain. This is illustrated in Figure 3 below.

Figure 3

Cost drivers by network topology



10.35 At the upstream end of the production chain, the physical infrastructure cost characteristics tend to depend primarily on distance. Even the marginal cost of fibre strands can be fairly low as most of the costs are associated with the duct and the cables and the difference in cost between a high fibre count cable and a low fibre count cable is relatively small. As such the marginal cost of bandwidth of physical infrastructure is very low.

10.36 Proceeding down the production chain requires the addition of nodal equipment and nodal equipment tends to have a strong bandwidth dependency. As the equipment is added at nodes, the total equipment cost will also vary according to network structure (effectively the 'hop count' of nodes through which traffic passes), however, this only has a weak dependence on distance.

10.37 Moreover, the nodal equipment normally includes multiplexing capability which allows physical infrastructure to be shared. As a result the proportion of infrastructure cost which needs to be recovered by each service is reduced. The more the infrastructure can be shared, the less the important of distance to overall cost. This will be true in the core of the network and less true in the access.

10.38 For downstream network services, the normal cost structure is strongly bandwidth dependent and there is potentially some distance dependence for local access.

10.39 Network systems integration costs are likely to be driven by the number of end customers handled by the systems integrator. There is unlikely to be any bandwidth or distance aspect to these costs.

10.40 When customer specific costs are added, these will add a per customer element to cost in addition to the bandwidth dependent costs and any distance related costs for local access.

10.41 This understanding of the changing cost structure down the production chain is important when comparing upstream services at different points in the production change and it also shows the particular importance of the bandwidth gradient in pricing.

10.42 The production chain is important to all stages of analysis of market boundaries and any finding of SMP:

- This production chain is the context for correctly defining the downstream retail focal product, the customer private network with multi-site interconnectivity, and not retail leased lines[7] as still apparently assumed by Ofcom. This is discussed below.
- The production chain is the context for correctly defining the upstream wholesale focal product access service and not a leased line segment as assumed by Ofcom. This is discussed below.
- The production chain defines the constraints to demand side and supply side switching for upstream services. Ofcom has not correctly identified these constraints in their analysis of market boundaries defined by bandwidth for CISBO services (discussed in Section 12), the particular features on mobile backhaul and LLU backhaul (Section 13), and legacy services (Section 15).
- The production chain defines the price constraining products which may give direct or indirect price constraints, along with the degree of price constraint, in the assessment of SMP and this is discussed in Section 14.

DOWNSTREAM RETAIL FOCAL PRODUCT

10.43 We note that in this consultation document, the downstream focal product is now unclear. It is still effectively a leased line whilst VPNs have been included in the list of retail services. We present an alternative approach in which we identify the primary retail product – the customer private network – but we do not attempt any direct detailed market boundary analysis at the retail level. The aim here is to capture the most important factors which are pertinent to identifying the upstream sources of market power. The retail market analysis therefore provides the context for detailed market boundary analysis at the wholesale level.

10.44 In essence, the analysis of the retail level is informal and focused on the differentiation created by the upstream supply of connectivity. The analysis at the wholesale level is more formal but differentiation is carried out in the context of the retail market analysis. An appreciation of the retail market informs the factors which govern real differentiation in wholesale services.

10.45 There will be many characteristics of customer private networks which will be important differentiators and significant in customer purchasing decisions. These characteristics might include features such as end user authentication, address management and assignment etc. but which are very largely decoupled from any upstream supply of connectivity. By and large, these capabilities can be located in many different places so their supply is very largely decoupled from the upstream supply of connectivity.

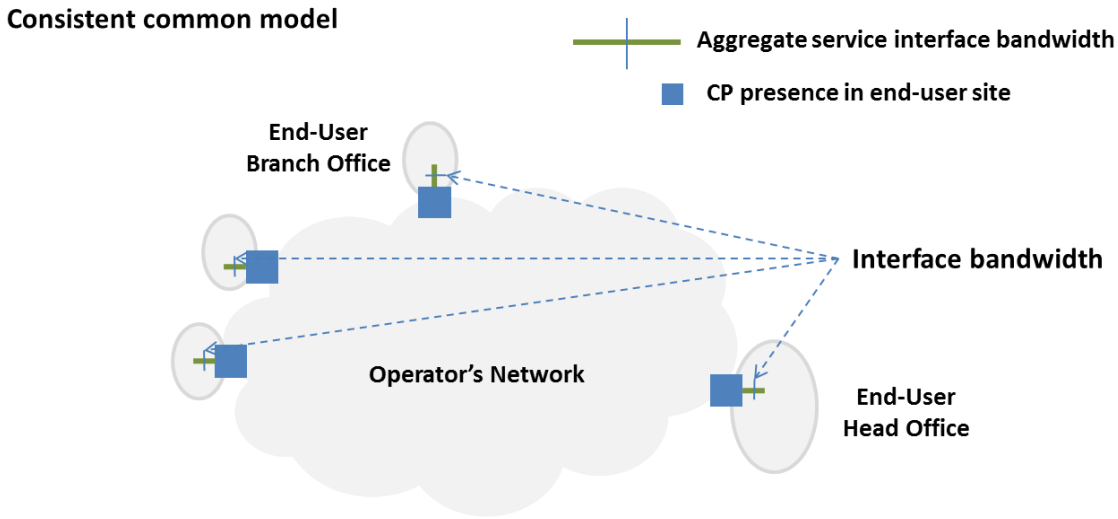
10.46 Looking at the downstream focal product from the upstream perspective, as illustrated in Figure 4 below, the primary characteristic of the customer private network is the set of customer sites themselves. On the demand side, the customer wants all their relevant sites attached to the customer private network and on the supply side, the supplier of the customer private network is concerned with the costs of attaching each site to the customer private

[7] Leased being defined in a particularly narrow way by Ofcom to be point to point uncontended bandwidth between two sites. (See data analysis consultation).

network. Importantly, at this retail level, the exact means by which a site is attached in not relevant. What matters is simply that all the appropriate features of customer private network are available at a site. This is why in the figure, the means of access is not shown, only the interface through which the customer private network is made available.

Figure 4

Multi-site interconnectivity is characterised by the aggregate interface at each site



10.47 Customers can source their multi-site interconnectivity in different ways with different degrees of focus:

- Customer site. Some customers single out individual sites and make separate supply decisions for these sites.
- Complete private network. Some customers choose a single supplier for their customer private network and so supply side switching depends on a provider being able to attach all sites of the customer private network.
- SLA. For some customers, aspects of SLAs are critical to their business and are important to their choice of supply.

10.48 These three need not be exclusive and for many customers elements of all three affect their purchasing decisions. For example, a customer may have some sites where service availability is a key criterion but for other sites, cost is more important and a residential consumer level of service would be adequate such as via NGA.

10.49 In considering the customer switching of supplier, it is also appropriate to consider geographic aspects at this stage. The geographic aspects of demand side switching poses the question "Is the customer willing to relocate in order to switch supply?".

10.50 In many cases the answer to this will be negative as the costs involved in moving location would outweigh the benefits from the competitive supply. However, it is important to consider that this is not always the case, especially sites of very high value. This situation may arise in a number of situations including the following.

- At the point that a customer is selecting the site in the first place and they have no 'sunk investment' in the site, they may consider the availability of communications services as a material factor in their selection of site. In some cases, the provision of communications may be an integral part of the customer's contract in using a site and the contract term

with a CP may well coincide with the lease on the premises. This is particularly likely to be the case for very high bandwidth sites.

- Customer sites where the predominant activity is communications based, for example a customer data centre or a customer call centre.

10.51 On the supply side, the willingness of a supplier to switch to supply a customer site will depend on the potential margin they will make from serving the site. This will be the difference between the overall revenue from the site at the retail level set against the costs of serving the site. The value of the site to the supplier may be complex but it is likely to include a much wider set of margins than those coming solely from the upstream supply of the access to the site. There will be considerable margins associated with network level functionality and management of the customer private network as a whole. The marginal value of any one site may be therefore difficult to assess.

10.52 However, our suggestion is that the retail market analysis should be given an 'informal analysis', it is appropriate to consider simple parameters which can give a reasonable proxy to the retail value. In this regard, we regard bandwidth as a not unreasonable proxy to this value.

10.53 If the supplier is connecting the site using their own infrastructure, the supply side switching costs are likely to be geographic; that is the cost of the CP extending their network to reach the customer site. The supply side switching is therefore simply stated as the greater the total retail value of a customer site, the more likely is supply side entry and the shorter the distance between the customer site and a CP's physical infrastructure, the greater the likelihood of this taking place.

10.54 It must be emphasised that it is the retail value of site that is attractive to a CP for supply side switching and this value will significantly exceed the value of the upstream input, especially at high value sites and it is this higher retail value that must be used in assessing supply side constraints and not just from the input cost of the supply which is implicitly what Ofcom has done in this Consultation.

CHARACTERISTICS OF THE UPSTREAM WHOLESALE FOCAL PRODUCT

(i) Framework

10.55 Ofcom's approach [Figure 3.6] to wholesale markets effectively traces the presumption of a two site point to point connection through the network. This framework depends on the concept of a network "segment" – i.e. wholesale products are segments i.e. segments of end to end connectivity between two sites. We have the following observations to make here.

10.56 This definition is not consistent with the change made in the relevant retail services where VPNs are now correctly regards as an alternative to retail leased lines. In the case of a VPN, trunk segments do not exist in any identifiable and meaningful way. There are two alternatives:

- either trunk segments do not exist with VPNs and the VPN core is regarded as a common 'cloud'; or
- the notional and transitory paths across the core are regarded as trunk segments.

10.57 Importantly, in neither case will attempting any SMP assessment of trunk using trunk segments yield any meaningful result. In the first case, large volumes of important price constraining service is simply not counted, while in the second case the volumes cannot be counted for practical reasons.

10.58 As a result, segmentation does not appear to be treated consistently. In the case of TI, there are many circuits which Ofcom has decided have trunk segments, even with a further segmentation into regional trunk and national trunk. However, in the case of CISBO, Ofcom has decided that BT's products effectively do not have a trunk segment, but this begs the question, where are the AI trunk segments equivalent to TI trunk?

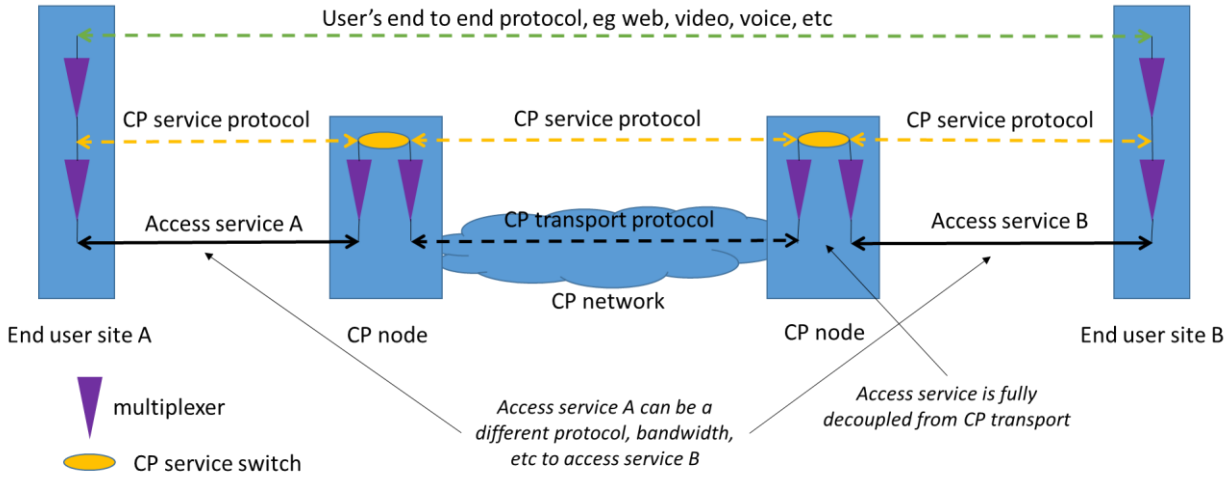
10.59 It might be concluded that AI and TI are fundamentally different and that TI has a core network and that AI does not. This might also appear to add weight to Ofcom's analysis finding a market boundary between AI and TI but in our view this is emphatically not the case. This distinction arises solely as a spurious consequence of the use of segmentation and the absence of multiplexing from Ofcom's framework.

10.60 The model used by Ofcom [Figure 3.6] for the wholesale market, defines segments of end to end leased lines and does not include the multiplexing and the existence of different protocol layers. As such, this model fundamentally misrepresents the nature of core networks.

10.61 Figure 5 below redraws this figure showing where multiplex can, and normally does exist.

Figure 5

Network design architecture



10.62 In this figure, examples of BT's access services includes broadband, NGA, EFM, EAD, PPC, OSA, and other CPs selling access services have similar products. Examples of CP service protocols includes IP (eg IP VPN service) and Ethernet (eg E-LAN or VPLS service). Examples of end user protocols include http, https, SIP/VoIP, and proprietary protocols like Skype, Lync, GoToMeeting, Webjoin, and YouTube.

10.63 Multiplexing, especially when coupled with flexible routing across network topology, can effectively ameliorate the characteristics of an access service and, broadly, any CP service protocol can be carried across any access service. The primary limitations on this are:

- there is sufficient aggregate bandwidth to the end user site[8];
- absolute delay in the access service that cannot be recovered.

10.64 Whilst these two technical characteristics will create barriers to switching between access services, most other technical features can be compensated for by multiplexing.

10.65 The following features are apparent from this Figure:

- The protocol and other service features of the access service to any customer site can all be independent of each other and all of these can be independent of the transport protocol used by a CP within its own network.
- The CP service protocol is carried transparently across the access services.
- The CP's end to end service is likely to be a multi-site service.
- The end user's protocols are carried transparently across the CP's end to end service.
- The location of BT's nodes and the structure of BT's network in delivering an access service is irrelevant to the downstream CP.

10.66 The range of upstream access services offered by different CPs varies considerably, especially when self-supply is properly taken into account.

10.67 BT has a range of products which have been the primary focus of Ofcom market boundary analysis. We have two concerns here:

- the market boundary analysis must reflect the full range of products available to a customer, and for example, an analysis of bandwidth breaks or a TI/AI break cannot be done properly on the basis BT services only;
- all of BT products are regulated and to use regulated products as the sole basis for market boundary analysis does not satisfy the requirement to follow a modified Greenfield approach.

10.68 Our position is that the analysis of wholesale markets can in the main simply reduce to the analysis of customer sites which is essentially the same as that described above at the retail level. In other words, the analysis need be concerned only with the presence of CP access at the sites themselves, it is not concerned with the details of how connectivity is engineered to the site.

(ii) Business Access Services

10.69 The pricing of the access is also coupled to the overall value of the bandwidth at site to the end business customer. A customer with high value applications to their business is likely to have a higher willingness to pay for the access. This suggests that not all sites of even the same bandwidth will necessarily have the same demand side conditions but it is a reasonable first order feature.

[8] It is normally possible to aggregate capacity from more than one access services for use as a single link at the CP protocol layer. This often referred to as inverse multiplexing. For example, EFM is a form of inverse multiplexing using an LLU access service.

10.70 The supply side is largely dominated by the marginal cost of physical infrastructure to connect the customer site. In general, higher value sites are more attractive to CPs and so any customer at a higher value site is likely to enjoy a greater competitive choice that a customer with a low value site. In addition, the marginal cost of the infrastructure is also very strongly influenced by geography and specifically customer density. Where there is a high concentration of customer sites, the marginal cost of serving each one is very substantially reduced.

10.71 This clearly suggests that suppliers will be most willing to move to places where there are high concentration of high value sites. Conversely, some customers are able to locate to areas which have competitive CP presence reinforcing the impact of density. Both dimensions of site value and customer density are important.

10.72 It is therefore essential that the assessment of market boundaries by bandwidth (and any other technical parameters and/or SLA parameters) is carried out concurrently with the assessment of geography.

10.73 The other primary factor which strongly affects the wholesale market competitive conditions is the presence of countervailing purchasing power. It is often the case that the CP is expected to tender for a large number of site accesses and often for an extended period contract. The size of the contract and the potential value of an extended period can allow the parties to spend considerable effort negotiating. Where a CP itself is the purchaser it will likely acquire considerable countervailing purchasing power.

10.74 Large scale, long term contracts are likely to be significant the further upstream the service. The access infrastructure is both an expensive and long term sunk asset and therefore there is considerable risk in achieving a profitable return on this asset. Upstream services are much more closely based on this asset and, absent regulatory obligations, the nature of the upstream services normally reflect this.

10.75 Coupled with this is the desire of the parties involved to strike a deal which will not spillover into negotiations with other parties. A CP is unlikely to want the terms of a deal struck with a major customer to be known to other customers, especially smaller customers who may not be able to negotiate the same advantageous terms. It this case, it works for all parties, and is economically efficient, if there is *not* transparent uniform pricing.

10.76 Absent regulatory constraints, there are broadly two strategies access infrastructure owners employ to achieve efficient non uniform pricing across its customers.

- To vertically integrate so that the upstream price in fully internalised and the investment risks can be defused against the returns from all points in the production chain.
- To sell under bespoke, long term and/or large scale contracts.

10.77 However, the normal conditions of regulated service run entirely counter to these market efficient solutions, for example conditions of non-discrimination and for a transparent service offer. Moreover, any analysis of market boundaries which looks at services with transparent service offers including pricing will not be consistent with the modified Greenfield approach.

10.78 A significant benefit to the alternative approach we propose is that there is no ambiguity as to which services are ‘in scope’ or ‘out of scope’. The analysis as set out in Ofcom’s data analysis consultation does in fact largely take this approach and the data are assembled into

customer site data – the end to end connections are prior processed into two demands, one at each end of the connection[9].

10.79 In order to test for the existence of market boundaries within this scope, we propose there are four primary dimensions of relevance:

- Aggregate bandwidth handed over across to an end business customer at a site (as a proxy for the overall value of the site);
- Location of the site and the extent/viability of competitive supply to the site;
- The nature of the downstream CP customer and the extent of countervailing purchasing power;
- Service level agreements (SLAs), for example 24/7 fault response and enhanced repair times.

10.80 In this framework, these four dimensions must be considered simultaneously and not sequentially. There may be additional parameters which could be considered as secondary parameters in the analysis.

10.81 For the customer, the total bandwidth required at each site is a critical parameter. Normally there is a considerable volume discount for large bandwidth and a single large access service will likely cost considerably less than the equivalent bandwidth made up from multiple smaller access services. As a result, a wholesale customer with a specific bandwidth requirement could switch to an access service with a higher bandwidth than the requirement but would not do so the other way around, even allowing for multiple access services[10].

10.82 Mobile backhaul or LLU backhaul are not within this scope of business access services as these do not hand over to an end business customer. We would propose that these be included by making an explicit and transparent extension of the scope to include aggregate interfaces at mobile base stations and, separately, aggregate interfaces at LLU exchanges. This is discussed further in Section 13.

10.83 In summary, this alternative analysis framework proposes that the market is measured according to aggregate interface to an end business customer at a site and that this sets the scope of the market boundary analysis.

(iii) Assessment of potential product breaks

10.84 In general, Ofcom has found a very broad bandwidth market but a narrow technology market. Were Ofcom to have based their analysis within a different market context and analysis framework as we have set out here, we believe they would have found the opposite, that is narrower bandwidth markets and broader technology markets.

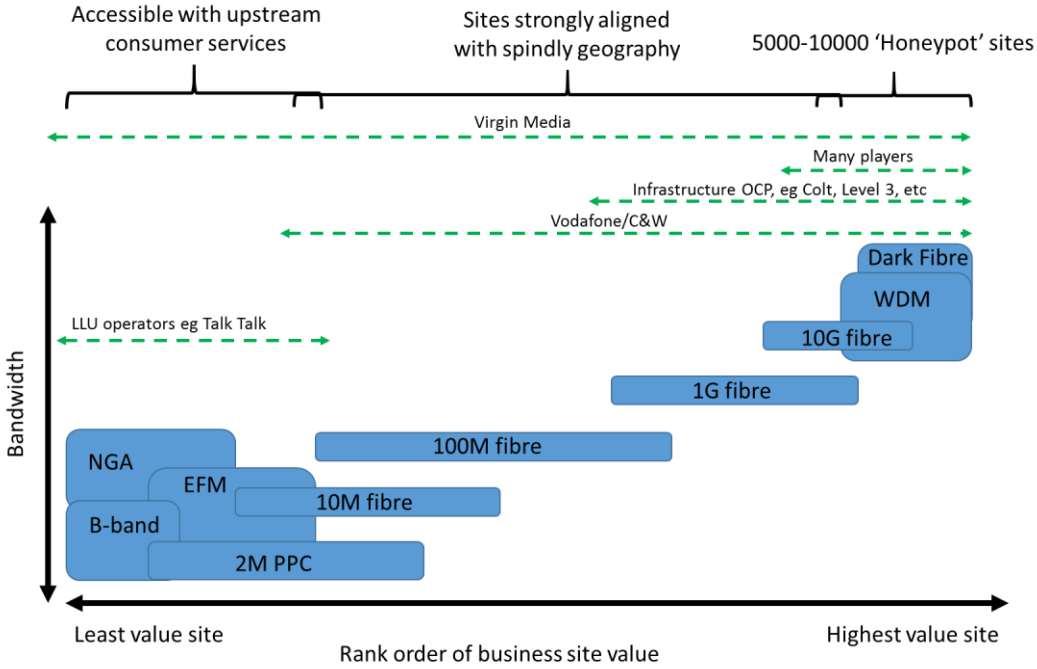
[9] There remains an issue equivalent to the one in the current data analysis arising from the need to classify of sites as either customer sites of network nodes, or both. With this proposed alternative approach, this problem can be substantially ameliorated by distinguishing interfaces with sites which are joint customer/network sites. Interfaces at the site can be distinguished depending on whether they are a) handover to an end customer; b) handover to CP; or c) internal to a CP's network. In this way, sites which are currently classified as both network and customer can be properly apportioned as part customer and part network. While some complications from incomplete information in the data collect would undoubtedly remain, the focus on the aggregate interface to a customer gives the opportunity to handle hybrid sites more appropriately.

[10] This is one reason why we do not consider that customers with very high bandwidth services would migrate back to multiple 1G services for example in a SSNIP experiment.

10.85 First, the bandwidth markets must be analysed in the context of downstream value according to the requirements of the modified Greenfield approach and it is clear that demand side switching between bandwidths is highly constrained. On the supply side, there are very significant differences in the competitive conditions as illustrated in Figure 5 below[11].

Figure 6

Market positioning by site value



10.86 The scaling of bandwidth changes over time as customer demand rises but the real market breaks are by site value and not by bandwidth as such. Bandwidth is only a proxy for site value and the reference benchmarks which map bandwidth to site value are changing significantly over time. Ten to fifteen years ago, 155Mbit/s would effectively have identified the 'honeypot sites'. However five to ten years ago, this moved to 1Gbit/s. Now it is above 1Gbit/s, either 10Gbit/s or more likely WDM. However, this will continue to move and the intrinsic targeting by CPs to sites will not fundamentally change.

10.87 Second, the fact that multiplexing exists between the access service and the CP's service protocol, means that switching between access services of technologies is straightforward. Ofcom's framework of segmentation, has greatly exaggerated the difficultly in switching between technologies and therefore found breaks where likely they do not exist, for example between 2Mbit/s access SDH service and EFM or 10/100Mbit/s direct fibre access service.

10.88 The very real breaks in the market by site value, for which bandwidth may be used as a useful proxy, is discussed in detail in Section 12. In particular, we are clear there is a marked break for very high value sites characterised by aggregate bandwidths above 1G. This break is very clear from analysis of both demand side switching costs and from an analysis of competitive conditions.

[11] For very high bandwidth it would also be correct to add in third party dark fibre supply.

10.89 In addition, we find that there is wholesale migration of TI services, including at 2Mbit/s, to AI services and as such the pricing of TI is strongly constrained by the pricing of these AI services. A price control on TI service requiring strong price reductions is unjustified and inappropriate. This is discussed in Section 15.

(iv) EFM and NGA

10.90 Ofcom considers in Annex 9 whether NGA or EFM should be considered as alternatives in the same market to direct fibre based products. Ofcom finds that EFM is in the same market as AI fibre based services, however, they find NGA is not. Moreover, we note that in Annex 10, Ofcom finds that 2Mbit/s PPCs are in a different market from both.

10.91 We do agree that EFM should be considered as being in the same market 10/100Mbit/s direct fibre services. While there can be a significant price difference between EFM service and direct fibre (significantly depending on distance[12]) they are widely regarded as alternatives by both end customers and CPs[13].

10.92 On the other hand, we believe Ofcom underestimates the degree of price constraining influence NGA and broadband have on other lower bandwidth business access services. While it is true that there are normally significant differences in SLAs between broadband/NGA and other business access services, these do not automatically remove price constraining effects:

- Not all customers require higher SLAs, especially at lower value sites;
- There are ways of adding redundancy using multiple broadband/NGA access circuits which can effectively ameliorate the effect of the lower SLAs for the consumer oriented services.

10.93 We completely disagree with the break Ofcom [Annex 10] finds between 2Mbit/s access services and lower bandwidth direct fibre services as well as with EFM. Ofcom [A10.13] concedes that these services are migrating in very large numbers to both 10/100M direct fibre access as well as to EFM. Both of these are profoundly price constraining on 2Mbit/s access services and their relative prices and Ofcom's price controls themselves govern the rate of migration. We maintain our position that TI services are in a wider market of one-way substitution. This is discussed further in Section 15.

(v) Core/Trunk definition

10.94 Ofcom has defined trunk/core networks on the basis of an assumed network structure which delineates their assumed segments. As there is no common network structure across all CPs, Ofcom has based its definition of trunk/core on a list of BT's nodes. In essence, a CP's network structure is a matter of internal convenience for themselves.

10.95 We have consistently disputed this approach to defining trunk/core on the basis of BT exchanges in that: a) it does not represent the structure of other CPs' networks and BT's exchanges are not necessarily common points of presence for other CPs as they interconnect at other points; and b) it does not fully reflect BT's network especially when coupled with Ofcom's assumed routing of circuits across the assumed structure.

[12] Ofcom has not carried any specific analysis on the impact of distant in defining market boundaries. Ofcom has normally adopted a 10km reference distance; however, the effect of this essentially random choice of length overwhelms any SSNIP of an HMT.

[13] BT has delivered its 2Mbit/s service using both direct fibre and HDSL on copper pair as a matter of internal engineering choice. The end customer was essentially unaware of the difference in access technology.

10.96 With the way the current Ethernet services are defined as remedies creates further departure from Ofcom's notional network structure as they service is defined by distance which does not reflect any network structure at all. It is effectively impossible to determine whether an EAD service is being used by a CP as an access, backhaul, or trunk within their own network structure.

10.97 As regards the handover of an access from a customer site to a downstream CP, the precise details of how a customer site is connected to a core network is either: a) a matter of internal network design where the CP is vertically integrated (.i.e. a matter of internal supply); or b) a matter of commercial and technical convenience between the supplier of the access services and the downstream CP in the case of no SMP designation; or c) an artefact of an SMP remedy again defined for the efficient commercial and technical convenience between the supplier of the access services and the downstream CP. The location and nature of handover is something of engineering convenience which is not the same as a distinct boundary as to where the bottleneck access network ends.

10.98 However, Ofcom's approach develops the concept of trunk segments delivered by a trunk network and which are bounded by TANs. In contrast, the model presented above which includes multiplexing is bounded by CPs' nodes. A trunk/core network is defined by a particular CP and the CP has full choice in deciding their network topology and structure; a trunk network is therefore simply what a CP has defined to be a trunk/core network. As a result, there is no meaningful analysis of the competitiveness of a core network which is exogenous to that CP and the services of which are never traded without access services.

10.99 A CP's base requirement is for an access service from end users' sites to their *own* CP node. It may be convenient for BT to devise a service which aggregates at BT nodes (for example aggregated handover), or even handover to the CP at the BT node, but there is no reason to *require* CPs to have presence at BT's nodes.

10.100 In summary, a) access service can and will normally use *different* protocols to end to end connectivity, b) whilst retail markets and access services do meaningfully and properly exist in commercial markets; trunk/core does not exist as a separate and distinct upstream market.

10.101 Core networks are discussed in more detail in Part 13 and as they relate to TI, in Section 15. Geographic issues are discussed in Section 11 including the inclusion on trunk/cores networks within a CP's geographic footprint.

GEOGRAPHIC NATURE OF COMPETITION

10.102 Geography is undoubtedly a major factor in defining economic markets boundaries and consequential evaluations of SMP; competitive infrastructure is not uniformly available across the UK[14]. Competitive infrastructure is normally focussed on dense clusters of high value customers although EFM is also targeted via BT exchanges which are widespread.

10.103 The following is a summary of a more detailed analysis of geographic markets contained in our response at Section 11:

- Geographic markets are neither national nor local (close physical proximity) but could be described as 'spindly' and follow the physical infrastructure deployment of CPs, both access and core infrastructure.
- CPs do not generally all target all customers even if they have presence and are technically capable of being served from their own infrastructure – there are other important aspects

[14] Nor is BT's infrastructure uniformly available leading to differential pricing though excess construction charges (ECCs).

of cost, notably marketing/sale operations and network operations which also have economics of scale and scope[15].

- The focus is of multi-site corporate private networks and not bundles of leased lines. The access service is an aggregate of multiplexed end to end flows. In practice this means that Ofcom has overstated the significance of barriers to switching between TI and AI but understated the barriers to switching between access service bandwidths.
- Postal sectors are often too large to accurately assess conditions of competition within the sector.
- The requirement of physical contiguity of postal sectors is invalid as the spindles of the geographic markets tend to cut through postal sectors.

[15] The one CP which we believe would offer the full range of BT services is Virgin Media which does have very widespread presence for businesses and all backhaul services.

11. Geographic Markets

SUMMARY

11.1 This analysis responds to Ofcom's geographic analyses both at the conceptual level as set out in Annex 21 (approach to geographic markets) and in some detail to the results of the approach which are set out by Ofcom in Section 4 (Market assessment for CISBO) and Annex 18 (Dig distance and costs).

11.2 We have referenced various diagrams from the 2013 Statement to illustrate our general points of the nature of competitive infrastructure and how this follows site demand but which will not likely align with postal sectors.

11.3 We then explore in some detail various findings from this review and illustrate how Ofcom is frequently making unreasonable assumptions which leads to underestimation of HNR relative to actual demand and how postal sectors can be misclassified including in the new breakdown of WECLA. We argue that competition will not necessarily be uniform across sites within a postal sector nor is there any reason to require postal sectors to be physically contiguous to define a separate economic market.

11.4 Specifically, we do not support the strong conclusion that Ofcom [4.8] makes that:

> 'The ability of CPs to compete using this infrastructure will be similar across the product range, and therefore in a given area we would expect competitive conditions across the product range to be broadly similar'. (underlining added)[16]

11.5 We accept that CP presence will potentially allow for supply of any interface type or bandwidth as Ofcom [4.8] states more loosely – 'Once a CP has infrastructure in a given area, it will be able to supply services across the range of bandwidths and interface types in that area'. It is however not the case that even if any bandwidth can be supplied, a CP will necessarily have the economic incentive to serve any customer in 'a given area'.

11.6 For any CP, a 'give area' in Ofcom's analysis corresponds to the geographic scope or islands within either 100m or 200m of their flex points. The aggregation of all of these islands within any postal sector will determine whether it is classified as one of HNR.

11.7 This approach will not result in finding areas of the country for which conditions are homogenous for a given set of products be that across protocol or bandwidth or indeed any other parameter of service:

- Postal sectors hugely vary in composition from those which are essentially almost entirely rural with no businesses at all to highly compact small sectors composed only of businesses.
- Within many postal sectors there is often a wide range of the mix of households and businesses when looked at in finer geographic detail. There are clear signs of big

[16] Ofcom [4.103 second bullet] subsequently appears to caveat this conclusion with the words '(Accordingly) whilst the presence of multiple networks nearby makes it more likely that customers will be competitively served, we cannot assume that all rival networks will compete for supply of all services to all customer types'. We believe that how Ofcom has interpreted the marketplace for very high bandwidth services suggests that this caveat is not binding in practice and the quote at [4.8] reflects the overall Ofcom position. Ofcom [A21.38] third bullet also states that 'competitive conditions within the sector are likely to be broadly similar in most cases'.

differences in the extent of the clustering and location of businesses according to bandwidth.

- The calibration of HNR statistics is seriously compromised by cumulative errors related to three factors of - (i) clustering of businesses within a postal sector which are not captured; (ii) economic dig distance; and (iii) locations of post codes relative to actual network ingress to the site.
- CPs will have a wider strategic incentive to target certain customer types to allow for recovery of customer sales and acquisition costs. For most CPs there are other major items of cost beyond network infrastructure which also have economies of scale and scope, notably service/network operations costs and sales/marketing costs.
- In particular, a CP is likely to set up sales/marketing as well as service/network operations to aim at a particular market sector, for example market sector by size of customer. The marginal costs of more customers of the same or similar type are then low. However, the marginal costs of handing other customers of other sectors may be very high[17].

11.8 We discuss these issues in more detail below.

THE FRAMEWORK OF GEOGRAPHIC MARKETS IN OFCOM ANNEX 21

11.9 Ofcom's analysis centres on considering the economic pressures leading to a single national market and economic pressures leading to local geographic markets. It analysis starts with a thought experiment which considers a situation where CPs are all vertically integrated and there is no merchant market. Ofcom [A21.7] then argue that in such a situation, this would lead to a single national market:

"Competition would be determined nationally with only CPs with extensive geographic coverage able to compete for the provision of bundles of leased lines connecting different sites."

11.10 We do not subscribe to this assessment, even assuming that most customer are multi-site customers which we address below. Not all customers have sites in all parts of the country and many customers have sites only in specific locations and these locations strongly coincide with the locations of other multi-site customers. This means that even vertically integrated CPs who might refuse to trade with each other, can still meet significant demand by targeting their build on the density areas[18]. Many customers' *complete* requirements will fall within this competitive footprint. But this competitive footprint is <u>not</u> national and the competitive conditions within the collective footprint of all CPs are quite different those outside the footprint.

11.11 Additionally, even using Ofcom's [A15.8] own method (which underestimates CPs' coverage) it is apparent that over 30% of business sites are within reach of two or more CPs, and given

[17] Sales, marketing, and operations optimised to customers offering contracts of £100k pa or more are unlikely to be cost effective of a customer with a demand worth only a £1k pa no matter how close they are to the physical infrastructure. This is important as it requires that the analysis of the geographic market boundaries must couple with the analysis of the product market boundaries. This must be considered at this stage of analysis.

[18] In fact in the 2012 Consultation Ofcom presented statistics showing there is a very vibrant merchant market even in WECLA.

this will understate CP presence by exclusion of EFM capability amongst other reasons, it is likely that CPs will be able to meet a significant proportion of inter-site demand[19].

11.12 A good example of CP capability is Colt who try to avoid 'off-net' access whenever possible. They have infrastructure in the major city centres of the country for the finance sector as well as the major communications links between them (eg the M4 corridor). With this footprint, they are able to meet some (probably many) customers' complete demand. Indeed, for Colt, they do not distinguish the UK as their footprint is the major city centres of Europe and the European major communications links.

11.13 For a significant number of CPs, their geographic markets are neither national nor local as Ofcom has described these terms; rather the market is a web of comparatively dense areas of clustered customers and this configuration is essentially absent from Ofcom's analysis.

11.14 Most significantly, this differential targeting of customers by CPs means there are different competitive conditions at different bandwidths and that geographic considerations underpin breaks in any chain of substitution of bandwidth.

11.15 In Annex 21, Ofcom [A21.38 –A21.39] sets out the justification for using postal sectors as the basic unit of geographic area and for imposing a contiguity constraint. We disagree completely with the two assumptions here:

- "competitive conditions within the [postal] sector are likely to be broadly similar in most cases";
- "CPs are unlikely to invest in an access infrastructure in an area just to serve a single post code sector. They will aim to serve customers in a wider local area – including multiple, where possible neighbouring postcode sectors – to benefit from the available economies of scale and scope."

11.16 As noted in the discussion above, CP networks are typically neither national nor local. CPs invest to serve as much of their target market as possible and the geographic characteristics of their target market is neither national nor local but is largely based on the location of the actual sites of their customers.

THE EVIDENCE OF GEOGRAPHIC MARKETS FROM THE 2013 BCMR

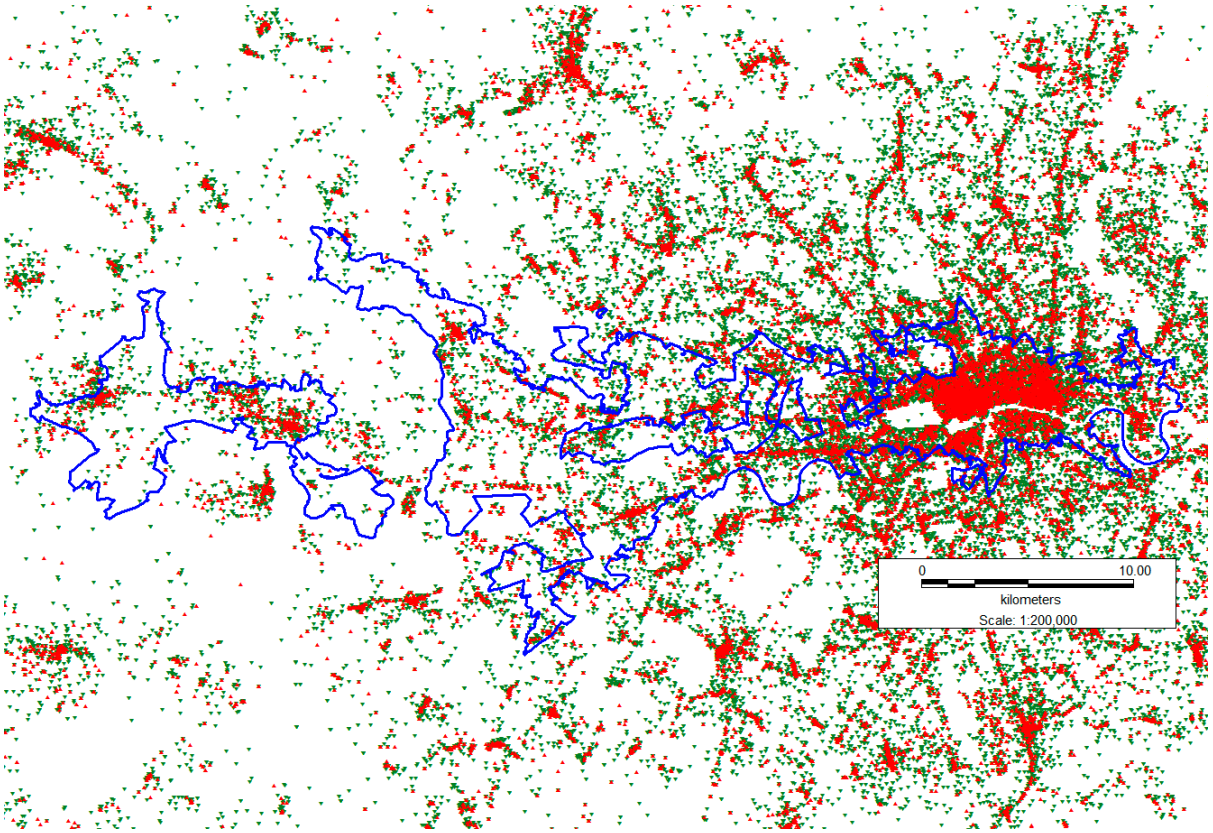
11.17 At this stage, we are obliged to use some of the information in the 2013 Statement as Ofcom has not offered equivalent diagrams and evidence in the 2015 Consultation. We believe the same broad conclusions would be drawn using the new database of businesses.

11.18 Figure 1 below is taken from the 2013 Statement and shows that the WECLA boundary is very poor at capturing a huge swathe of businesses outside with very large areas of clustering (red and green dots).

[19] For comparison, we estimate that less than 65% of these business sites are within 200m of BT's flexibility points, even though Ofcom [A13.25] misleadingly describes BT's network as 'ubiquitous'.

Figure 1

Clustering of sites in Experian database
(reproduces Figure 5.14 of 2013 BCMR Final Statement)



Key: red dot = business site with 250+ employees, green dot = business site with 11 to 249 employees, WECLA+ outlined in blue.
Source: Experian data/Ofcom

11.19 Broadly speaking, the 'spindly' nature of the clustering of customers is very evident from this picture and it is also evident that the sites of large businesses (the red dots) are very substantially more clustered than the sites of smaller businesses. From this we can see immediately that the degree of clustering is not homogeneous with site size within a postal sector as Ofcom has implicitly assumed and which is a significant assumption in justifying a single market all in a bandwidth chain of substitution.

11.20 In fact, it is also clear that the red dots trace the major arterial roads of greater London; major sites are heavily drawing to the major city centres and the roads between them. On the other hand, it is equally clear that the WELCA boundary which is based on postal sectors has little intrinsic fit with the spindly nature of the dots, especially the red dots. Large numbers of spindles are missed altogether, for example down to Croydon, but at the same time large areas of white space are included where there are no businesses.

11.21 In the previous two market reviews, it is now clear that Ofcom had very poor information from many CPs on their circuit inventories and it was (arguably) reasonable therefore to use an external list of candidate sites such as Experian. However there are known difficulties here that the "large business sites" chosen by Ofcom are defined not on a site basis but on an aggregate basis of total corporate employment nationally. There is not necessarily a good mapping to site demand particularly at the local level when HNR statistics are being computed. As we have noted previously, this creates a very retail-skewed site list as there are

many retail companies with more than 250 employees who are spread across multiple small outlets. This becomes apparent in some of the diagrams shown below.

11.22 Figure 2 shows the calculated network reach for actual circuit ends in 2013, averaged across each individual postcode (as opposed to the much larger Postcode Sectors Ofcom have chosen to use in their market definition). This is based on the circuit inventories from 2011, and is thus dominated by TI circuits (over 70% of circuit ends were TI), many of which will be delivered using copper rather than fibre access. This shows that there is a reasonable match with the Experian database when looked at in outline but more critically, there are enormous areas of HNR which are not captured in WECLA. (Note that there is not an equivalent breakdown of circuit end by bandwidth.)

11.23 This Figure demonstrates one of the issues of interpreting maps of postcode areas. Postcodes vary enormously in size as they are fundamentally based on the amount of physical post that is delivered, buildings receiving on average more than 25 items of mail a day are given individual postcodes. It is therefore more likely that the large postcodes are the ones with no or few businesses. There will also be no demand for business connectivity services either in these areas of the large white expanses in Figure 2.

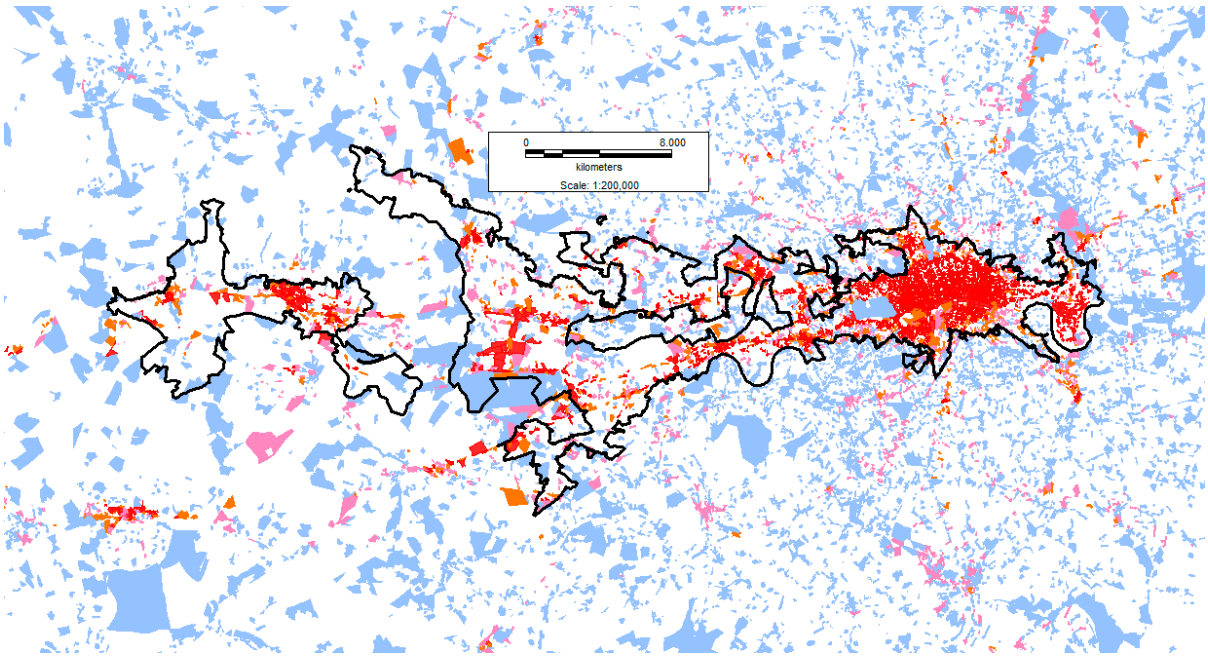
11.24 The Figure also has some large areas of blue, indicating areas of lower network reach. Again, these are often very sparse areas where there is very limited demand. For example, the blue square area in the south west of this figure is actually two individual postcodes covering an area of 10km^2 of Bracknell Forest. These two postcodes have only seven delivery points, (5 domestic and 2 non-domestic) but gives the impression of being a large area of low network reach. Conversely, there are many areas of high HNR (pink, orange red) which probably contain large numbers of businesses but as these areas are physically smaller, they are much less noticeable giving the impression that there is limited areas of HNR outside WECLA and which remain regulated.

11.25 Put another way, it is apparent that CP supply follows very closely customer site demand. This picture shows high network reach has exactly the same 'spindly nature' of the red dots above in Figure 1. The WECLA boundary does not fit with the actual location of HNR, with spindles of high network reach missed out and conversely large areas of white included in the WECLA boundary.

11.26 In our view, Ofcom's assumption (discussed above) that the economies of scale and scope are local to neighbouring postal sectors is incorrect. It is perfectly clear that HNR follows a CPs core network quite as much as its access network and that Ofcom's argument for a contiguity (or just 'near contiguity') constraint of Postcode sectors is completely unjustified; Slough and Croydon are just as 'contiguous' with central London as are Manchester, Birmingham, Bristol.

Figure 2

Network reach by post of actual circuit ends
(Figure 5.11 of 2013 BCMR Final Statement)



Source: Operators/Ofcom
Key: WECLA+ outlined in black, average number of OCPs within reach coloured as follows[20]:

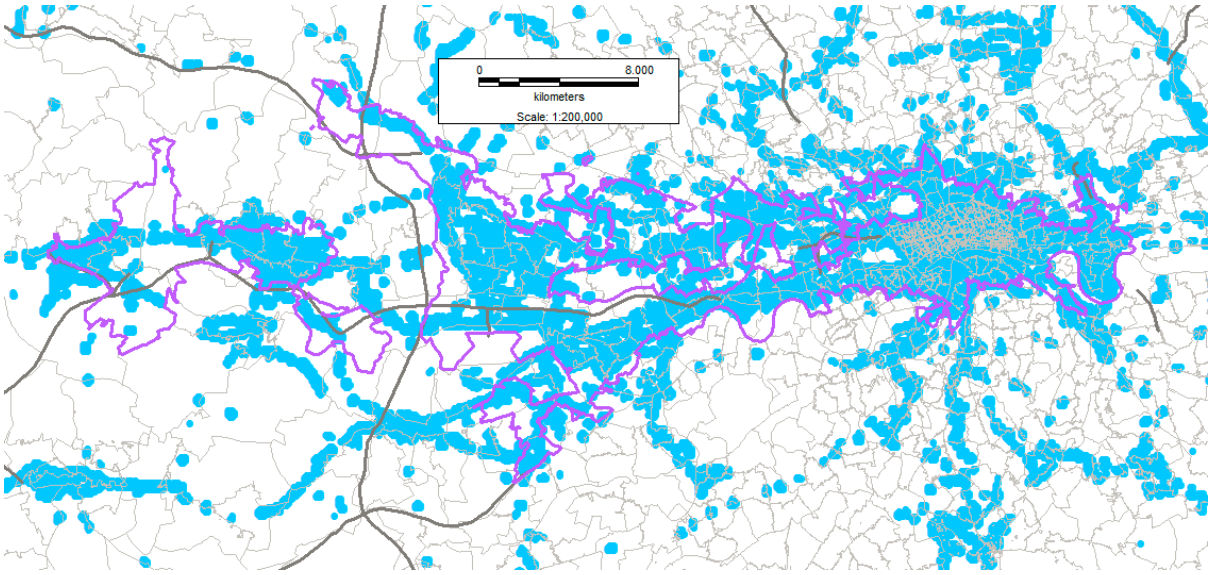
- 4 to 16
- 3 to 4
- 2 to 3
- 0 to 2

11.27 The same conclusion of CP presence following spindles of customer demand can be deduced when a much smaller area is used than a postal sector as shown in Figure 3 below. With this 100m grid, the spindles are reasonably clear and the alignment with the red dots is still good. This can be seen in Figure 4 which super-imposes this grid onto Ofcom's 2013 Figure 5.14 showing the business locations.

[20] We understand that a < symbol is missing from the key, that is blue is 0 to <2, pink is 2 to <3, and orange is 3 to <4.

Figure 3

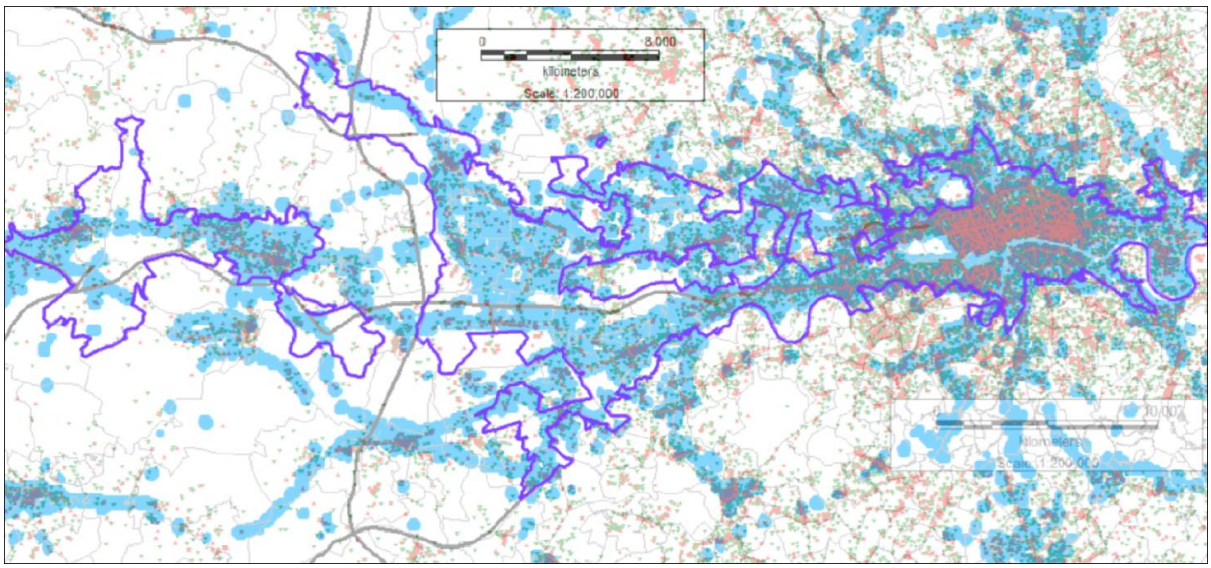
HNR by a 100m grid
(Figure 5.10 of 2013 BCMR Final Statement)



Key: Blue points indicate two or more OCP flexibility points within 200m. The WECLA+ is outlined in purple.
Source: Operators/Ofcom

Figure 4

Alignment of business sites with areas of HNR (by a 100m grid)
(Figures 5.10 and 5.14 of 2013 BCMR Final Statement)



Key: Blue points indicate two or more OCP flexibility points within 200m : red dot = business site with 250+ employees, green dot = business site with 11 to 249 employees, the WECLA+ is outlined in purple
Source: Experian data/Ofcom/Operators

11.28 It is clear from this that there are significant areas of business density outside the WECLA area that are in fact actually areas of HNR when viewed at a more granular level. Figure 4 also

highlights some areas where Ofcom predicts there are sites of large businesses but calculates limited OCP network infrastructure. One such area is Fulham between WECLA and the Thames. Using an estimation of the sites that Ofcom has chosen, it appears that a significant number of these sites are retail outlets (e.g. Tesco Express, Boots, Subway, Evans Cycles) which are unlikely to be high users of business connectivity services and so this area has not attracted significant OCP network build. This highlights the mismatch between the demand distribution chosen by Ofcom based on the database and the real demand.

11.29 We examine this issue below in some detail in conjunction with consideration of other related factors including the implications of Ofcom's assumptions to reduce the dig distance to 100m from 200m. It is helpful to illustrate some of the general problems here by reference to the postal sectors that form the basis of the new split of WECLA into CLA and LP. To be clear the problem we are highlighting is not restricted to WECLA which we use for illustration and where Ofcom has decided to split up into two separate economic markets.

THE IMPACT OF HETEROGENEITY OF POSTAL SECTOR ON GEOGRAPHIC ANALYSIS

11.30 We believe there are a number of material weaknesses in Ofcom's analysis:

a) Competitive infrastructure is not homogeneous across many Postcode Sectors and the averaging across these areas dilutes areas where there is truly competitive supply of services leading to an underestimate of the competitive footprint.
b) Ofcom's choice of business sites includes many small retail sites where there is limited demand for business connectivity services and even less demand for the higher value services. It is unsurprising that CPs have not chosen to build to these sites.
c) Ofcom plots the business sites at the location of the postcode centroid but this is not the location a CP has to build to in order to provide service and introduces errors of serving capability.
d) In order to connect new customers, Ofcom's calculation assumes that a CP will always have to dig from their fibre flexibility point whereas in practice this is not the case as they can take fibre into the actual location of the nearest duct which will be a lot closer and so this methodology greatly underestimates the competitive footprint.
e) The move for a 200m to 100m "dig" distance increases the impact of both the plotting inaccuracy and incorrect use of flexibility points as the extremity of the CP network.

11.31 We do not have access to the new "Business Locations" data set used by Ofcom nor the OCP fibre flexibility points data that Ofcom has used in their process for calculating areas of High Network Reach. We have therefore had to use alternative sources of data that are available to us to illustrate these issues:

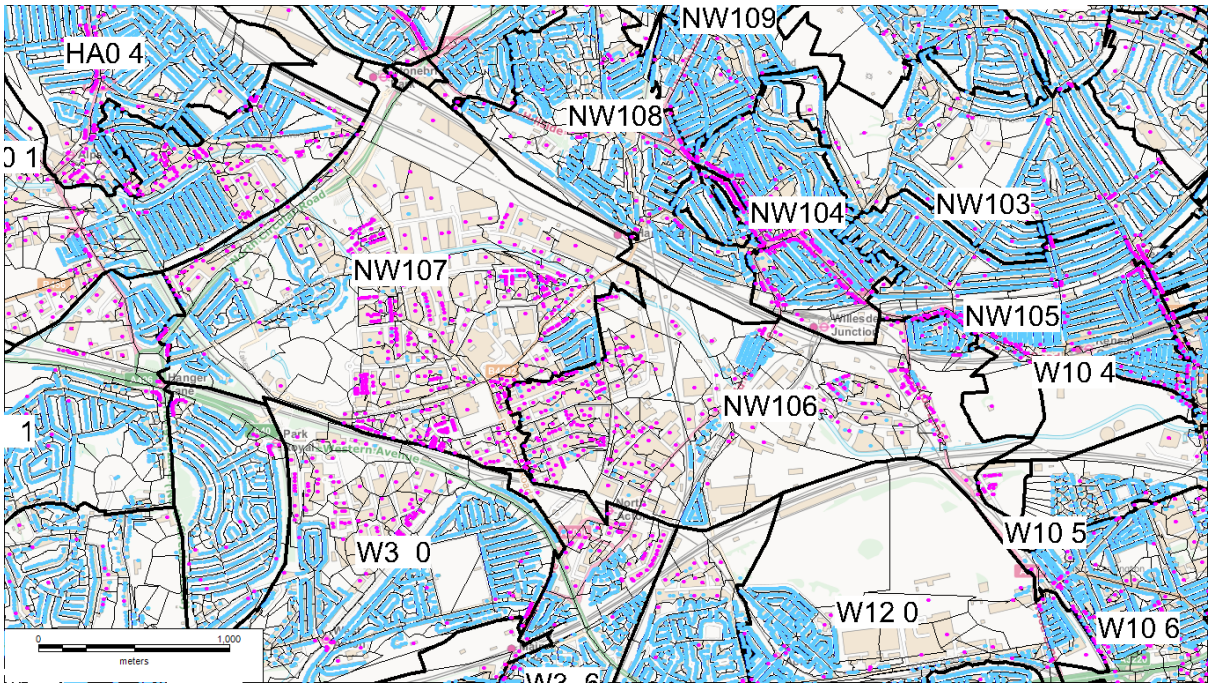
a) The 29.6 million Actual delivery point locations, split into "domestic" and "non-domestic" locations. We have used the 2.3 million "non-domestic" delivery point locations to indicate the actual locations of business, although the majority of these sites will not require business connectivity services, it helps understand the nature of a geographic area.
b) Commercial business site data from which we have extracted a set of sites to represent those of businesses employing over 250 people nationally.
c) Our fibre flexibility points as submitted to Ofcom in 2014.
d) Full postcode boundaries supplied by the OS.
e) Postcode centroids supplied by the OS.

11.32 We now present a series of postal sectors in WECLA to illustrate these problems.

11.33 Figure 5 shows an example in North London of around North Acton and Harlesden. The purple dots represent the non-domestic delivery points and the blue dots represent the domestic delivery points (i.e. residential homes). In this area there are two postcode sectors (NW10 7 and NW10 6) that are predominately business areas, being primarily large areas of purple, although they both have small areas that are distinctly residential.

Figure 5

North London Postal Sectors



Note: Blue dots are residential dwellings, purple dots are non-residential – these are actual building locations not the postcode locations that Ofcom uses

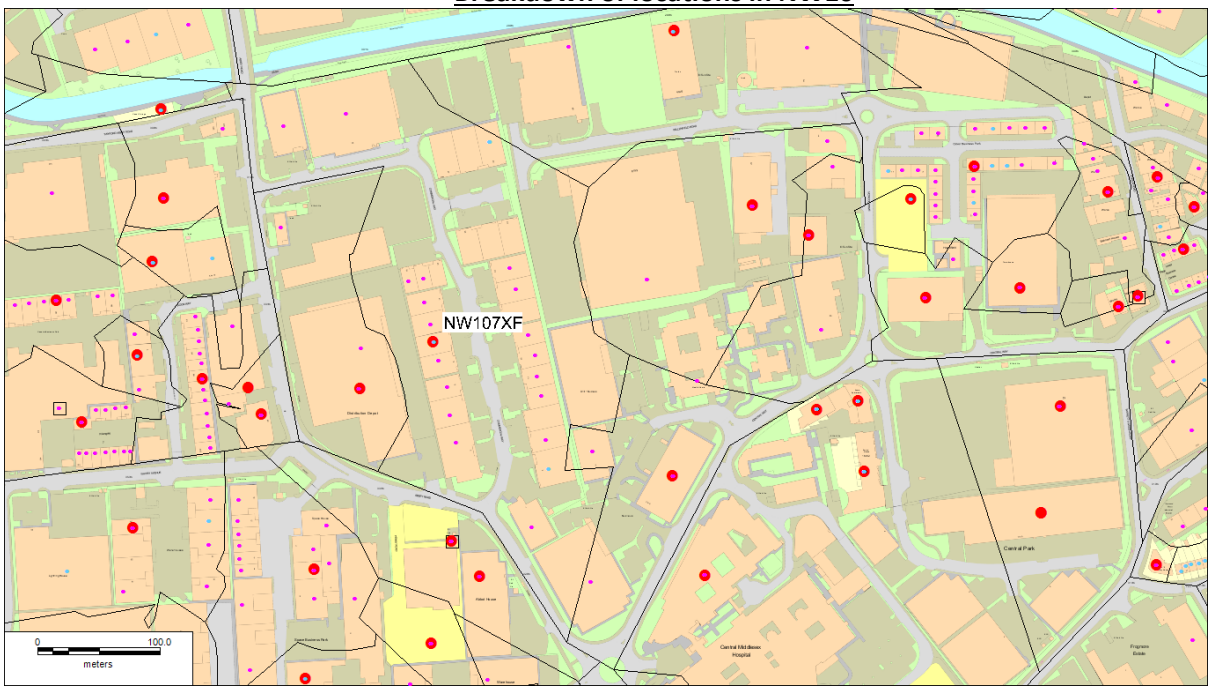
11.34 Based on Ofcom's Figure A15.8, both these postcodes have a network reach of "5 to 8" CPs when using a 200m distance from CP fibre flexibility points. Given the number and location of businesses in these Sectors, the conclusion must be that a number of CPs have extensive networks covering this area.

11.35 When Ofcom then calculates the "Network Reach" based on the shorter 100m distance (but still from OCP flexibility points) these Postcode Sectors meet neither of the conditions required to be in CLA and therefore are not classified as having sufficient competitive infrastructure to be fully de-regulated.

11.36 We believe that this result is due to the combination of some of the errors noted above including incorrect dig distances. Figure 6 shows more detail of one part of this area. This illustrates the issue of the accuracy of the location data that Ofcom uses which is discussed in Ofcom [A15.57]. In this Figure, the non-domestic deliver points are again shown as small purple dots, the postcode boundaries are the black lines, and the postcode centroids that Ofcom uses to position the businesses are shown as red circles. The example of NW10 7XF is illustrated and this postcode represents 20 to 30 business units. If any of these feature in Ofcom's Market Location dataset they are assumed to be at the centre of the postcode at the location of the red circle.

Figure 6

Breakdown of locations in NW10



11.37 Ofcom examines the likely impact of plotting businesses at the postcode rather than the actual site by calculating the theoretical radii of postcodes by assuming the postcodes are perfect circles (presumably based on the known area covered by the postcode).

11.38 We have tried to replicate Ofcom's calculation for the LP postcodes and our results differ from those presented by Ofcom [Table A15.1] and are shown below in Table 1. We have additionally calculated the cumulative distribution of the non-domestic delivery point (i.e. business point) in these postcode as a proxy for the number of businesses that may be affected by positional accuracy approximations.

Table 1

Comparison of Ofcom and BT calculation of cumulative distribution of postcode radii for LP

Radius (m)	Area of postcode (m^2)	Ofcom cumulative distribution of postcode radii (from Table A15.1)	BT calculated cumulative distribution of postcodes	BT calculated cumulative distribution of non-domestic delivery points in postcodes
<=10	314	12%	2%	1%
<=50	7,854	75%	68%	59%
<=100	31,416	97%	95%	90%
<=150	70,686	98%	98%	96%
<=200	125,664	99%	99%	98%

11.39 We are unsure of the source of the differences, but it appears that Ofcom's cumulative distribution may be somewhat optimistic and under estimate the impact of using a shorter "dig" distance. We have also calculated the number of businesses in these postcodes, which

shows that 10% of businesses in LP are in in fact in postcodes with an area greater than 31,416m^2, i.e. with a theoretical radius of more than 100m.

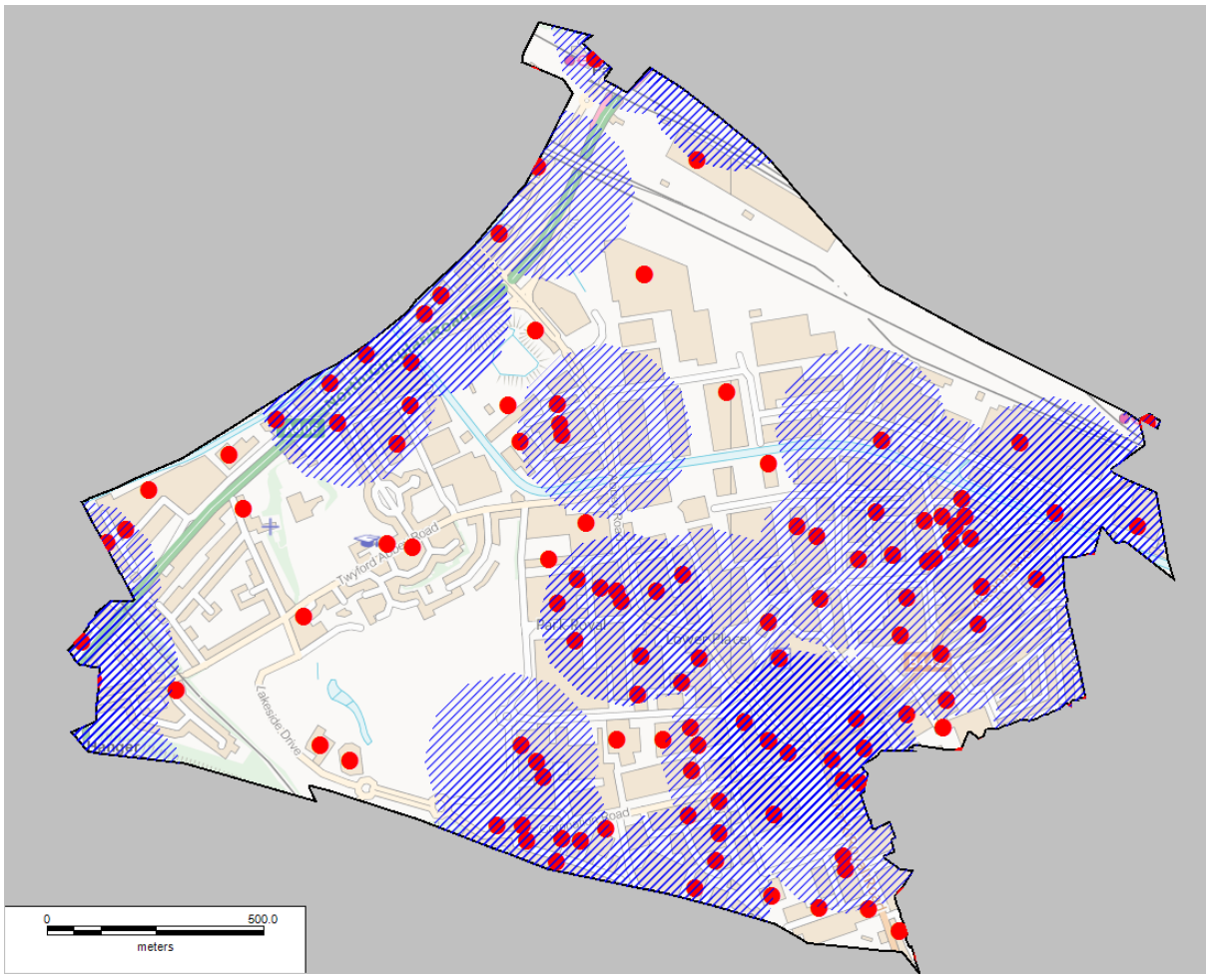
11.40 The choice of assuming that areas served by postcodes are perfect circles is also distorting the results. For example, in the example of NW10 7XF shown above, the postcode area is 64,040m^2 which equates to a theoretical radius of 147m whereas in reality the extremities of the postcode are in excess of 250m to the north and south of the centre.

11.41 This Figure also highlights another issue that Ofcom [A15.57] has identified – that of the size of some business sites and the representative location being at the centre of buildings "tens of metres away" from a potential fibre entry point. Ofcom [A15.58] acknowledges this, and notes that "*any interpretations of our network reach analysis should take into account the degree of accuracy we are able to achieve in locating flexibility points and businesses*". We believe that overly rigorous conditions have been applied for inclusion of areas into the CLA and which in any case appear to place undue confidence in the accuracy of the analysis.

11.42 Although we do not have the locations of OCP flex points, we do know the locations of BT's flex points. Figure 7 shows the postcode sector NW10 7. The red circles are again the postcode centroids used to plot the locations of the businesses (in this example only postcodes with non-domestic deliver points are included so the picture is not distorted by residential locations). The hatched areas are 200m radii from BT's fibre flexibility points.

Figure 7

Detail of Postcode Sector NW10



Note red circles are business postcodes, blue hatching are areas <=200m from a BT fibre flexibility point.

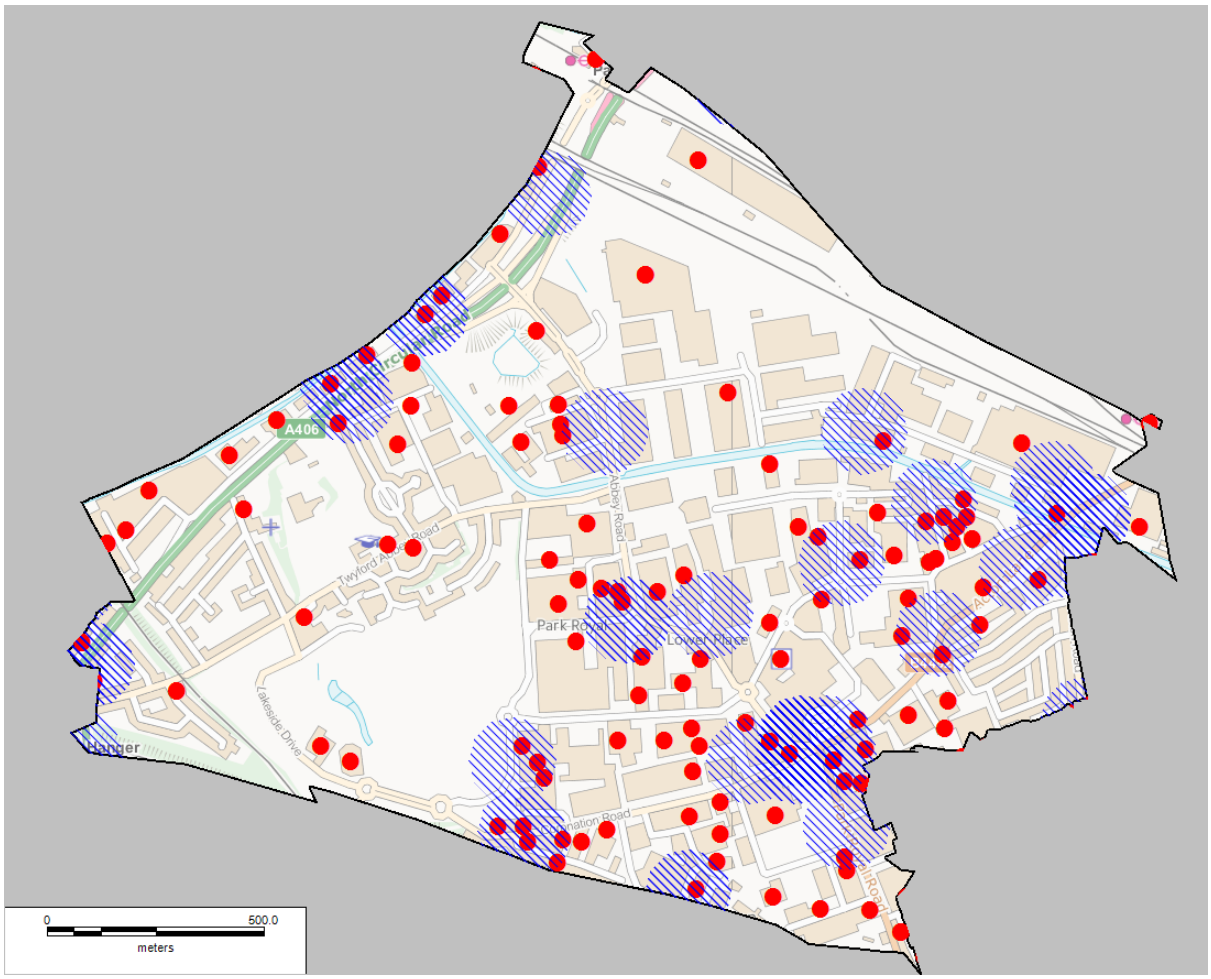
11.43 Using Ofcom's methodology, and the longer "dig" distance of 200m, it is evident that a significant number of businesses would be deemed to be outside of BT's fibre footprint. In reality, BT does serve many of these locations.

11.44 Figure 8 reduces the "dig" distance, in line with Ofcom's current proposals, to 100m. Using BT as an example of a CP, in this postcode sector we have a comprehensive network infrastructure and can provide services across the area, but Ofcom's methodology of assuming a coverage of 100m from fibre flexibility points would lead to the conclusion that we can only cover about half of the postcodes.

11.45 Ofcom's methodology therefore leads to a result that is unrealistic. As we do not have the locations of CP flex points nor the OCPs real network coverage we are unable to repeat this analysis for other CPs but we believe Ofcom's results are not an accurate reflection of the true nature of competition.

Figure 8

BT coverage using 100m in NW10

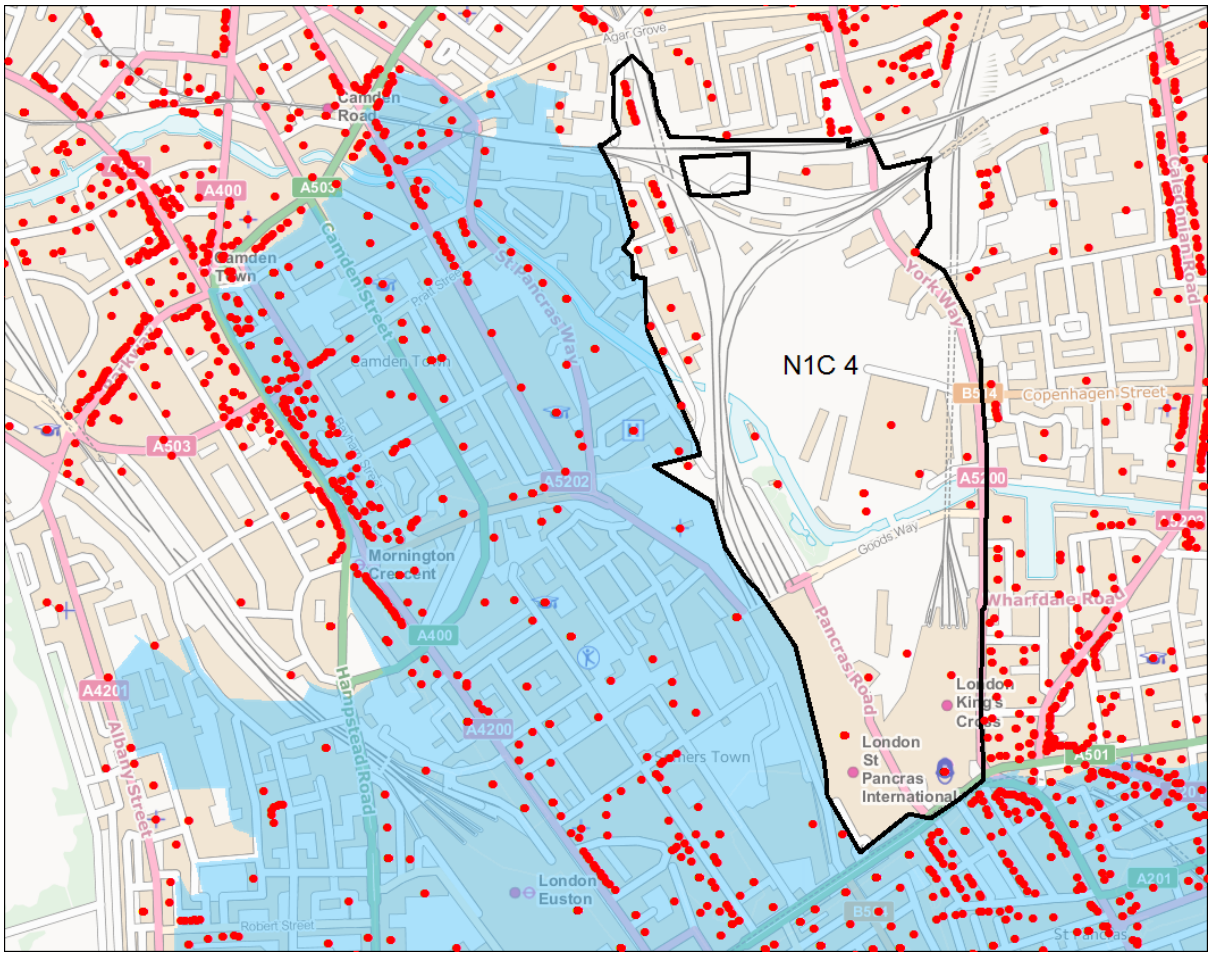


Note red circles are business postcodes, blue hatching are areas <=200m from a BT fibre flexibility point.

11.46 Another example of predominately business postcode sector which has been excluded from CLA is N1C 4. This postcode sector has been created since the original CELA definition and compasses the redevelopment area North of Kings Cross and St Pancras as shown in Figure 9.

Figure 9

Postal Sector N1C 4



Note: CLA shown in Blue; red dots are business postcodes; N1C 4 boundary shown by Black border

11.47 It can be seen that there is little existing infrastructure and currently very few business delivery points (red dots), as much of the area is still being developed so there are few existing business sites.

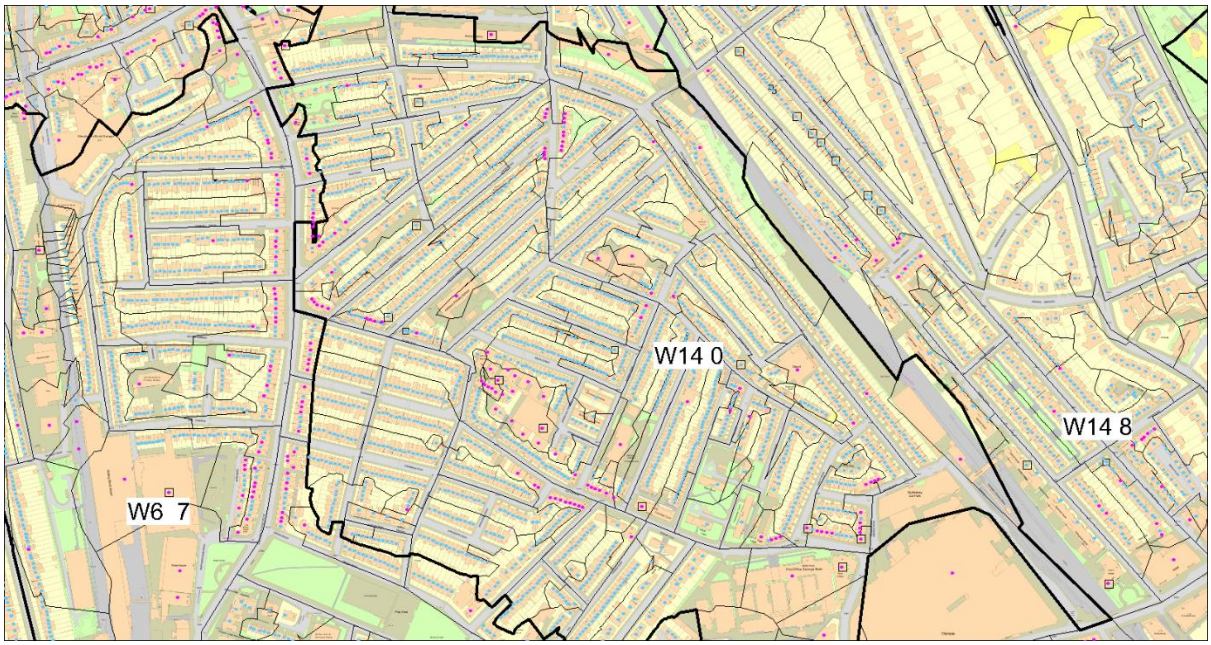
11.48 What telecoms infrastructure, ducts etc. there are, have been installed by INFL – not by Openreach or BT. It would therefore be inappropriate to regulate BT for any services in this area[21].

11.49 Figure 10 gives an example of a predominately residential area - W14 0 – just North of Olympia.

[21] Consumers and businesses in this area would potentially benefit greatly from inclusion within the CLA/WECLA area – as BT and/or Openreach would be in a much better position to deliver tailored solutions, and may even be able to provide a compelling competitive choice for such end users. Inclusion in CLA/WECLA, under the current Ofcom proposals, would mean any bespoke solutions would not need to be notified in advance, or formally published Ofcom should consider adding postal sector area "N1C 4" to the CLA area. We do not support a limited deregulation just of CLA for clarification but should be extended much further.

Figure 10

Postal Sector W14 0



Note: Blue dots are residential dwellings, purple dots are non-residential – these are actual building locations not the postcode locations that Ofcom uses.

11.50 In this postal sector there are a number of schools, a couple of rows of local shops (shown by the lines of purple dots), a main post office site in the south and a small business area in the centre behind the Mews streets. This sector is in WECLA but not in in CLA but both adjacent sectors are in CLA (although W6 7 to the west is not shown on Ofcom maps)

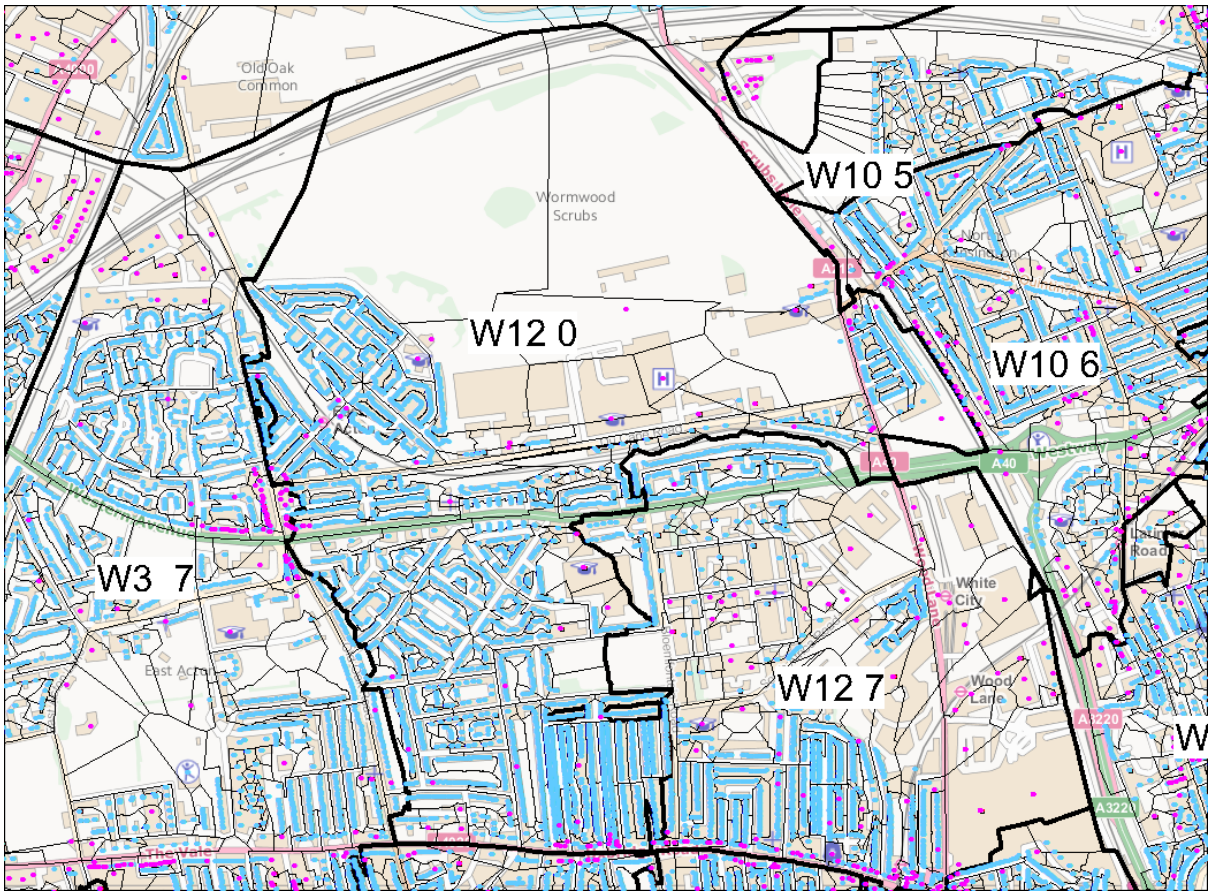
11.51 Using a 200m dig distance, this postcode has a Network Reach of "5 to 8" CPs Ofcom (Figure A15.8). Dropping the distance limit to 100m results in this postal sector no longer being classed as "competitive".

11.52 The same positional issues detailed above will be manifested in the analysis of this area, but given the relatively low business density, the analysis here will be very dependent upon which business locations Ofcom has chosen to use, and whether these are the ones where CPs have chosen to build networks. It is possible that this area is not classified as qualifying for inclusion in CLA is due to the inclusion of "low value" retail sites which are not within 100m of OCP fibre flexibility points and CPs have chosen to build to other sites such as the business cluster in the centre of the sector.

11.53 Another example of a predominately residential area is W12 0 – Wormwood Scrubs shown in Figure 11. This is mainly a residential area (blue dots) with a few business sites scattered around (purple dots). Using 200m, this postcode has a Network Reach of "5 to 8" CPs (Figure A15.8) but moving to 100m reduces this classification. Again, the exact choice of which businesses are chosen must have a material impact on the Network Reach calculation.

Figure 11

Postal Sector W12 0



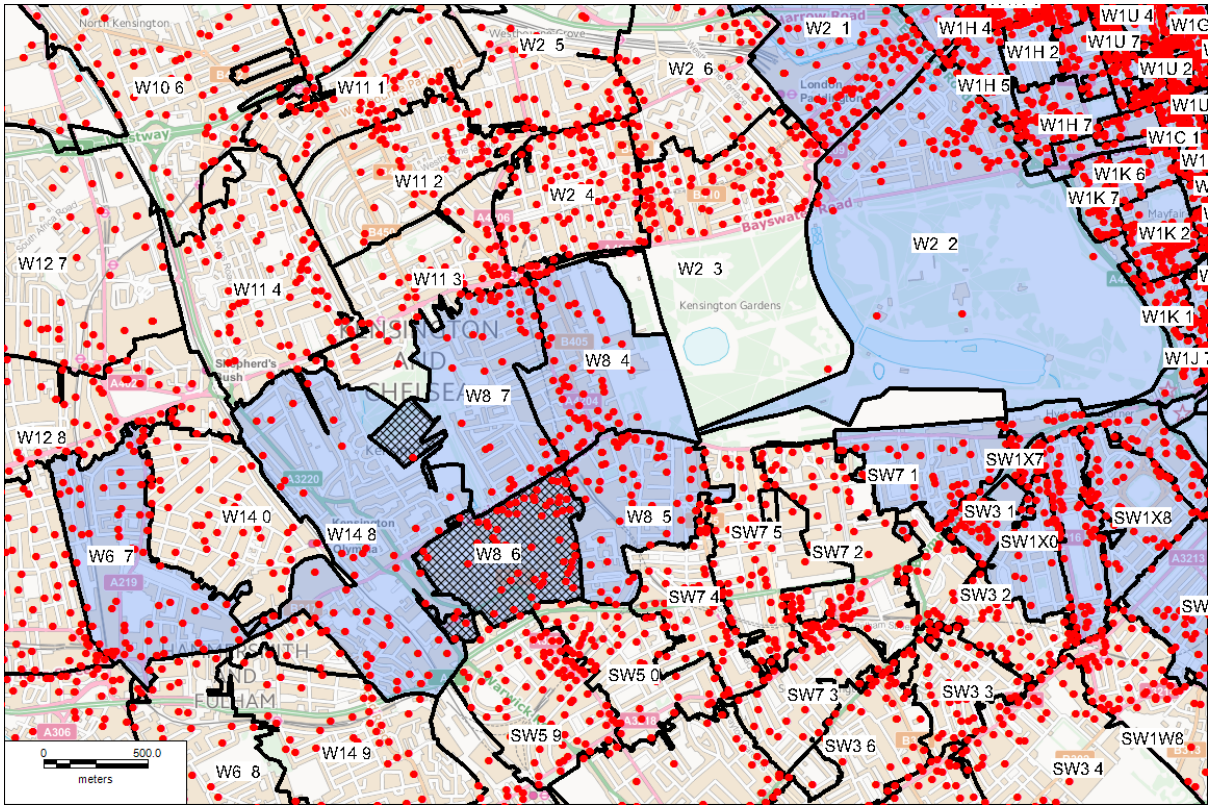
11.54 The above examples look at the detail within specific postcode sectors that were part of WECLA but fall outside the proposed CLA.

11.55 It is also informative to talk a step back and look at a wider area to help the understanding of the implications of using Postcode Sectors as the building blocks for defining geographic areas with homogeneous conditions of competitive supply based on onerous network reach thresholds.

11.56 Figure 12 shows western edge of the proposed CLA, and includes W14 0 shown in detail above.

Figure 12

Detail of W14 0



Note: proposed CLA shaded Blue; business postcodes red dots; black boundaries represent postcode sectors

11.57 As noted above, W6 7 appears to have been omitted from the "final" map (included as Ofcom [Figure 4.4 and Figure A15.19]) but has been included in Schedule 1 of the Legal Instruments and meets both of the CLA conditions Ofcom [Figure A15.17]. Thus W14 0 is according to Ofcom [A15.168] - "almost entirely surrounded by sectors passing the boundary test". We believe therefore its exclusion is arbitrary.

11.58 Ofcom's results show that W2 3, which does not meet the CLA conditions breaks the contiguity between the main area and the western block of CLA[22]. This highlights the arbitrary nature of postcode boundaries which are drawn in areas where there are no premises – in this case it is Kensington Gardens. The "network reach" of this area will be totally dominated by the business locations north of Bayswater Road and not Kensington Gardens itself. That an area like this could ever be regarded as even capable of breaking any economic links between the sectors on either side of the CLA is very hard to fathom[23].

[22] This area also includes a postcode sector that comprises non-contiguous areas which is W8 6 shown as the cross-hatching. In our data set this is not quite the case as W2 2 extends across to W8 4.

[23] We imagine that the residents and businesses in Kensington postal sector might be rather surprised to discover they no longer live or work in central London but are in fact part of the London periphery.

11.59 Ofcom [A15.175] suggests that that the three CLA blocks are likely to be strong but by the same token so will be the linkages with blocks which are excluded from CLA and which fully meet SMP thresholds for deregulation at most if not all bandwidths.

11.60 In summary, the breakdown of WECLA postal sectors on the basis of criteria which are outside an SMP threshold and on assertions about strength of economic linkages does not form the basis of robust geographic markets.

12. Assessment for CISBO Services

SUMMARY

12.1 The primary focus of this economic analysis concerns Ofcom's arguments for a chain of substitution of the entire bandwidth from EFM up to optical services along with the assessment that BT has market power in all bandwidths outside a new CLA geographic market.

12.2 We fundamentally disagree with the economic and technical arguments put forward by Ofcom as to why there is an unbroken chain and maintain that very high CISBO is in a separately market and one which is fully competitive nationally. In our view this position is augmented when consideration is given to third party dark fibre sales.

12.3 We have concerns over the presentation of service shares for very high CISBO where according to Ofcom's market definitions, BT only has a share of 24% well outside the range of 30-32% shown in this consultation. It also seems very likely that third party fibre is not fully taken into account here and which would also lower our share significantly in very high CISBO.

12.4 We also disagree with Ofcom's new assessment of splitting WECLA into two parts and believe that the criteria proposed to distinguish CLA are not in keeping with Commission Guidance and the obligations of alignment with an SMP threshold. Ofcom requires a level of competition which is considerably in excess of effective competition.

12.5 We respond in detail below to the specific relevant parts of Ofcom's consultation.

OFCOM SECTION 4.1: INFRASTRUCTURE AND THE APPROACH TO ASSESSING COMPETITION

12.6 Ofcom presents a unified assessment of product and geographic boundaries alongside an associated SMP assessment. In doing this, OF deals with these jointly and not sequentially. Whilst we support this approach in general, we do not agree with a number of key conclusions drawn by Ofcom. This is in spite of the fact that we can support a number of the points made in Section 4.1 (Infrastructure and general approach). Specifically we agree that the two primary factors affecting intensity of competition are:

- The number of competing networks [4.7].
- Geographic features [4.9].

12.7 Our position is that these interact and we set out in Section 11 our critique on Ofcom's [4.8] assessment of competition as being likely uniform for a given geographic area. Our view is that this is an incorrect characterisation of likely competitive conditions. In particular, given the specific way in which Ofcom has assessed network presence, it is clear that the extent of competition is systematically understated. We explain this in more detail below, where we set out our own provisional views on market boundaries.

OFCOM SECTION 4.2: THE PRODUCT MARKET DEFINITION

4.2.2 Asymmetric broadband and EFM

12.8 We provide detailed comments on the issues of broadband services and EFM in Section 10 of our response. We maintain that broadband services including NGA apply a relevant direct substitute in some circumstances for sites of comparatively low bandwidth requirements for the provision of VPN services which is the primary relevant downstream market. We agree that EFM should be included in the relevant product market and that presence of CPs in BT exchanges is an important competitive constraint but which has been disregarded by Ofcom in the calculation of HNR.

4.2.3 Product market for CISBO – preliminary considerations

12.9 We disagree with Ofcom in the matter of a single chain of substitution across all bandwidths and we have also commissioned external consultants to consider this matter and related market definition issues[24].

12.10 Our position on this matter is as follows. The relevant test for a chain of substitution remains the hypothetical monopolist test; the single chain is but a special case of the general proposition of a single supplier making a monopoly profit from a 5-10% price increase over and above the competitive level. In our view, both the Commission and the OFT have set out much more stringent conditions for a single chain of substitution which have not been met by Ofcom[25]. Essentially, Ofcom has looked at a series of notional price points and made assumptions about a certain level of implied demand side switching between adjacent products augmented by a view that competitive price levels have narrowed somewhat since the previous market review.

12.11 However finding there is a sequential series of potential substitute services is not a sufficient condition to justify a single product market[26]. The OFT (2004) states[27]:

> **3.11** Sometimes a focal product will be part of a long and unbroken chain of substitutes. For example, consider five products labelled A to E, which are differentiated by their perceived quality[21]. The closer two products are in the alphabet, the more substitutable they are from the point of view of customers. Thus consumers whose favourite product is C consider B and D to be very good substitutes for C but consider A and E to be poorer substitutes for C. Even though all products in the chain are substitutes, this does not mean that the whole chain is the relevant market. For example, it may be that a hypothetical monopolist of three products next to each other in the chain could profitably sustain prices 5 to 10 per cent above competitive levels[22]. In short, the hypothetical monopolist test is a way of determining what range of products in the chain constitutes the relevant product market.

12.12 The previous 1999 OFT 403 Report quoted a specific example which has a certain resonance here:

> *3.11 'The Director General will sometimes look at chains of substitution when defining markets. However, he will look carefully to ensure that there are no breaks in the chain which could suggest that separate markets exist. In the hypothetical example above, the Director General might find that a monopolist in large luxury cars would not be constrained by substitution to smaller models, because there is gap in the chain of substitution. It might then hypothetically decide that a chain of substitution existed between small and medium-sized cars, but that large cars formed a separate market.*
> *3.12 A chain of substitution is a useful concept, but it does not necessarily define the boundaries of a market. The Director General often needs to identify the narrowest potential market so part of the chain might still be treated as a separate market.'*

[24] These will be provided to Ofcom shortly.

[25] Commission Notice on the definition of relevant market (97/C 372/03) and OFT 403 of 1999 and 2004.

[26] This requires that the HMT is failed for every individual service and every sub-combination of services such that only the entirety of all services is necessary to make a monopoly profit. The overlay of non-overlapping geographies of networks serving different customers at different bandwidth will also weaken any presumption of a single chain.

[27] Available now on the CMA website.

12.13 Even if it was the case that we could observe a line of prices rising continuously and smoothly from EFM up to optical services, this does not imply that there is a continuous chain of substitution that implies all products are in the same market. It is necessary to test each service individually within the chain and of course one should consider all possible combinations.

12.14 The substitutes which Ofcom identifies of increasing bandwidth are in any case not based on observable competitive prices but as Ofcom [4.40] acknowledges, on notional prices based – as far as we can tell - primarily on marginal equipment cost differences[28]. However by removing any notion of a competitively determined bandwidth gradient in this fashion, both between bandwidths and not adjusting for differential cost recovery over time associated with different services, Ofcom is biasing the SSNIP test experiment. The conclusions derived are solely a function of the very specific prior assumptions being made and not robust to alternatives.

12.15 Ofcom [A8.20] argues that prices in a competitive market reflect incremental cost differences and by looking at prices in this way - 'it allows us to understand the extent to which incremental costs drive observable differences in the relative prices of services, and how far price differences in incremental costs reflect differences in the extent of common cost recovery and also possibly exploitation of market power'.

12.16 With regard to cost recovery, we would agree that this is certainly a possible issue for Ofcom to address, but the HMT presumes an equilibrium in prices and some market driven solution to the recovery of common costs. The competitive equilibrium does not presuppose that prices are set at long run marginal costs nor that the differential in prices across the bandwidth gradient will be equal to marginal cost differences[29].

12.17 Regarding the interpretation of indicating possible market power, Bishop and Walker[30] state the following:

'There is a tendency in the academic economic literature to define 'market power' as the ability to price above short-run marginal cost … Further we noted that the focus on marginal cost pricing arises from the inappropriate application of the idealised economic model of perfect competition. If "market power" is defined as the ability to price above short-run marginal cost then virtually all firms have at least a degree of market power. But if virtually all firms have market power, then the existence of market power is not a useful guide to whether or not there is effective competition and whether or not intervention is required.'

12.18 The role of price-cost margins normally features in an assessment of geographic markets or SMP rather than a product analysis as undertaken by Ofcom at this stage. We believe that any investigation of price-cost margins should be undertaken for all operators particularly for very high bandwidth services as it would be wrong just to focus on one supplier and where we believe we do not have dominance in any case.

[28] Ofcom [4.59] correctly notes that there is a large element of common costs of duct but the discussion at Ofcom [4.62-4.65] is essentially around costs of equipment. We would point out with regard to Ofcom's [Footnote 93] observation with regard to WES and BES charges that these are obsolete services and BT wants customers to migrate off to modern replacements.

[29] This is straightforward economic analysis. Consider a monopolistic competition market where there are many firms and each one offers a range of differentiated product. Each firm will offer a menu of products and will set different mark-ups (based loosely on what are called super-elasticities as per Ramsey pricing). The market is competitive, but the price cost margins will vary from product to product.

[30] Bishop and Walker The Economics of EC Competition Law 2010.

12.19 We believe that Ofcom's approach basing the HMT analysis on equilibrium prices focussing on equipment cost differences is unjustified for the following reasons[31]:

(i) It is not compatible with Commission Guidance[32]

12.20 The Commission states that actual observed prices should be the starting point of the analysis unless there are good reasons to the contrary:

'In principle, the "hypothetical monopolist test" is relevant only with regard to products or services, the price of which is freely determined and not subject to regulation. Thus, the working assumption will be that current prevailing prices are set at competitive levels. If, however, a service or product is offered at a regulated, cost-based price, then such price is presumed, in the absence of indications to the contrary, to be set at what would otherwise be a competitive level and should therefore be taken as the starting point for applying the "hypothetical monopolist test". '

(ii) Prices have been set under regulation to emulate the features of a competitive market

12.21 Ofcom itself has mandated BT to set prices (up to and including 1G services) under a basket and which has the inherent flexibility of a price gradient. To our mind it is contradictory to then assume that this should not form the benchmark for price assessments as the whole point of this framework is to provide incentives to BT to emulate the properties of a competitive market.

12.22 BT has supplied Ofcom with detailed comments and observations on how Openreach has met the basket requirements in practice including canvassing the opinions of CPs themselves on the optimal way to meet their requirements in the marketplace. We have seen no evidence from any CP in any submission which indicates that this has failed the marketplace in any way.

(iii) It is contrary to previous Ofcom practice when investigating bandwidth breaks for Ethernet

12.23 In the June 2012 BCMR consultation Ofcom stated the following when investigating the bandwidth gradient –

'3.234 However, an issue to note is that we do not know what prices would look like in a competitive market. It may be that even though prices have been regulated, there is still some supernormal profit and that the pricing structure is distorted by market power. In a competitive market, the increases in price with bandwidth could be smaller than the ones we currently observe. Hence, as in the 2007/8 Review we have investigated the underlying costs of provision. This may provide some additional insight into the likely competitive level of prices although we also note that, whilst competitive markets would bring prices into line with costs on average, some prices could be lower than BT's FAC whilst others could be above FAC. The structure of prices in a competitive market could still feature prices which increase with bandwidth more steeply than BT's fully allocated cost. ' (underlining added)

12.24 Here Ofcom accepts that it is judgemental in constructing a benchmark of the competitive price how to treat common costs and a marginal cost difference is not a definitive indicator of

[31] We later examine the other factors that Ofcom considers in particular with respect to very high bandwidth services including technology aspects.

[32] Commission Guidelines on Market Analysis 2002.

a competitive outcome[33]. Indeed Ofcom argues that there could well be a gradient in excess of FAC which is compatible with what we observe here. (This is especially relevant for very high bandwidth services which are a minority volume in the Openreach portfolio.)

12.25 Margins above FAC cannot be used to infer anything as discussed above and particularly absent information on price elasticities.

(iv) It is contrary to how Ofcom is currently looking at TI services

12.26 Ofcom states the following[34]:

A10.28 In the absence of retail price data we have used BT's wholesale input prices as a proxy for the competitive retail price benchmark. We do so because the competitive level of retail prices will be approximately equal to costs, and we then use BT's wholesale charges as a proxy for costs since they are subject to an RPI-X charge control which is intended to bring wholesale prices and (expected) costs into line over the charge control period. However, some care is needed in the use of BT wholesale prices since (as discussed previously in Annex 8), even charges which are subject to an RPI-X charge control may sometimes differ significantly from underlying costs and competitive market prices.[98]

12.27 Ofcom here sets out the basis of using observed prices as the benchmark but noting that some caution is needed in practice (final sentence)[35].

(v) Industry practice of a bandwidth gradient has been long standing

12.28 It is our experience that a bandwidth gradient has been inherent in this marketplace across all technologies and Ofcom appears to be taking a position which is not evidenced from the views of customers and competitors. Indeed Ofcom [A26.98] explicitly acknowledges that BT and CPs take willingness to pay into account in setting active service prices. CityFibre [A26.86] also pointed out that they use value-based pricing by which we understand that they take willingness to pay into account and will be reflected in bespoke pricing.

(vi) Ofcom's remedy proposals do not reflect marginal cost differences

12.29 There is an inherent inconsistency in that Ofcom is proposing a remedy of dark fibre which in conjunction with a charge control will mean that regulated prices themselves will not equal the incremental cost differences of the equipment.

12.30 There are other criticisms of Ofcom's approach beyond those related to what presumptions are made about competitive price levels in the SSNIP test and we set these out below.

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[33] Ofcom [A8.19] makes the same point.

[34] Ofcom does in fact caveat reliance on prices set by charge controls in Footnote 98. However as we have pointed out, Ofcom does not find any evidence or cite any concerns that BT has set relative prices for strategic considerations or exploitation of market power. If any CP had such concerns they could have raised a dispute with Ofcom or requested that Ofcom intervenes.

[35] Ofcom [Annex 11 Footnote 125] also takes as its comparison for Ethernet backhaul the actual current 1G price of around £9000 indicating that in this example it was a competitive standard – 'We would anticipate that, in a competitive market, an Ethernet mobile backhaul service (that uses the same underlying inputs) should be priced in a similar manner.' If an alternative benchmark was envisaged for the hypothetical comparison we would assume that Ofcom would have caveated its statement accordingly.

(vii) Supply-side switching by CPs

12.31 Ofcom [4.31, 4.41] argues that suppliers may be prepared to switch to supply using different inputs making the chain of substitution more likely. However, this argument is in complete contrast to every other market review where Ofcom has discounted supply-side switching of this type on the grounds that such suppliers would likely be present in the relevant market in any case[36].

12.32 For example, in the June 2012 BCMR consultation, Ofcom stated the following:

> 4.87 In those geographic locations where such CPs have network presence but are not currently active in the provision of high speed Ethernet, we consider that they could offer a competitive constraint on a hypothetical monopolist of wholesale Ethernet services. Where CPs have sufficient network presence, the value of the customers at very high bandwidths makes provision commercially attractive. We also observe that it is technically feasible to enter the market for the provision of Ethernet services using WDM presented with Ethernet interfaces.
>
> 4.88 However, if an operator does not have significant network presence, then the high sunk cost associated with digging and ducting is likely to create a barrier to supply-side substitution. On this basis, we consider that supply-side substitution may only offer a relevant further constraint in limited geographic locations.

12.33 In essence, in 2012 Ofcom argued that either: (a) the CPs were already present in the market and serving customers across all likely substitute products in which case supply-side substitution was not really relevant; or alternatively, (b the costs of entry would be too high[37]. In this consultation however, Ofcom appears to allow for both possibilities and abstracts from any limitations of CPs' geographic presence so the costs of entry are ignored. We have broadly supported Ofcom's previous position and consider there is now inconsistency in approach.

(viii) Customer switching costs

12.34 When considering very high bandwidth services, Ofcom disregards economic switching costs for customers moving from >1G services to multiple 1G services or multiple 10G Ethernet services. (To establish there is a chain of substitution would require an assessment of the proportion of existing customer base likely to take these services over some specified time frame.) This is in complete contrast to the comparable arguments and analysis in Annex 10 which puts forward the proposition that the high costs of switchover would imply there are captive customers who cannot economically switch between TI and AI. Ofcom always lays great stress on the issue of economic switching costs but not in this instance and gives no explanation for not considering the issue.

12.35 In fact, we believe that there are likely to be higher costs of moving from Ethernet point-to-point service up to optical services compared with changing protocol from TI to AI.

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[36] See Footnote 117 of Annex 11 which states that – 'However, we would normally only broaden a market on the basis of supply-side substitution if there were additional suppliers that would enter the market rapidly and at low cost in response to a small price change, and which were not already operating in the (narrowly-defined) market.'

[37] This is a common argument that Ofcom has made in other market reviews. In the 2013 Statement, Ofcom stated [3.301] that - "supply-side substitution between circuits of all bandwidths in the market is clearly technically feasible, although we did not put weight on it as a source of constraints on prices for market definition purposes".

(ix) Exclusion of customers who would have migrated anyway

12.36 In the parallel examination of TI services, Ofcom [10.24] explicitly excludes all switching across services which would have happened anyway absent a 5-10% price increase in the SSNIP[38]. For this assessment it must also be true that Ofcom would have to discount a significant cohort of customers who would have migrated up to higher bandwidths for Ethernet and optical services in the 1-2 years of the SSNIP test.

12.37 We are then left with the cohort who were not planning to increase bandwidth over the forthcoming few years but are then incentivised to do so following the SSNIP. Ofcom does not present any quantification of the impact of the SSNIP on this cohort yet this is a critical factor. We cannot find any coherent exposition of transparency concerning this in the consultation.

12.38 Additionally, there might be some customers who would plan to switch down to a combination of lower bandwidth circuits following a SSNIP although it seems implausible that this will in general happen although it is theoretically possible.

(x) Likelihood of low price elasticities

12.39 In general we believe that industry price elasticities for customer site access are likely to be comparatively low and will not strongly influence the relevant cohort to migrate upward or downward in bandwidth demand, the latter being even less likely[39]. Ofcom [A10.33] suggests that migration between protocols from TI to Ethernet is not price sensitive. The price elasticity will in any case not be that of the upstream input alone but of the entire incremental costs associated with higher bandwidth in the network as a whole and we discuss this below.

12.40 However there is no reason to imagine that market elasticity would be high for bandwidth demand as businesses generally will not face high derived demand in final downstream markets. Generally businesses will need to plan their networks on a complete end-to-end basis including access links and will not likely change these significantly in response to price changes in just one component alone.

4.2.4 Chain of substitution for lower bandwidth CISBO services

12.41 Our comments here relate to customer site access. We set out our general position on economic markets in Section 10 and our summary position is as follows. The 10Mb service has in effect been overtaken by a superior substitute at a similar or even lower price and hence it is a product largely in one-way substitution. EFM is something of a middle product here but the critical point is that any assessment of competitive conditions would almost certainly place it in the same geographic market as the 100Mb service as the overlap of supply with competitors to BT and especially that of Virgin Media would be very close indeed. Given the generally accepted views of customers and suppliers that EFM is a real substitute for Ethernet direct links, it makes total sense to combine these services.

12.42 Ofcom links 1G service into lower bandwidth services and this appears to be carrying forward of its position in the previous market review. In our view it seems highly implausible that a hypothetical monopolist of services up to and including 100Mb could not make a monopoly

[38] Ofcom here sets out the exclusion on the basis of 'no immediate plans to move to alternative technologies'. There is also a suggestion of tie-in related to contractual terms. As such it is not evident quite how Ofcom is treating migration in SSNIP terms. Ofcom [A10.32] argues that migration is insensitive to price trends. In our view this is far from proven as there will likely be lags in response.

[39] We include here the possibility of purchasing multiple lower bandwidth circuits for a single higher bandwidth circuit.

profit as these constitute the vast bulk of circuits in volume terms. A large number of customers would then have to migrate up to 1G to make a modest price increase of 5-10% unprofitable. By the same token, it is equally implausible that users of very high bandwidth services would migrate down to taking multiple circuits of 1G or less.

12.43 However, the position when looked at from a geographic perspective ('homogeneity of competitive conditions') - is not clear cut and we do not have access to relevant HNR statistics which take clustering into account which use true economic dig distances. Taken from the perspective of conditions of competition the position for 1G service is less obvious in comparison with lower bandwidths but we believe that BT's service shares are broadly comparable which we discuss below. We are therefore comfortable with including 1G with lower bandwidth Ethernet services.

4.2.5 No separate market for very high CISBO

12.44 As discussed above, we disagree with Ofcom's analysis and conclusions regarding very high bandwidth services. Our objections on principle are augmented by our belief that the service shares for both BT and Virgin Media are calibrated wrongly and do not take into account third party dark fibre.

12.45 We suggest that an alternative perspective would have been taken if Ofcom had applied the Three Criteria Test (TCT) to very high bandwidth services directly to the current position of the marketplace. Ofcom's own market research finds no evidence of concern for these customers given the regulation that is in place at the moment. We disagree with Ofcom's assertion that BT will 're-assert' its dominant position as it is clear we never had one to start with. These services are fully competitively supplied now and would continue to be so absent any regulation at all. .

12.46 We provide comments below on the various other arguments made by Ofcom in this Section.

Technical assessment [4.2.5.1]

12.47 We find it difficult to appreciate the relevance of the discussion here which compares the capabilities of single service Ethernet above 1G with WDM based services. Given that in the 2013 BCMR Ofcom included single services greater above 1G in the same MISBO market as WDM services (a position that all parties appears to broadly agree with), we do not see how this discussion has any bearing on whether or not now there is a market break between 1G and above 1G.

12.48 In our view, what the discussion does highlight is the need to consider the total aggregate bandwidth and not the bandwidth of individual tributaries as we set out in Section 10. In particular, it is not correct to characterise the bandwidth of WDM by the bandwidth of each wavelength. The equivalent service being offered is a very high bandwidth pipe which can be used to carry different tributaries at the customer's discretion. The same is true of single service Ethernet; however, the customer normally would provide the multiplexer rather than being integrated into the NTE as it is with WDM. The significant point is that the like-for-like comparison is the WDM multiplex with the single service Ethernet and not a WDM tributary with single service Ethernet.

12.49 Ofcom [4.63] suggests that 1G WDM tributaries somehow create a bridge between 1G and above 1G. This is emphatically not the case; the WDM multiplex will normally be above 1G (otherwise WDM would not be cost effective, a point Ofcom noted in 2013) and therefore the service is above 1G.

12.50 As a further clear illustration of this point, BT as part of our 10G EAD product is actively considering an option which would include a multiplexer giving 8x1G tributaries in a very

similar way to WDM services. The distinction between aggregate and tributary is a critical technical point which Ofcom does not discuss despite this being raised by BT in our response to the 2012 consultation as well as in the October 2014 consultation on data analysis.

Price and cost evidence [4.2.5.2]

12.51 We understand that this discussion forms Ofcom's primary analysis of demand side substitution although unlike the 2012 consultation which was explicit on this, it is not clear to us here.

12.52 We are of the view that the analysis and associated discussion are inadequate as it is being presumed that the only barrier to switching is the price of the specific upstream service. In practice there are other and considerable switching costs incurred by the customer from changing the bandwidth of a service Normally the customer needs additionally to upgrade the bandwidth of all of the equipment at each end of the access and in all likelihood at locations well beyond the ends of the access service in order for the increased access bandwidth to have any meaningful use[40]. These implied complementary bandwidth dependent costs are very likely to significantly exceed any price differential in the bandwidth of the access service.

12.53 We set out our perspective of demand side switching costs in our alternative framework set out in Section 10 of our response; switching of upstream services must be considered in the context of downstream multi-site interconnectivity. In this context, the consequential complementary costs of upgrading bandwidth across the network is clear. There is no point in upgrading an access link from 1G to 10G if the rest of the network can still only support 1G. Moreover, the costs in the rest of the network are normally much more sensitive to bandwidth[41].

12.54 This creates a very significant barrier to demand side switching between 1G and above 1G which is completely absent from Ofcom's discussion[42]. We are of the view that this by itself likely implies a break in the market in the context of a SSNIP test of a small increase in price of the upstream component.

12.55 We also consider that Ofcom has been inconsistent in its treatment of consequential complementary costs. In the analysis of TI services, Ofcom [A10.40] takes these very costs to be a primary source of a barrier to switching from TI to AI despite overwhelming empirical evidence that customers are doing just this. In fact, the consequential complementary costs of switching from TI to AI are considerably lower than network capacity upgrades For protocol switching, it is possible to restrict the consequential costs to the two end of the new AI access service using circuit emulation - as is the case on BT's MEAS service. While the consequential costs are generally lower in the case of TI to AI, Ofcom finds that they are still sufficient to create a barrier to a single market. However, when the consequential costs are generally higher in this case of 1G to above 1G, Ofcom finds that they are insufficient to create a break in the market.

[40] Indeed Ofcom [Footnote 92] agrees that the substitution analysis should be done 'from an end-user perspective'.

[41] If the customer is to upgrade bandwidth, some of the consequential costs are wholly unavoidable even if the customer makes no use of the bandwidth. As soon as the customer wants to make use of the upgraded bandwidth, all the wider network costs also become unavoidable.

[42] The barriers to switching back down in bandwidth are different but equally real. The price of multiple 1G services of equivalent capacity would never be attractive under a SSNIP to a 10G or WDM service.

Price differentials

12.56 Whilst we agree that price differentials between different bandwidths do give the appearance of narrowing, we believe it is not correct to conclude as Ofcom does - that this supports a chain of substitution. What Ofcom is observing is simply the long term trend of falling prices for rising bandwidth as technology advances along with second degree pricing discrimination. As we noted in Section 10, the benchmark between high bandwidth and very high bandwidth has been moving upwards consistently over the years. The boundary today is between 1G and 10G; however, this will change in time and it is likely to move to between 10G and 100G in several years' time but definitely outside the relevant timeframe of this review. In the meantime, there will be some narrowing of prices for services at specific bandwidths and price narrowing by itself does not show that the break has disappeared as it says nothing about whether there is a break in the chain of substitution or not.

12.57 It is also important to remember more generally that bandwidth is only a proxy for the value of a site to a supplier. The identity of these sites is not changing as a consequence of rising bandwidth demand and the competitive supply to the sites is not intrinsically changing as a consequence of some narrowing of prices at different bandwidths. It is simply that over time, the bandwidth to these sites is increasing and therefore the bandwidth which delineates 'honeypot' sites from other sites is also increasing.

12.58 Finally, on price differentials, the general analysis shown by Ofcom [Figure 4.1] is not particularly meaningful or relevant as distance plays such a critical role in pricing of these services and Ofcom has simply assumed a reference distance of 10km. There is no analysis of how distance might affect market boundaries. In addition, Ofcom is using BT's prices and BT is a minority player in the supply of these services so they cannot be taken as a definitive basis for the competitive price of these services for the purposes of an HMT.

Cost differentials

12.59 The analysis of cost differentials only considers the costs of end boxes and some operational costs which are largely common across services but does not consider properly the costs of the physical infrastructure. These costs are either customer specific and so may be subject to customer specific charges, e.g. excess construction charges or are common costs.

12.60 We provide in Section 5 above some specific data with respect to cost and price differentials which suggest that although costs and prices may have narrowed there remain significant gaps and which would not be affected by an additional 5-10% cost or price change.

12.61 It is not at all clear precisely what Ofcom assumes as to how common costs are apportioned with respect to the number of fibres. BT has always had a policy of differential cost recovery of common costs into different services and as we understand is also the case for other infrastructure owning CPs which Ofcom [A26.98] acknowledges and has endorsed as being economically efficient. (This reflects the point made above about competitive but profit maximising prices and margins reflecting super-elasticities.)

Product positioning

12.62 That Ofcom [4.65] identifies there may be some overlap in the market position of shared and dedicated WDM services does not show there is a chain of substitution.

12.63 A key consideration absent from this discussion is demand side switching costs which we discussed above. The fact that two products may co-exist at a given price is insufficient to conclude there is a chain of substitution as the consequential complementary costs of changing bandwidth for a customer are considerable and are most unlikely to be overcome by a SSNIP.

12.64 We would also note again that any price comparisons which are based on a 10km main link are also likely to be highly misleading as this will not generalise to other distances[43].

Competitive conditions [4.2.5.3]

12.65 We disagree with Ofcom's analyses and conclusions as discussed below. In particular with reference to rising demand for bandwidth, we consider that Ofcom [4.46 and Footnote 83] is wrong to attribute this as a potential source of market power. As we explain in Section 10, this view is based around a misunderstanding of the incentives to serve high value sites.

12.66 We do not agree with Ofcom's [4.35-4.36] assertion that the primary reason for OCPs to win business is from BT choosing to set high margins. The reason that there is higher competition at higher bandwidths is because OCPs can spread the high fixed costs of customer marketing and sales across a high value of the site itself which is set at the downstream level of a multi-site contract and de-risk the sunk investments.

12.67 Ofcom [4.36] presupposes that BT is the primary provider in the very high bandwidth market in a 'leader follower' position when there is no basis in fact for assuming this. Indeed Ofcom does not present any evidence to show that this is how the market is operating.

12.68 It should be stressed that BT is in a completely different position to OCPs competing in this marketplace as it is subject to constraints from EOI and other regulation. As a consequence we are not in a position to offer bespoke pricing and which would be the natural market outcome in an unregulated market.

12.69 In this context we wish to respond to some of the related commentary that Ofcom made in the 2013 Statement. Ofcom [7.55] argued that there were three additional considerations to the general premise that pricing above competitive levels would not be profitable for a firm in a competitive market:

- Captive sales. Ofcom suggests that it is 'conceivable' that a firm with SMP will choose to price to a captive group. This however is essentially a tautological argument that in effect there are two separate economic markets and would have to be substantiated. Ofcom has not shown that there are any captive customers for very high bandwidth and it seems exceedingly implausible that there are any anywhere at all; these are highly experienced customers including large finance firms who work with integrators and CPs who have full network knowledge to rival that of BT.

- Uniform pricing absent regulation. Ofcom presents a double hypothetical thought experiment here postulating that absent regulation, BT might choose to uniform price essentially for internal reasons (unexplained). Ofcom then discounts the implications of SMP regulation on Greenfield site arguments. In the context of very high bandwidth services, we are very clear that it is the SMP regulation which is the binding constraint and we have made clear in papers submitted to Ofcom in the context of passive remedies that we feel more broadly we are constrained by regulation from offering cheaper more commercial deals to customers.

- Ceding the market. This is in effect just a version of the first argument of captive sales. It is particularly irrelevant in the case of high bandwidth services where it is readily apparent that BT never ever had a position of dominance to cede in the first place.

[43] As some key information is redacted from this Section it is not possible for us to respond in the detail which we would have wanted to do.

The treatment of MNO backhaul circuits

12.70 At this stage we wish to raise a matter of some concern which is the representation in the consultation of the service share statistics and associated SMP indicators (including HHI) for very high bandwidth services.

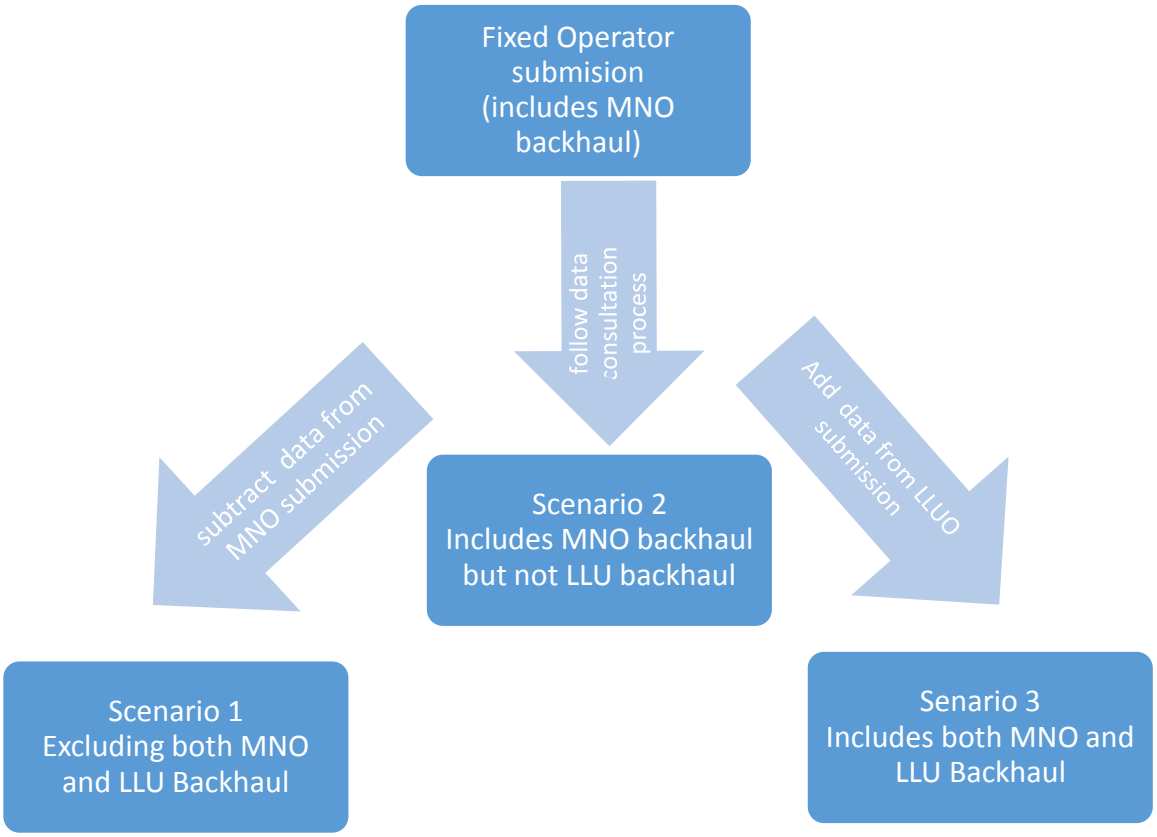
12.71 For the most part, the shares and volumes Ofcom has presented refer to the associated analysis which is detailed in the October 2014 Data Analysis consultation. This is based on the submissions by the 18 fixed-line operators, but with circuit ends at network nodes removed, it essentially includes MNO backhaul services at mobile base stations but excludes LLU backhaul as these are between two network nodes (provided the LLUOs e such as TTG and Sky nodes are included in the list of network nodes).

12.72 For this consultation, Ofcom has additionally gathered information on LLU backhaul and MNO backhaul, and has chosen, solely for the very high CISBO market, to present the shares on a different basis such as in Table 4.4 (see the final Footnote of this Table) where the ranges for BT shares respectively include or exclude both MNO and LLU backhaul but the central estimates and circuit volumes include MNO backhaul. On the other hand, Table 4.5 excludes both MNO and LLU backhaul for the circuit volumes but the share ranges are as in Table 4.4.

12.73 It is now our understanding that Ofcom has taken the central data set and then either added the circuit volumes reported by the LLUOs, or removed the volumes reported by the MNOs. This has created two scenarios of either including or excluding both LLU and MNO backhaul as shown in Figure 1 below.

Figure 1

Estimation of service shares and treatment of backhaul



12.74 Ofcom has then chosen to present results from a mixture of these three Scenarios so the very high CISBO results in Table 4.4 are the BT and Virgin Media shares for Scenarios 1 and 3 but

the volume data for Scenario 2. For all other bandwidths, Ofcom has quoted the market shares for Scenario 2, including the MNO backhaul circuits.

12.75 [redacted]

Table 1

Service volume and share estimates for the "Rest of UK" (excluding CLA, LP and Hull)
Very high bandwidth services

[redacted]

12.76 [redacted]

12.77 [redacted]

12.78 [redacted]

12.79 [redacted]

[44] [redacted].

[45] [redacted]

[46] [redacted]

[47] [redacted]

[redacted]

Overall assessment of the chain of substitution and very high bandwidth services

12.81 As far as we can tell, Ofcom's arguments are essentially more akin to a 'double thought experiment', not only of the impact of a hypothetical price increase but more critically from postulating a different set of equilibrium prices from what is observed and based on some narrowing of equipment cost differences. As we discussed above, the latter is however merely a reflection of technical progress and does not demonstrate that, at the moment, the bandwidth break has moved upwards. There are other material bandwidth dependent costs in the production chain which will dominate the true costs from an end-user perspective; there is no gain to a firm from increasing its bandwidth at the upstream input layer and not being able to acquire the benefits on an end-to-end basis.

12.82 We can see no reason for Ofcom to depart from Commission Guidance here and fundamentally Ofcom has produced no evidence as to why it should do so. For there to be no bandwidth break now, we believe that most of the following factors would need to be satisfied:

- Low or zero switching costs for both CPs and customers.
- Seamless supply-side switching by bandwidth for a large number of CPs.
- The current bandwidth gradient in the marketplace is an aberration.
- Reasonably high cross-price elasticities by bandwidth even though there is likely a low market bandwidth elasticity and where Ofcom presents no evidence for either.
- The service shares showing that BT is in a dominant position in very high bandwidth service.
- BT but not CPs will re-assert its position in the marketplace across some or all of the AI/MI product range.

12.83 The counter-factual case that there continues to be a bandwidth break is overwhelmingly more likely. Even if Ofcom were not so convinced, it would be essential for a market failure to be evidenced from specific market research so that for very high bandwidth services continuation of even the current level of regulation could be justified. We now turn to examine the role of dark fibre at this end of the marketplace which in our view shows even more conclusively that there is absolutely no market failure for these services for Ofcom to address with any regulation whatsoever.

[48] [redacted]

4.2.6 Dark Fibre sold to end customers

12.84 Following discussions with Ofcom, we now understand that a certain volume of dark fibre ends shown in Table 4.3 are in fact sold to CPs and included in the service shares in Ofcom [Table 4.4]. We understand that the data in this table are solely at customer ends and do not include circuit ends at network sites including core network sites nor the data centres which Ofcom has identified.

12.85 We do not agree with Ofcom [4.74] that it is reasonable to assume only universities, media and finance companies will use dark fibre for very high bandwidth solutions. We also assume that integrators will likely have an important role to play here as well as CPs and whose activity should be added to the 10-30% already attributed to the very high bandwidth sector.

12.86 Whilst we can agree with Ofcom [4.76] that dark fibre is to a degree targeted, it hardly can be regarded as niche given the volumes implied and which are considerably greater than assumed in the previous BCMR.

12.87 We also agree that an assumption of 2-3 wavelengths lit per fibre is a reasonable assumption for a typical fibre although it is also the case that some fibres have far higher volumes of wavelengths, leading to a potentially significantly higher average number of circuits and reducing BT's service share even more.

12.88 We cannot see how Ofcom [4.76] can possibly infer that - 'most dark fibre seems likely to be used outside the very high bandwidth CISBO market' simply because a large number of fibre strands are terminating in one particular postcode outside London. This is perfectly compatible with demand residing in the very high bandwidth market and fully in line with Ofcom's own research quoted at Footnote 99.

12.89 Ofcom [4.75] argues that most dark fibre takes place in London. On a postal sector basis and relative to a concentration of certain business types that may well be true but the fact remains that almost three times as much dark fibre is sold in RoUK compared to CLA; as a proportion of very high bandwidth sites it is not self-evident if intensity of use of dark fibre is greater or lesser outside London[49].

12.90 It is possible that if dark fibre is used for very short distances this might indicate bandwidth at 1G but lower than that bandwidth is highly unlikely. Ofcom's [4.77] suggestion that dark fibre will 'tend to broaden the market' seems to us to be most implausible.

12.91 Given the uncertainty in the assumptions that Ofcom has used to derive the estimate of the impact of dark fibre of about 1,700 – 2,550 very high CISBO ends, we have undertaken sensitivity analysis to attempt to calculate a plausible range which will include the active circuits based on dark fibre sold by third party infrastructure CPs like CityFibre. There are three ways in which this third party dark fibre come into the assessment:

a) Some is already included in the service shares shown in Ofcom [Table 4.4] as it has been sold to CPs. Ofcom has not advised Stakeholders of this proportion as far as we can tell.
b) Some (we assume the majority) will be for >1G services.
c) Some will be for 1G service or very unlikely even lower bandwidth.

12.92 Figure 1 below shows four options (isobars) where an assumption is made about the share of dark fibre circuit ends which are already included by Ofcom in the service share results and these range from zero up to 60%. The lines then show the effect on BT's shares for 1G and

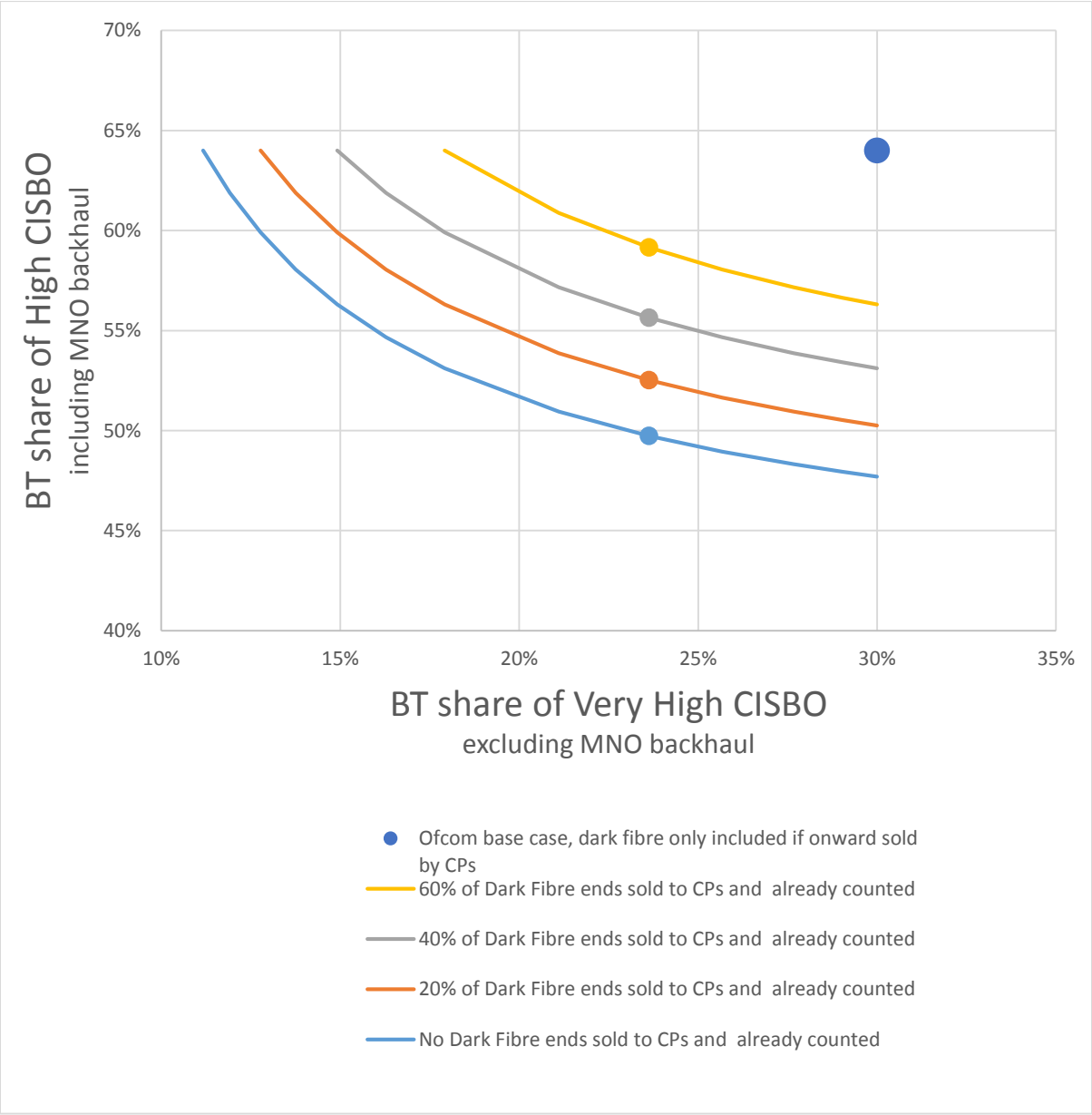
[49] To the extent that any of this dark fibre is used to build a network which is on a single site which does not allow third party access e.g. a campus, then this would at least potentially be outside the scope of this market review and be irrelevant to any consideration as to whether or not it would tend to 'broaden the market' as Ofcom [4.77] concludes. We assume that all data presented are relevant to the market under investigation.

separately for above 1G/WDM services. To try to reduce the complexity, we have only presented results for RoUK and only included the central estimate of on average, 2.5 wavelengths per dark fibre; if a higher number of average number wavelengths is used then the isobars move to even lower BT share values for both services.

12.93 The round markers on each isobar represents Ofcom's assumption that 16% of the dark fibre is used to provide additional very high Bandwidth circuits not already included by Ofcom in the active service shares.[50]. If this comparatively low proportion is taken then the BT share in very high bandwidth is 24% and the share at 1G could go as low as 50%.

Figure 1

Impact of third party Dark Fibre on BT active shares



[50] This is derived from the range presented by Ofcom [4.74] conforming to the mid-point of the ends in the range 1700-2550.

12.94 If as seems highly likely, these dark fibres are important in this marketplace, it would also be the case that Ofcom's [Table 4.5] Herfindahl Indices are also materially overstated and there is not a high degree of concentration in this sector. In fact, this conforms entirely to our long held position and that of our consultants.

12.95 The HHIs presented in Table 4.5 already imply that in addition to BT and Virgin Media there are many smaller players; certainly we would have expected both Colt and Vodafone to feature here and are surprised at their omission. Using the shares of dark fibre presented in Figure A15.10 and using Ofcom's estimate of only 16% of dark fibre being used in the very high CISBO market, the HHI falls from the quoted 3,260 down to 2,000-2,300 (based on 2 or 3 wavelengths).

12.96 Assuming a higher percentage of these dark fibre circuits are used for very high bandwidth circuits will reduce this even further. Table 2 below presents an alternative scenario showing that the HHI would likely need to be reduced very considerably.

Table 2

Impact of third party dark fibre on HHIs for very high bandwidth (lower volumes as per Ofcom)

		Ofcom Base case	Ofcom Scenario	Alternative Scenario
Count of Dark Fibre usage	very high CISBO	0%	16%	30%
	H CISBO	0%	84%	30%
	Onward CP sales	unknown		40%
Wavelengths per fibre		-	2.5	3
Number of Circuits		5,624	7,141	9,037
BT Share		30%	24%	19%
HHI		3,260	~2,140	~1,600

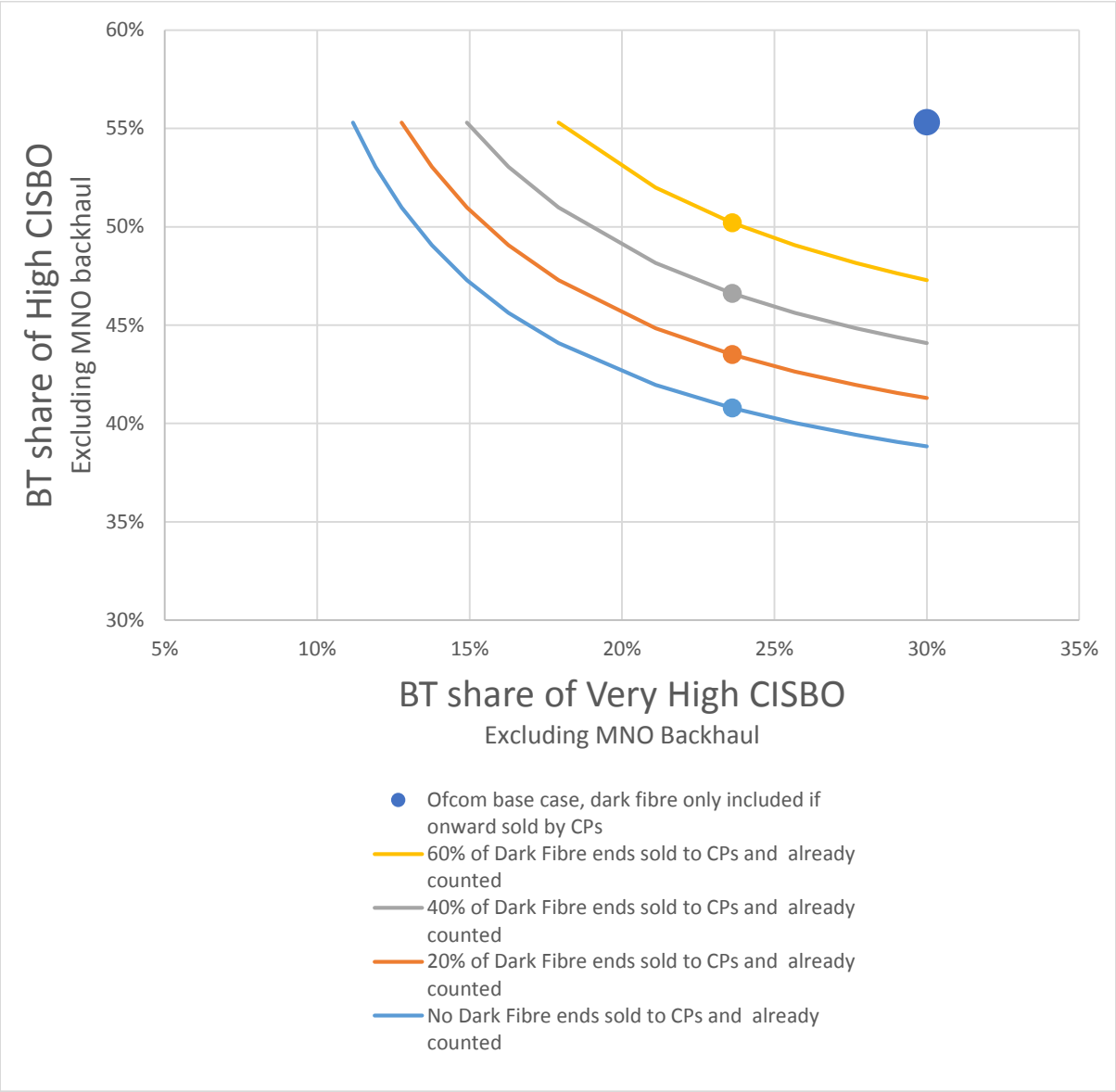
12.97 [redacted]

12.98 The ramifications of this matter are very considerable for as Ofcom [4.74] notes, BT and Virgin Media shares in very high bandwidth services would be reduced very considerably. It is not at all difficult to see that at the maximum the contribution of dark fibre could equal that of BT alone; clearly detailed consideration is needed of this issue. Our position therefore is that even based on the current evidence competition in this market for very high CISBO is fully effective and even a modest allowance for third party dark fibre would only strengthen that position.

[51] [redacted]

Figure 2

Impact of third party Dark Fibre on BT active shares
(excludes MNO backhaul from both H and very high CISBO)



OFCOM SECTION 4.3 GEOGRAPHIC MARKET ANALYSIS FOR CISBO

12.99 Our general comments on Ofcom's approach to geographic markets are contained in Section 10. Whilst we are to a degree comforted by Ofcom's improved data collection in this review, we have substantive concerns on the application to define geographic markets. These include the following issues:

- Network reach calibration. This covers detailed aspects of how HNR is calculated including issues of site value, clustering of sites and EFM presence.
- The requirement for physical contiguity of postal sectors to justify identification of a relevant geographic market.

The CBDs

12.100 Ofcom [Table A15.8] presents statistics showing 46k businesses with HNR, then switches discussion at Ofcom [A15.161 and Table A15.15] based around a threshold of 'at least 4 OCPs' covering half of businesses. Table A15.15 demonstrates that about 95% of businesses are in economic reach of two or more OCPs. We cannot see the basis for Ofcom adopting far more stringent criteria than are required for an SMP threshold and effectively using that as basis not to deregulate where it is patently justified. Section 11 of our submission provides details of specific London postal sectors.

The treatment of London

12.101 Ofcom [4.87 and 4.89-4.92] introduces without any explanation whatsoever a completely different geographic breakdown for London. Ofcom does not explain why it needs to change from the previous market review; in such a mature highly competitive area it seems unlikely that within only a few years the position has changed radically and certainly the updated service share information gives no obvious explanation as to why this is the case. Ofcom could as a matter of principle have fully deregulated CLA in the last review. The change means that each successive market review has altered the definition for London.

12.102 Fundamentally, for CLA, Ofcom [4.91] advances two entirely novel standards for effective competition without any justification. These seem to be exceptionally high and way beyond any normal set of standards observed either in this market review or other comparable ones such as Wholesale Broadband Access.

12.103 We cannot see how this is possibly compatible with Commission Guidelines[52] which sets effective competition at the standard of the absence of single or joint dominance. This is not a trivial issue; at the time of the introduction of the current regulatory framework, there was considerable discussion about different levels of regulation being set according to different levels of market power – dominance (SMP) and 'super dominance'. Ofcom has in effect opted to define a geographic market which corresponds to something like 'super effective competition'. Ofcom [4.92] quotes a requirement to find a standard which 'minimises any risk of tacit collusion'. A search of the June 2012 BCMR consultation Section 7 'Market power assessment' finds no trace of reference to either collusion or tacit collusion as something to be addressed. This appears then to be a new criteria which is not explained.

12.104 We separately provide detailed evidence in Section 11 that there is no consistency between the postal sectors included and excluded from CLA. We therefore reject in entirety the new breakdown of London.

12.105 We set out in Section 13 our position that Ofcom's 'buffer distance' in the network reach calculations has been undertaken incorrectly. It is clearly wrong in principle by mixing two methods of using either (a) the 'distance dug' and measured from appropriate points in CPs networks (i.e. duct routes); or (b) alternatively to analyse the distance of new connections from actual flexibility points. Ofcom has taken a hybrid which understates competitive footprint and likely significantly so for high and very high bandwidths.

12.106 Ofcom [4.95.2] argues that Kensington and Docklands have strong economic and physical links to the main block of CLA sectors. Arguably they probably have just as strong links to other sectors in the LP it is not at all obvious why Docklands which is dominated by financial services has especially strong links to Kensington which does not rather than for example Croydon

[52] Commission Guidelines of 2002 on market analysis and assessment of significant market power COM (2002) paragraph 19.

which also has a strong finance sector. As such Ofcom's claim is just an assertion which has no obvious objective basis in fact.

12.107 It is difficult to understand how a postal sector which has Kensington Gardens can be regarded as in the London Periphery and is a reason to split the CLA into distinct parts. The businesses in Kensington postal sector are clearly fully competitively served and a park is not a good reason to imagine that economic links between neighbouring areas are thereby broken.

The four indicators of competition

12.108 As purely a matter of principle we are supportive of Ofcom's more integrated approach here which directly and explicitly combines SMP measures with geographic boundary analysis. We disagree on material aspects of detail and application. Comments on individual issues are set out below.

Presence of rival infrastructure

12.109 We have set out our position on infrastructure presence above; we make clear that we cannot see that competition will be homogenous 'for a given area'. The buffer distance will vary by value of site as Ofcom in Annex 18 acknowledges. Resilience [4.103] does not necessarily require additional OCPs; Colt for example claims to have complete resilience from its rings architecture.

Service shares

12.110 We set out in Section 14 our views on the data analysis. We believe that additional breakdowns of the circuit data and sensitivity testing are required to account for a variety of issues.

Pricing and profits

12.111 We dispute the inferences that Ofcom has drawn here.

12.112 Regarding Ofcom's consequential assessment of competition for very high CISBO we have the following additional comments beyond the points already made

- Whilst Virgin Media might well be the largest alternative OCP it is very clear that Ofcom's HHI statistics are completely wrong.
- There is no evidence of customer complaints or suggestions that this sector is anything other than being served highly effectively.
- BT profits for a single year snapshot provide no evidence that competition is ineffective. Ofcom has not investigated the profitability of other providers.
- BT will emphatically not be 'reasserting itself' across the CISBO range as Ofcom [4.137] mistakenly assumes which arises from a lack of appreciation about migration and bandwidth growth[53].

[53] Ofcom [4.8] also argues that CPs ability to compete across the product range will ' reassert itself over time as prices change and users move between products, and particularly in the absence of regulation'. If both BT and CPs are 'reasserting themselves' then presumably the current market shares would be maintained as they are.

BT's provisional views on market boundaries

12.113 Sections 10 and 11 of our response provide the context to our assessment of product and geographic boundaries. However we do not have adequate information to form a definitive set of alternative markets to those provided by Ofcom. We have formally requested that Ofcom undertakes additional analyses especially for RoUK to include the following:

- Table 4.4 distribution of service shares - Rest of UK to be split out between the Virgin Media footprint and outside the Virgin Media footprint.
- Tables 4.4, A15.5 A15.14, A15.15 and A15.16 - to be re-estimated show the impact of including EFM coverage based on location of the relevant serving BT exchange.
- An additional split of OCP coverage including EFM but limited to the Virgin Media footprint outside London specifically.
- A breakdown of HNR of BT + 1/+2/>2 based on actual circuit ends excluding LLU and MNO backhaul but split by three groups of bandwidth of EFM/10/100Mb, 1G and >1G. If possible also run for a range of plausible dig distances to flex points say 50m – 200m.

12.114 Our preliminary views based on incomplete evidence in this consultation is that there are likely four primary economic markets associated with business sites:

- A city market which likely extends beyond WELCA for London and CBDs which have multiple CPs present and which are fully competitive at all bandwidths.
- Very high bandwidth services >1G of all technologies which is nationally fully competitive.
- A market associated likely around Virgin Media and EFM for bandwidths up to and including 1G[54].
- All geographic areas and bandwidths outside the three categories preceding.

12.115 Essentially we are proposing a return to an AI and MI distinction but with further geographic breakdowns. However, absent further analysis, we reserve our position which is provisional.

OFCOM SECTION 4.4 ASSESSMENT OF MARKET POWER IN RELEVANT MARKETS

12.116 We provide detailed comments in Section 14 of the economic analyses to the following related Ofcom Annexes:

- Approach to SMP assessment - Annex 13.
- Data analysis - Annex 15.
- Dig distance and costs - Annex 18.

12.117 In summary, we do not consider that Ofcom has captured the economic incentives of OCPs to serve businesses at different bandwidths in particular with adequate accuracy and the net result is to understate HNR particularly at higher bandwidths:

- The dig distance is set on the basis of incompatible metrics which understates economic incentives to extend networks.
- The database should be calibrated on actual circuit ends as well as the business site data set.

[54] If dark fibre is included as an upstream remedy of active services then 1G service is fully contestable nationally the only possible barrier to switching could be a contract term.

- HNR estimates need to vary by bandwidth and recognise clustering (proximity to core networks as well as businesses to each other) and recognition of the supply of EFM.
- CPs will have a wider strategic incentive to target certain customer types which is all to do with recovering customer sales and acquisition costs and which will have a very high impact on the incentive to serve sites of different downstream value.

12.118 To put into context, Ofcom [A15.8] estimates that there are around 53.3k business sites with HNR and of these proposes to deregulate only those in CLA comprising around 4.3k business sites [Table 4.4]. We have good reasons to believe that the volume of competitively served sites is underestimated quite apart from the fact that EFM coverage is ignored, but even taking at face value, some 32.5% of sites have competitive supply on this measure but only about 2.5% of sites in CLA are actually deregulated.

12.119 We consider that the impact of dark fibre will have an immediate and profound impact on the existing circuit base and that volumes of active circuits will change potentially quite rapidly[55]. At the minimum, we believe that Ofcom should have given consideration to how the provision of dark fibre would affect possible market boundaries and market power at different bandwidths and in different geographies[56].

OFCOM SECTION 4.5 LEASED LINES AS INPUTS TO OTHER MARKETS

12.120 We provide detailed commentary on Mobile and LLU backhaul in Section 13 of our response. At this stage we record our disagreement with how Ofcom has treated mobile backhaul by failing to recognise the interaction between geographic considerations and alternatives. It is not clear to us how Ofcom [4.178] is treating microwave but from the data in Table 15.11 there is extensive use of alternatives to BT.

12.121 We further dispute Ofcom's [4.179] of our 'strong position' which is an outcome of a bidding process where the MNOs held considerable countervailing buyer power. It is in any case unproven given the treatment of Virgin Media's 1G services which as discussed above Ofcom has selectively chosen to ignore in the presentations and accompanying analysis.

OFCOM SECTION 4.6 IDENTIFYING THE BOUNDARY BETWEEN TERMINATING SEGMENTS AND CORE/TRUNK NETWORKS

12.122 We set out our high level position on the nature of core network identification in Section 10 and further detail in Section 13 of our response.

[55] Forecasts of passive take-up are contained separately by Ofcom in the LLCC.

[56] In the 2013 BCMR Ofcom included a re-examination of retail markets consequent on the Stage 3 upstream wholesale regulation as a Stage 4 analysis. In principle we consider the same should have been done here treating active remedies as downstream of passive remedies. In this context we disagree completely with Ofcom's assessment of the impact of dark fibre on migration opportunities.

13. Backhaul Services and Core Networks

SUMMARY

(i) Nature of backhaul

13.1 In Part 10 we argued that there are significant differences in the market context for MNO and LLU backhaul compared to business access. The production chains in which MNO and LLU backhaul sit are quite different and there are aspects of purchasing, supply, geography, and technical requirements which are also all different from business access. Importantly, Ofcom should not presume that MNO and LLU backhaul under modified Greenfield site assumptions, would make use of the identical upstream products as business access, as Ofcom has in fact done by largely basing its analysis on the characteristics of BT's regulated upstream products.

13.2 We suggest that Ofcom should consider MNO and LLU backhaul on their own merits and not make implicit linkages with constraints arising from business access and vice versa. For example, microwave radio is widely used for MNO backhaul across the world but largely absent in the other downstream applications.

13.3 Another key difference between MNO and LLU backhaul compared with business access is the nature of purchasing, as Ofcom has acknowledged for MNO backhaul in the consideration of 'Managed backhaul services for MNOs. Their preference is to source large scale turn-key managed solutions for their backhaul covering a large number of base stationing in a single contract. We note, as does Ofcom, that LLU backhaul has similar purchasing characteristics.

13.4 There are a number of critical factors which arise from this style of purchasing. First, it is clearly a 'bid market'. The Commission Guidelines give explicit consideration to the assessment of SMP under bid markets and say that "In bidding markets the number of bids won and lost may also be used for an approximation to market shares"[57]. Ofcom has not followed these guidelines and has only used working system size as the basis of assessing market shares. With a bid market the current working system size is a backwards look and cannot be a reliable indicator of competition forward looking.

13.5 Moreover, the number of bids arising in any one review period is sufficiently small that even basing market shares on bids won and lost may not have any statistical significance. It is therefore even more important that Ofcom gives proper consideration to the nature of competitive supply specific to MNO backhaul and, separately, LLU backhaul, and not place weight on market shares as it has done especially when these market shares exclude microwave radio.

(ii) Core networks

13.6 We maintain that Ofcom's analysis is still conflating two separate issues which are the boundary of non-competitive access and the identification of PoH. These will not be the same – the former is an access issue and the latter one of engineering convenience.

13.7 Whilst we are supportive of a wider core network we believe that there is considerable opportunity to expand the number of nodes regarded as competitive.

[57] EU Commission Guidelines of 2002 para 76.

13.8 We note that, Ofcom has considered its assessment of mobile backhaul in the following order: 'Technical assessment'; 'Demand-side substitution'; 'Differences in competitive conditions'; 'Microwave links'; and then 'Managed backhaul services for MNOs'. We consider this order of analysis is incorrect and leads to an Ofcom drawing erroneous conclusions assessment.

13.9 It is the fact the MNOs purchase backhaul as large turn-key managed solutions that should provide the context for all the other aspects of the analysis (which Ofcom only considers at the end of its analysis) and by considering this last, Ofcom has not drawn the correct conclusions. We note and agree with Ofcom's conclusion that BT Wholesale does not have SMP at the level of managed services for mobile backhaul for the reasons stated below, for example, the existing alternatives to the supply of MEAS. We therefore start by considering the downstream market first.

Managed backhaul services

13.10 We fully agree with Ofcom's [11.60] observation that "MNOs have typically purchased backhaul in the form of integrated managed service solutions which aggregate connection to large numbers of aerial sites, rather than making discrete purchases of large numbers of links to connect each aerial site individually".

13.11 Most significantly, whilst Ofcom [A11.60] notes that - "BT Wholesale provides a high proportion of these managed services for MNOs' backhaul, in the form of its Managed Ethernet Access Service (MEAS) product" – we do not accept that this is indicative of SMP. BT Wholesale happened to win two contracts at a particular point in time and since then, BT Wholesale has been much less successful in winning MNO backhaul business. MEAS is based on Openreach EoI inputs and any CP could have developed and sold this solution.

13.12 [redacted]

13.13 BT Wholesale has no competitive advantage based on ownership of SMP inputs, a point Ofcom [A11.65-70] does broadly acknowledge. We discuss the issue of microwave and other aspects of competition below.

13.14 Considering the second point first, the timescale of the contracts is in large part that of the MNOs choosing and cannot be cited as a barrier to switching as is implied by Ofcom [A11.68]; it is one of self-choice which is acknowledged as relevant to take into account in the Commission Guidelines[58]. We also cannot accept any suggestion from the MNOs [A11.62] that there is significance on their current reliance on MEAS given this is a downstream product based on EoI inputs and the MNOs chose to enter into these contracts.

13.15 In summary, the MNOs have and do exercise very strong countervailing purchasing power and choose to seek a turn-key managed solution and there is no evidence that BT has any market power if the market boundary were assessed at either stage of production upstream or downstream at the managed service level. At one point in time the MNOs chose MEAS as that solution; however, in recent years they have chosen alternatives notably from Virgin Media. The major restriction for BT in meeting MNO backhaul requirements arises from the

[58] Commission Notice on the definition of relevant market (97/C 372/03) paragraph 54 and 2002 SMP Guidelines paragraph 76 which states that - 'In bidding markets the number of bids won and lost may also be used as approximation of market shares'.

regulatory restrictions on BT Wholesale offering a package avoiding any element of double marginalisation. We have on a number of occasions raised concerns that Ofcom has restricted BT unreasonably in this sector.

Microwave links

13.16 Microwave links are, in effect, a self-supply solution for a managed backhaul service and they need to be considered as such and not on an upstream link by link basis. We consider that Ofcom's exclusion of microwave is unsupportable on technical and demand-side substitution grounds and Ofcom [Table A15.11] demonstrates this very fact; for TI services up to 8Mb including self-supply of microwave shows that BT has a service share of only 23%. The reason for the difference in market shares comparing microwave with AI services is largely commercial and not technical. Some of the MNOs pooled their purchasing under MBNL and both MBNL and Vodafone happened to choose the MEAS solution at that point in time. This does not indicate that microwave links are somehow suitable for TI but not A, and there are many examples across Europe and the rest of the world where microwave links are used for AI links.

13.17 In fact, Ofcom [A11.51] accepts that microwave can carry Ethernet transmission and this is easy to manage. That microwave might not be able substitute for fixed equivalents in 'all cases' is missing the point of where alternatives to fixed networks exist and a comparison 'under all scenarios' is not a reasonable test of substitutability – it is an extreme one which is not recognised in any normal competition assessment. In any case, the four examples that Ofcom lists here are totally misleading as they all imply that MNOs have no choice over the siting of microwave sites to overcome any such technical difficulties.

13.18 Ofcom does not explain how in spite of the apparent problems of microwave that some MNOs have managed perfectly well to use them completely as a substitute for fixed access. Indeed Ofcom [A11.56] then acknowledges that microwave is used for backhaul.

13.19 Ofcom mixes what is essentially an important distinction between links from end-sites, especially rural end sites, and links from aggregation points. While it is true that the bandwidth available on microwave links may be more limited compared to optical fibre, this is not relevant in the outer parts of the rural network where microwave can and does deliver the links from the end sites. There is a strong correlation between the ability to use microwave and the absence of fibre infrastructure, competitive or otherwise[59].

13.20 Conversely where the capacity requirements are higher for aggregated links, these are likely to fall in locations where there is a competitive supply of fibre. Moreover, the MNOs have the ability and freedom to actively choose to structure their networks such that these aggregation links do fall within a footprint of competitive fibre supply.

13.21 Microwave and competitive fibre are in fact highly complementary and Ofcom is entirely wrong to exclude one without considering the presence of the other. As noted, Ofcom is wrong to exclude microwave because it cannot meet aggregation capacity requirement when competitive alternatives to BT can provide this. Ofcom is equally wrong to exclude competitive fibre because of its absence in rural areas when this could be met by microwave links.

13.22 Our position regarding 4G networks has been provided to Ofcom in a number of submissions in the consultations on passive access services. We are clear that completely new networks

[59] As we point out elsewhere, BT did not have fibre infrastructure at the vast majority of these rural base stations, or indeed much duct infrastructure, and needed to make substantial incremental investment to meet these requirements.

are going to be needed for data services and that this raises a totally different set of issues forward looking.

13.23 Ofcom's [A11.57-A11.58] conclusions are not only not supported by any technical or economic assessment but are contradictory. It is irreconcilable with Ofcom's own service share data. Ofcom looks at the costs of switching from fibre to microwave; it would be equally possible to reverse this test and look at the costs of switching in reverse in which case Ofcom would come to the same conclusions.

13.24 Moreover, Ofcom draws this conclusion on an implicit assumption that switching will take place on a link by link basis and this is emphatically not the case as the MNOs prefer to purchase managed backhaul services as large turn-key contracts. In the context of such contracts, switching costs are readily absorbed within the scale, scope, and timescale of the contract.

Technical assessment

13.25 We note Ofcom [A11.10-A11.14] now effectively accepts that the absence of synchronisation on standard Ethernet has not been a barrier to seamless switching from TI to AI services as we set out in our response to the June 2012 Consultation[60].

13.26 There are however some remaining misunderstandings here. It is not that case as Ofcom [A11.14] states that all MNO backhaul services "will require an enhanced form of Ethernet that supports synchronisation". First, while a mobile base station requires synchronisation it can acquire that from a number of different sources. Second, there are other technology solutions which do not require SyncE. For example, it is possible to combine IEEE1588v2 with a high stability local oscillator at the base station, noting that the costs of such local oscillators have fallen considerably in recent years.

Differences in competitive conditions

13.27 Under modified Greenfield site assumptions and therefore considering the situation that would exist without regulated upstream inputs, we are of the opinion that the MNOs have a number of strategic options for their desired supply of large scale turn-key contract for a managed service:

- Self-supply using microwave radio links and to complement where necessary with their own fibre for more aggregated parts of their network (a solution widely adopted in Europe).
- Competitive supply using fibre where available, for example from Virgin Media, and then complement this with self-supply using microwave radio links in rural areas.
- Supply based on active services from BT.
- A strategic mix of the above solutions based on geography and/or time of ordering in order to ensure the MNO is not tied to any one option.

13.28 All of these options are fully consistent with the nature of mobile networks as discussed by Ofcom [A11.34-A11.42], which ensures that the MNOs enjoy the full benefits of competitive

[60] We would also note that SyncE was cited as a major technical obstacle to the general substitutability of TI by AI services. We think that for Ofcom [A10.5] to argue that "the qualitative differences between legacy TI services and Ethernet have eroded" is highly misleading. Ofcom's previous analysis was simply incorrect as we pointed out at the time.

supply. In this regard, BT is of the view that there is no clear market failure to consider here at all.

13.29 Whilst it is true that remote rural locations are by definition outside the footprint of OCPs who have rival infrastructure [A11.35], it is also the case that BT has had to extend its own network as Ofcom concedes. BT has in effect had to build a network for MNOs and it is therefore not the case that the argument of sunk costs from an existing network will confer advantage [A11.36] as MNOs argue. The MNOs can take a strategic view of the offers made by BT in comparison to microwave and self-supply.

13.30 In addition, the economies of scale and scope cited by Ofcom [A11.42] are simply not relevant in considering these strategic options of supply. Ofcom is implicitly making an assumption that all competitive supply will look like BT EAD MEAS services which is not the case.

13.31 In response to the arguments put forward by Ofcom [A11.43-A.11.49]:

- In relation to microwave, as set out above, Ofcom incorrectly analyses on a link by link basis and not an a turn-key contract basis where switching costs are readily amortised and Ofcom also fails to consider the way microwave can be strategically complemented with competitive fibre (or self-supply fibre).
- In relation to competition from existing networks, Ofcom again fails to consider the complementarity of microwave and competitive fibre and also the option of the MNO to select a contract based on the reach of a CP;
- In relation to share data, Ofcom excludes microwave and fails to consider the nature of the bid market and incorrectly rely of working system size shares which are unduly influenced by BT's historic success in winning just two contracts.
- As regards the number of competing operators, as set out in Section 12 of our response, we consider that the conditions used by Ofcom to define the CLA go beyond the SMP threshold of effective competition and further that in conditions of strong countervailing purchasing power, the normal benchmark should be slackened and not strengthened as Ofcom has done.

Demand side substitution

13.32 Ofcom has discussed substitution within the general context of link by link substitution and not strategic, large scale, long term contacting; which later on Ofcom [A11.60] agrees is the real nature of the mobile backhaul sector[61].

13.33 For example, much of the discussion in the section once again centres on the need for synchronisation and SyncE and whether the need or otherwise for SyncE means that a 'standard Ethernet product' is useable for mobile backhaul. Ofcom concludes that SyncE is now widely available and likely to "become part of the standard Ethernet product"[62]. While this may be true it completely misses the primary point.

13.34 BT was able to offer a managed solution to the MNOs in the form of MEAS which included synchronisation but did not involve SyncE which was insufficiently mature at the time. The

[61] We support Ofcom's position that mobile backhaul should not be considered to be a separate market in its own right. However, our submissions are intended to correct particular points in Ofcom's assessment.

[62] BT notes that in the slide presented by Ofcom in Figure A11.1 which illustrated that the ADVA FSP150 family of equipment supports SyncE and IEEE1588v2, timing is the fourth item noted. The first item noted which might reasonably understood to be of the primary importance, that is demarcation to allow isolation of a customer's network from a CP's network, is completely disregarded and eliminated by Ofcom's proposed dark fibre remedy.

need was met by the managed solution and capability of the point to point link was ameliorated in the managed solution.

13.35 In this regard, it is also clear that the barriers to switching between TI and AI are equally misconceived by Ofcom. Ofcom consider this on a link by link basis, however, in the proper context of the MEAS managed solution, the technical issues of switching are ameliorated with suitable circuit emulation and the switching costs are fully absorbed in the scope and lifespan of the managed service. Ofcom's identification of significant switching costs is entirely misplaced and are irrelevant.

13.36 Finally, Ofcom is wrong to use the fact the Virgin Media have used WDM as part of the managed solution for mobile backhaul as a reason for justifying a chain of substitution. The context of mobile backhaul is that of a large scale long term contract where there are many technical and commercial factors involved for both the MNO and the supplying CP and which make the use of WDM a suitable technology option. This has no meaningful connection with the use of WDM in the business access market and Ofcom cannot use this in support of their previous finding on the chain of substitution.

OFCOM ANNEX 12: LLU BACKHAUL

13.37 We set out in Section 10 our position that backhaul should be treated as access points but in a different fashion to handover of customer site links. Backhaul is intrinsically a feature of core network design so there is a more limited set of sites of relevance but they are also subject to tendering not on a site basis but as part of network solutions by CPs who have strong network knowledge to purchase using countervailing buyer power. In this context we consider that Sky and TalkTalk are being unreasonable in suggesting (Ofcom [A12.8]) that they might receive worse conditions as they are easily identifiable. We do not agree with Ofcom's assessment of market power based on shares [A12.2] which fails to address the strategic choices open to CPs and the nature of backhaul as a bid market.

13.38 Ofcom [A12.7] notes that BT does not distinguish in its product offerings to LLU backhaul providers and other services. This is hardly surprising as Ofcom has placed LLU backhaul in the same market and subject to identical regulation as other services.

OFCOM ANNEX 20: CI CORE NETWORK

Background

13.39 We have set out in various Paper submitted before and during the CfI that we do not subscribe to the TAN concept either for TI or for AI services and it is a mistake to bring over a failed model of regulation from the former to the latter. Whilst some of the problems arising with TI services do not in fact repeat in AI services as Ofcom has decided not to regulate the AI 'Trunk market', nevertheless there are some problems as we discuss below.

13.40 On the principles of how to define core nodes we set out our position in Section 10 of our response. We are supportive of the general thrust to extend the size of core networks and to include data centres although the scope to date of the analysis is too limited and the evidence supports much wider deregulation with more nodes appropriate as boundary limits.

13.41 There are also some material matters of definition:

- It is not easy to interpret Ofcom's definition of a Trunk Segment into anything which corresponds to actual circuit routing in practice[63].
- There is no logical reason for circuits between exchanges in the same TAN to be regulated if they meet the same threshold for deregulation between different TANs as CPs will not recognise this distinction in their build buy purchasing decisions.
- There are differences in definitions with the Undertakings which makes interpretation of EOI very difficult if not impossible and in our view intra-TAN circuits should not be EOI.
- There is no definition of what constitutes a CP core node and as a consequence BT is given obligations which are likely too wide.

13.42 Ofcom's [A20.10] hypotheses of the incentives of CPs to aggregate OHPs into TANs are not empirically founded as we discuss below.

Exchanges

13.43 Indicators of operator presence. We discuss Ofcom's analysis below.

13.44 Limitations of interconnection purchases as a measure of infrastructure-based competition. The point we wish to make is that Ofcom should not underestimate the purchasing power of large CPs in competition to BT.

13.45 Number of competitors needed to establish competitive nodes. We believe that a BT + 2 CP is adequate here given the nature of competitive tendering.

Data centres

13.46 We disagree with Ofcom's [Figure A20.2] suggestion that a route analysis gives any indication of competitive conditions. With regard to DC D, CP 2 and CP 3 both have connectivity to all other DCs as they will daisy chain via the other DCs. It is quite wrong to regard DC D as not being competitive as this does not accord with engineering principles of network design.

Results of analysis

(i) Exchanges

13.47 [redacted]

13.48 [redacted]

[63] In practice it is highly unlikely that BT could tell whether or not a trunk segment was actually part of an EAD circuit without considerable analysis which would need to be done for each circuit individually. In practice the impact of the TAN framework only affects the imputation of charges for downstream BT for transport in our own network which likely third parties would not be interested in having anyway.

13.49 [redacted]

13.50 [redacted]

13.51 [redacted]

13.52 [redacted]

13.53 [redacted]

13.54 [redacted]

13.55 [redacted]

[redacted]

13.56 [redacted]

(ii) Data centres

13.57 We are broadly supportive of Ofcom's approach here. We believe that a number of additional Data Centre nodes should be added to the list. Section 6 of this response sets out our suggested amendments which include a class of Data Centres where BT is not the preferred provider of connectivity as well as a small number of additional 3rd Party Carrier Neutral Data Centre sites that Ofcom seems to have overlooked in the candidate list.

Market definition proposals

13.58 We fundamentally disagree with grouping exchanges together to create AI TANs which is a completely unnecessary complication. We have shown that it is not supported by all the evidence which contradicts Ofcom's assumption that CPs would only interconnect for TI services at one SDH Tier 1 node in each city and elaborate further below.

13.59 With the exception of London, the majority of SDH Tier 1 groups were nodes in the same city, these being:

- Birmingham – 2 nodes, 6km apart.
- Cambridge – 2 nodes, 3km apart.
- Coventry – 2 nodes. 1km apart.
- Edinburgh – 3 nodes max spacing 12 km apart.
- Glasgow – 2 nodes, 12km apart.

13.60 The only cases where different towns/cities were grouped were Southampton/ Portsmouth and Cardiff/Newport. As the TI trunk regulation was based on theoretical catchment areas this grouping removed anomalies that would have otherwise occurred. However this was in any case a framework which we strongly dispute as invalid.

13.61 Further, the current proposed groups are significantly more extensive than the original groups. Many of the groupings now cover multiple discrete areas. In Figure A20.5 Ofcom has illustrated this TAN grouping to the West of London. The example used is the Slough TAN which includes 4 exchanges Slough (OHP), High Wickham (OHP), Egham (ASN) and Uxbridge (ASN). This grouping means that an inter-exchange link between Egham and High Wycombe, over 25km in length, is classed as a terminating segment, whereas Egham to Bracknell

(labelled as “Reading” TAN in Figure A20.5) is a de-regulated core circuit. Evidence indicates that both Virgin Media and Vodafone have infrastructure at all four of these sites[64].

13.62 In the discussion of grouping the additional exchanges Ofcom [A20.80 – A20.85] accepts that two CPs are “present” at both Egham and Uxbridge (presumed to be Virgin Media and Vodafone), but justify the imposition of regulating links between Egham and Slough on the basis of a 3rd CP that may need to connect a customer site in the Egham area to their own core network at Slough. Even if this was the case, this does not justify the inclusion of the Egham exchange to Slough exchange link also being regulated[65]. We therefore see no reason why circuits between these four sites should be regulated.

13.63 [redacted]

13.64 [redacted]

13.65 The consequence of Ofcom’s proposed proximity methodology is that it groups together exchanges in a way which does not reflect competitive conditions. A far more appropriate approach which would also have the beneficial effect of radically simplifying the structure of Ofcom’s regulation in this area would be simply to identify a single list of competitive TANs. There is no need or benefit from trying to group these further.

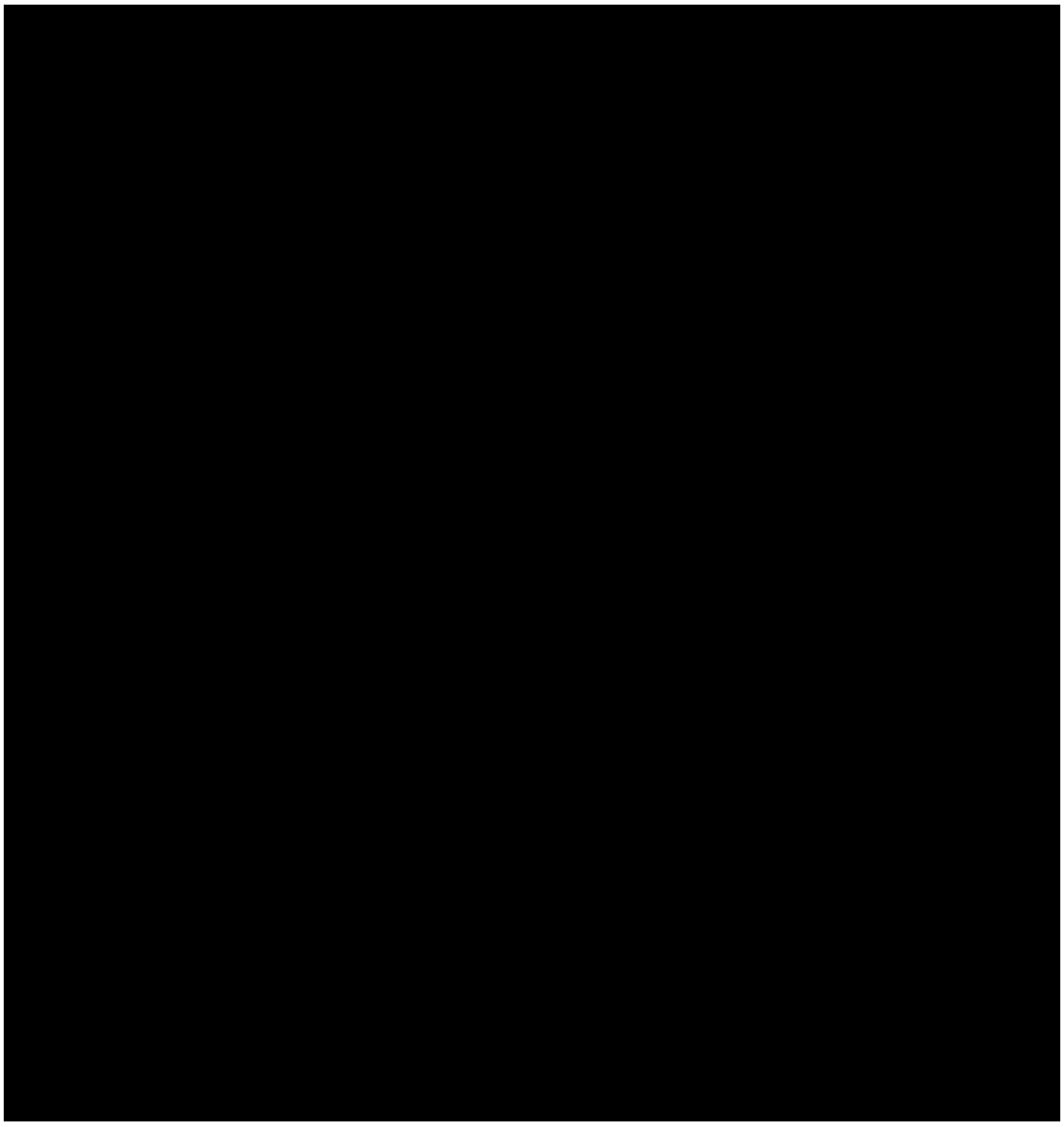
13.66 [redacted]

[64] Although Figure A20.5 claims that only one infrastructure CP is at High Wycombe, it is believed that both CPs are present as C&W had multiple IBI there and VM’s duct extends to the exchange.

[65] If one CP uses another for backhaul the handover point would likely not be at any BT exchange anyway but could be somewhere completely different such as a data centre. Focussing on BT exchanges to determine core network boundaries for CPs is not going to be relevant for CPs as we set out in Section 11.

Table 1

Estimation of the number of Intra-TAN Openreach circuits



14. SMP Assessment

SUMMARY

14.1 Whilst we agree that Ofcom has identified the main relevant criteria for assessing SMP, we dispute a number of the assertions which are not evidence based. There remains a number issues regarding the estimation of market shares where we consider there is still one-way bias to exaggerate our service shares. This is quite apart from the specific issue of third party dark fibre for high and very high CISBO. Ofcom has not produced any ranges to reflect these sources of uncertainty. Ofcom mischaracterises our network as ubiquitous and in effect costless to maintain.

14.2 There are other factors in the SMP assessment which we believe are incorrect. For example, customers do not foresee difficulties of switching as is evidenced by Ofcom's BDRC survey and BT does not benefit for the technical reasons stated from its network.

14.3 Ofcom's calibration of economic dig distances is flawed in our view combining two separate methods to give a downward bias in length and underestimating HNR for CPs.

OFCOM ANNEX 13: APPROACH TO SMP ASSESSMENT

14.4 We broadly agree with Ofcom's [A13.4] choice of most relevant SMP criteria to consider this market whilst disagreeing with aspects of interpretation. We maintain that there is substantial overlap between the three criteria of control of infrastructure, economies of scale and scope and barriers to entry and that in practice Ofcom has not found distinct impacts for each but they essentially interact as Ofcom [A13.43] accepts.

General assessment of SMP criteria

14.5 Market shares. As a general comment we would like to note for the record that we believe that the concerns which we raised last time about the robustness of Ofcom's service share calculations have turned out to be fully justified in the light of current evidence[66].

14.6 We maintain that in spite of clear material improvements to the data analysis, Ofcom has not provided stakeholders with plausible ranges for service shares; nor is it possible to readily discern whether the shares are rising or falling which is also an indicator of SMP. We believe that there remain a number of clear one-way biases in the current estimates of services shares to find BT with SMP which Ofcom has not acknowledged or reflected in its assessments.

14.7 We note Ofcom [A13.26] identifies a set of limitations with regard to very high bandwidth services. If such limitations were important now it begs the question as to why Ofcom did not express the same caveats in the previous review where Ofcom [Statement Figure 7.20] attributes BT with a share of MI outside WECLA of 57% and as high as 67%. The current estimate is 30-32% but including MNO backhaul it would be 22% or even much lower if third party dark fibre sales are taken into account. Either BT has now lost substantial market share or the two sets of shares are not comparable; it is difficult to see that BT has 're-asserted' its market position since the last market review or how it could do so in the future.

[66] We refer to the BT submission prior to the Data analysis Consultation dated 21st August 2014. As far as we can tell Ofcom subsequently did not dispute or disagree with any of the points we made. Further, it is also readily apparent that the multitudes of Scenarios which Ofcom constructed in 2013 did not represent credible alternatives or plausible representations of the inherent uncertainty in the data.

14.8 We do not accept Ofcom's [A13.27] assertion that greater account should be given to service shares in the broader CISBO market for the reasons we have explained earlier; we do not accept that there is a single product market across all bandwidths in any case.

14.9 We do not accept Ofcom's [A13.26] expectation that migration up from 1G service will have a material effect on BT's position for very high bandwidth services as this will not by itself change the likely attractiveness of most sites for CPs to serve. As bandwidth grows, the relative attractiveness of sites will remain broadly similar; clearly some sectors of the economy may grow faster than others but this is a long term trend factor. We explain our position in Section I0 of our response.

14.10 We have raised the issue of the absence anywhere in the Consultation of any reference to the fact that under Ofcom's own market definition, Virgin Media has a central estimate of a share in very high bandwidth of 63%.

14.11 If Ofcom wishes to exclude MNO backhaul or separate these services from customer site access in its analysis such as Table 4.5, then an alternative set of markets should have been analysed. A final possibility is that a large volume of these circuits are in fact 1G delivered over optical service and which could have been attributed to the high bandwidth market in which case BT's share in Table 4.4 is incorrect.

14.12 Control of infrastructure not easily duplicated. The reasoning here of incremental costs to build a network largely are duplicated in the following section of barriers to entry – sunk costs. The argumentation is in effect identical.

14.13 Ofcom [A13.25, A13.33 and A13.102] makes continuous reference to BT having a nationwide ubiquitous network as a source of comparative advantage. In fact, as we have shown in the Section 11 of our Geographic analysis, BT is only within 200m of 65% of business sites from its flex points. We do not have the information to calibrate the statistics for other CPs but Ofcom itself [A15.8] estimates that over 30% of large business sites are within HNR and we believe that for a whole variety of technical reasons this is underestimated. Further, Ofcom's HNR values do not include any allowance for EFM provision and in our view, copper unbundling should be presumed as part of modified Greenfield site assumptions i.e. it is upstream regulation which is outside this market review.

14.14 Whilst it could be argued that absent regulation BT would have an incentive to go beyond 200m from its flex point to serve a customer and that the proportion of sites is understated, the exact same argument can be made for CPs.

14.15 It is a matter of fact that BT has a large duct network although in fact for businesses when assessed on a value basis, we continue to believe that Virgin Media can replicate our services for the vast majority of sites.

14.16 We disagree with all of Ofcom's [A13.33] arguments here and present in Table 1 responses to the points made here. We also respond to similar points made in the 2013 Statement [Figure 7.2]:

- Speed of service. On Ofcom's own measure, BT is not in proximity of 35% of business sites, so whilst it is true that for some sites we will have close network this is not universally the case. In any case, agreeing service for a new customer will often take as much time as establishing the physical connection. Ofcom's BDRC research showed that provisioning was not a high factor of concern.
- Reliance on third parties. As Ofcom's text is redacted we cannot easily respond but it was clear from the market analysis in 2013 that there is a strong merchant market and CPs are well capable of contracting with each other.

- Network security. We explain in Table 1 that encryption can mitigate insecure access components.
- Cost of sales. We consider it is untenable to suggest that BT has market power as a function of 'size and brand' which is a subjective assessment against other CPs and which they would likely dispute and strongly disagree with. It is in any case completely overlapping with other criteria such as market share.
- Resilience. This is largely irrelevant as we discuss in Table 1.

14.17 Regarding the third bullet (network security) – customers place value on knowing a single supplier supplies the whole physical infrastructure – we refer to Ofcom's own market research by BDRC which indicates that there are no key barriers to switching and for businesses that use a single supplier only, 80% said this was not a barrier to switching[67]. We discuss this below.

14.18 Barriers to entry and expansion. Ofcom perpetually represents BT's network as sunk and if it were totally costless to maintain and extend. In practice both inferences are incorrect.

14.19 In practice, CPs will extend their networks on the basis of reasonable expectation of demand and in many cases only when contracts are signed as we explain in Section I0; this is a part of a geographic ladder of supply for CPs which de-risks network expansion. We have suggested for example that clustering of 1G sites is one example where network expansion is more likely[68]. Sunk costs cannot be taken in a blanket fashion across all geographies and all sites.

14.20 Ofcom [A13.46] interprets the BDRC market research as confirming 'that switching costs are present to a material degree and to the extent of raising barriers to entry and expansion in markets for wholesale leased line services'[69].

14.21 We cannot see how Ofcom can possibly have taken this inference from the survey which to us shows the precise opposite that switching costs are comparatively minor and easily manageable:

- The reasons not to switch which Ofcom [A13.46] cites (Figure 8.6) are all extremely minor in customer ranking with price being the most important one and again this is indicative of effective competition and absence of barriers to switching.
- It appears that around 50% of customers have contracts up to and including 3 years which suggests that there is fairly rapid potential for change of supplier within one market review period.
- According to the report 'the majority of businesses review value-for-money or service quality at least every 2-3 years and nearly three in five go to formal tender within the same period'.
- Most business are actually satisfied with their service – about 87% - and this in itself is indicative of an effective market.
- Reliability or resilience is only the fourth reason for using more than one supplier and attributes a very small percentage of 10% (Figure 8.4).

[67] BDRC Report Section 8.2.3.

[68] The term clustering refers to proximity to core as well as access networks and not just physical proximity of like business sites to each other.

[69] Ofcom [A13.53] qualifies this with respect to market growth.

Table 1

BT Assessment of Technical Features

Characteristic	General Network Amelioration	End Customer Site Access Amelioration	Residual Relevance
Availability	The customer private network can provide multiple paths meaning the end to end availability is normally much higher than availability of any one component. This path diversity, whether it is created at the component level (i.e. high availability leased line) or at the customer private network level essentially equivalent.	Diverse access can be costly whether as resilient access component or two separate access components. Higher SLA levels can be important on non-diverse access.	SLA levels can be a differentiator on non-diverse access. Otherwise little or no residual relevance.
Bandwidth	A component carries an aggregate of end to end bandwidth and the end to end bandwidth is largely decoupled from the component bandwidth. There is a broad trade-off between economies of scale in bandwidth and network diversity (see above).	Economies of scale in bandwidth suggest that few, often one, large access component aggregating all capacity to the site is cost effective. This may need to trade off with the need for diverse access to a site (see above).	The total aggregate bandwidth to a site is the basic requirement for an access component. Where the bandwidth is ultimately destined is irrelevant.
Contention[70]	Contention is a network level phenomenon and uncontended components does not remove contention from the network. Conversely multiple diverse contended components can combine to give greatly reduced contention. Uncontended components can make for easier overall management of contention.	The significant of contention on an access component is likely to depend on the degree of aggregation of customer private network traffic on the component. The more highly aggregated the customer traffic, the more likely that uncontended service is advantageous. Conversely, on site with sporadic traffic, a cost reduction stemming from a contended service may be advantageous.	Contention is a differentiator of component services. However, there is demand for both contended and uncontended services, especially for access components. Uncontended is coincidental to a business service and not defining of a business service.
Jitter	Jitter can be buffered and filtered at the receive end of a component service and the jitter completely mitigated. However, the buffer will add to latency (see below).	Characteristics of access components are identical to other components.	Jitter can be entirely removed although it may be turned into latency.

[70] Contention is the dependency of a service effective bandwidth on the effective bandwidth of other services sharing the same aggregate component. Contention can occur at many different time scales and accepting contention at one timescale can mitigate contention at other timescales. For example, session control can control contention at the session level (session requests can be refused) and this can mitigate contention at the packet level. Contention can also occur at different places in the network and control on contention at one location can mitigate contention at other locations. For example, a packet level access policer can mitigate packet level contention in the core of the network and/or egress of the network.

Characteristic	General Network Amelioration	End Customer Site Access Amelioration	Residual Relevance
Latency	Lost time can never be recovered and there is no general network mitigation for latency. Indeed a network may well add to latency by adding paths which are not the shortest (i.e. lowest latency) path.	Characteristics of access components are identical to other components.	Latency remains and cannot be mitigated.
Range	Range merely places a mild constraint on the placing of network nodes. The network must be comprised of link components and nodes and the topology is optimised around many factors of which range is but one.	Range determines a constraint on the siting of a node(s) to which a customer site can be attached. If need be, access components can be arranged in tandem to overcome any range limitation.	Range must be consistent with the general topology architecture of the customer private network but is rarely a primary constraint.
Resilience	In the context of the customer private network, resilience leads to availability. As discussed under availability, they are largely transposable, however, resiliency is the more fundamental. Generally a network is built to have diversity.	Resiliency in an access essentially means at least two diverse access components. It is largely irrelevant if this is one service or more than one service.	The residual issue is diversity independent of the number of services this is supplied through.
Security	This is a primary concern the customer private network but can be largely decoupled from the security of components through encryption. In addition, a highly secure link components can be irrelevant if nodal equipment is insecure.	Encryption can fully mitigate insecure access components.	Good security of components can remove the costs of encryption, otherwise, this is largely irrelevant to the supply of components.
Symmetry	The symmetry of bandwidth can vary widely across different customer private network and even within a customer private network.	In principle, characteristics of access components are identical to other components, however, there is more likely to be an asymmetric demand for access components.	Symmetry is not a requirement and is not defining of business service. Symmetry only affects the matching of bandwidth demand to suitable components.
Synchronis-ation	Timing across a link component for example using SDH or SyncE is one of a number of ways of achieving accurate timing at a site. Others include off air timing (e.g. GPS, eLoran), packet transfer (e.g. PTP, NTP), or a stable local clock (e.g. Stratum 2 or 3E). Often a combination is used.	Notwithstanding other timing sources (see left), synchronisation is not needed on every access component.	Even where accurate clock is needed at an end site, SyncE is a useful but not essential.

14.22 Ofcom's [A13.50] suggests that incompatibility of technology can be a barrier to switching. The first issue appears to relate to CP order gateways. In practice and absent regulation, all CPs would develop these as needed and they do not count as a barrier to the end customer switching. Similarly, the second point relates to customer equipment and this is an issue of industry standards and not any single network operator in any case. Neither points are substantive in any way with which to attribute BT with dominance.

14.23 We respond to Ofcom's [A13.52] points about BT's pricing in Section 12 dealing with BT's share in very high bandwidth services.

14.24 Economies of scale and scope. Whilst we can agree on the broad definitions applied here, we disagree with their application as we consider that Ofcom does not allow for targeting of CPs to their customers. It is far too sweeping for Ofcom [A13.63] to assert that all OCPs cannot achieve similar densities from their scale. Rival infrastructure [A13.66] is not limited to Virgin Media but also importantly includes NGA and EFM which provide important access services to this market.

14.25 Ofcom's conclusion here would appear to follow from its original hypothesis the geographic markets are either local or national. As we discussion in Section 11, geographic markets are neither local nor national but follow hotspots of dense and/or high value customer sites and the links between them. As such they might be described as 'spindly' looking not dissimilar to a map of main roads. High value customers in particular and OCPs presence are concentrated in this geography which has not been identified under Ofcom's hypothesis of markets being either 'local' or 'national'.

14.26 Countervailing buyer power. Whilst in general we would accept that demand is spread across many customers, we believe that Ofcom is taking a rather narrow view of the potential strength of large informed buyers in the presence of even vertically integrated competitors. Ofcom [Table A13.1] cites a high internal share of BT sales; this however is misleading in that BT has been restricted from offering commercial solutions to external customers by regulation thus depressing the external share itself. BT is being prevented from providing some of the competitive solutions we would do absent regulation to include volume and term discounts across a portfolio of services together in which total spend can be taken into account.

14.27 External constraints. We set out in Section I0 that Ofcom's characterisation of the downstream market is too restrictive and we believe that there are wider constraints which Ofcom is not addressing. In particular, Ofcom has not included the consequential costs on the downstream CP and on the end user which arise when changing the bandwidth of an access service. These costs are very significant and mean that customers will tend to change access as part of a major upgrade to their network. At this point, they will frequently review supplier at the same time.

14.28 Profitability. We note Ofcom [A13.88] identifies many limitations on the interpretation of BT's reported profitability. We believe that these are particularly pertinent for very high bandwidth which is in a growing market and where lifecycles of equipment are somewhat unpredictable.

14.29 Prospects for competition. We have noted above that Ofcom does not appear to have given sufficient consideration to the impact on competition subsequent on the introduction of dark fibre. We discuss the implications for competition more generally in Section 17 of our response.

OFCOM ANNEX 15: DATA ANALYSIS

Calibration of HNR

14.30 We have provided in Section 11 a number of specific examples to show the implications of a series of assumptions made by Ofcom in the data analysis which we believe is biasing downwards the assessments of HNR for many postal sectors.

Business Locations

14.31 There appears to be no sensitivity analysis to different sets of customer demand distributions especially by bandwidth. Ofcom has not addressed the issue that "all sites of large businesses" will not be a good proxy for higher value business connectivity services when undertaking the necessary proximity assessments at a reasonably granular level. In 2013, Ofcom used a variety of information including circuit ends, actual MNO sites, and MISBO ends to evaluate network reach and which gave rather different results. We have therefore requested that these additional analyses be undertaken by Ofcom.

14.32 The October 2014 Data Analysis consultation stated that Ofcom had " not reached a view on which businesses to use in the network reach analysis"[71]. As noted in Table A15.15, BT suggested a different approach to business selection and Ofcom accepts that it is possible to analyse network reach against any set of businesses. However the current consultation appears not to present results for any other than the "all sites of large businesses".

Network footprint

14.33 We note that the EFM footprint is not included at all by Ofcom even though such circuits are growing and form a clear substitute for both 10/100M Ethernet and TI services.

Circuit counts

14.34 We make the following observations:

- Ofcom [A15.67] accepts it may miscount multi-site sales but - "do not believe it is likely to have a material impact". However no evidence is provided to support this assertion.
- Ofcom [A15.85] –totally excludes 7,000 circuits where there of no interface type. There are 606k leased lines and we believe that of these, about 271k are OCP so assuming that none of these are BT circuits this is about 2.5% of OCP circuits. This is a one-way error against BT which needs to be considered in the interpretation of the service share results.

[71] Para 2.29,Business Connectivity Market Review, Consultation on Data Analysis, 8th October 2014

- Ofcom [A15.96] has identified that some circuit ends are reported with a PO box postcode and this is unlikely to be the true circuit location and more likely to represent a billing address. We agree with this interpretation but although the percentage volume of this is small (<0.5%; < 3,000 circuits), it should still be investigated further. If these errors are focused on a subset of CPs it may indicate a more systematic error in their circuit records and there may be a significantly larger number of circuits that have been recorded against a billing address, but these have not been identified if they are true geographic postcodes. It is also not clear if the same PO Box check has been done for the Business location data. We have observed similar issues with Commercial Business location datasets. If these have not been removed from Ofcom's "Market Location" dataset these will be distorting the network reach calculation as the Post Office sorting office where PO boxes are located will have multiple stacked businesses at that location.
- For operators who omitted to supply "on-net" information for a significant proportion of their circuit sales Ofcom has assumed that only circuit ends within 200m of one of their flexibility points were classed as on-net. Ofcom has not justified the choice of this distance; it may be derived from the "dig-distance" data and if so, it is subject to the same issues. As noted below, customer sites are often significantly more than 200m from flexibility points. Ofcom could easily calculate the distribution of the distance of on-net circuits to flex points and use this to choose an appropriate distance to use in this case.
- Ofcom [Table A15.7] – 18% of WDM ends have no postcode and this should be reflected in Table 4.4 market shares with an error margin. We believe this may bias against BT at this bandwidth.
- Ofcom [A15.141] accepts dark fibre inventories are probably incomplete and this will lead to a one way error against BT.

14.35 Overall there appears to be no attempt at calculating error margins around service shares and only two scenarios are quoted (with and without MNO backhaul). We believe that Ofcom should undertake some assessment of potential errors in the share calculations as most are biased against BT given that we have supplied fairly complete data.

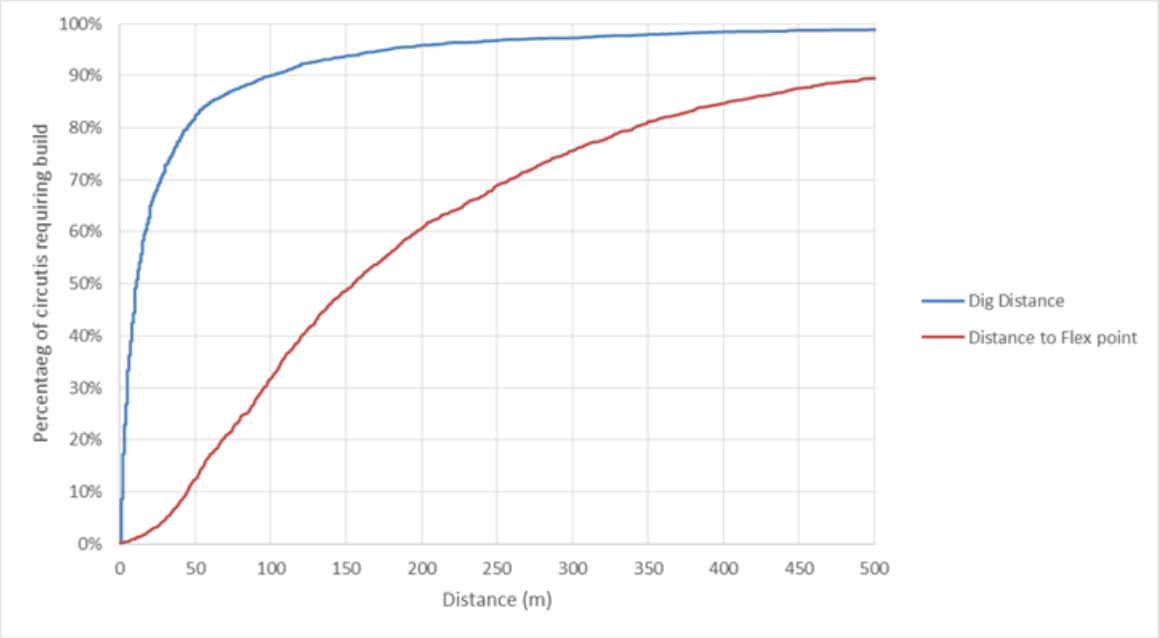
OFCOM ANNEX 18: DIG DISTANCE AND COSTS

14.36 Ofcom's method of calculating areas of "High Network Reach" estimates the number of CPs that would be willing to serve each target business site. We believe that Ofcom's method is flawed as the distance between a customer and a CP's nearest flexibility point is not a good proxy for the required dig distance.

14.37 This can be seen clearly using the data BT submitted in response to Ofcom's Section 135 Request Question C2i and C2ii which requested both the actual distance dug and distance to the nearest flex point as in Figure 1 below:

Figure 1

Comparison of dig distance and flex point



14.38 Table 1 shows the distance statistics for these two distances. If these are compared to the statistics Ofcom present in Table A18.3, it can be seen that mean and medium "distance dug" by BT is, as expected, shorter than the average of all other CPs. This is significantly shorter than the distance to a flexibility point.

Table 1

Distance Statistics for BT "new build" data supplied to Ofcom

	BT "distance dug"	**BT "distance to flex point"**
mean distance	44m	238m
Median distance	11m	155m
% shorter than 200m	96%	61%

14.39 As we have stated previously, we believe that Ofcom should either use the "distance dug" and measure it from appropriate points in CPs networks (i.e. duct routes), or analyse the distance of new connections from actual flexibility points. Mixing the two methods as Ofcom has done results in an underestimate of the competitive footprint.

14.40 We note that Ofcom did request information of new connections from the CPs flexibility points, but understand that the data submitted was not comprehensive enough to be used. However, the potential lack of data should not be justification for using inappropriate data just because it is available.

14.41 We believe that Ofcom can easily derive an estimate of actual distance that new customers are from existing flexibility points. In the last market review Ofcom collected data on the locations served by each CP so by comparing the sites served previously with the sites now served, Ofcom could derive “new sites” that a CP has connected in the last 3 years. It is then trivial to calculate the distance between these newly served postcodes and the set of flexibility points at the time of the last review. This would compensate for both errors noted in Ofcom [Footnote 383] as it would also remove errors of caused by using a measured route distance and applying it to a radial distance.

15. Legacy Services

SUMMARY

15.1 We respond here to Ofcom Section 5 (Market assessment for legacy wholesale services), Annex 10 (Wholesale product market definition) and Annex 19 (TI Trunk market definition).

15.2 We have material concerns with Ofcom's treatment of low bandwidth TI services which now face a sharp drop in prices thereby reversing current policy of modest pricing increases and also with designating regional trunk as now constituting termination absent any economic analysis or assessment at all.

15.3 There is clear evidence that both end-user and CP demand for TI services are in sharp decline; the number of new 2Mb connections expected over the next three years is extremely small. We show in Section 7 Figure 1 our latest projections for PPCs.

15.4 The networks for TI services historically have served extremely disparate groups of businesses from low bandwidth analogue circuits used for civil infrastructure up to corporate private networks. Not surprisingly, economic incentives to switch to alternative modern technologies has not been uniform and this likely reflects a range of factors; some end-users are themselves regulated utilities or public sector bodies and may not perceive much if any net benefit from doing so and some of these bodies take a greater time to migrate simply from the slowness of decision-taking. At the other end, the alternatives to high or very high bandwidth TI services have long been available and such customers are actively targeted by CPs.

15.5 BT's SDH network is actually multi-service and supports not only end-user TI services, but also PSTN signalling and a small volume of IP Stream service. These services are also in sharp decline. At some point in time BT will wish to terminate the entire network although we do not as yet have a specific timetable for this, but we have publically stated intentions to move to an all-IP network[72]. In the meantime, the costs of maintaining the network will rise on a per unit basis and network rationalisation is certainly something that would be normal practice.

15.6 Whilst BT does not wish to withdraw digital services from end-users, by the same token we do not want the market to be under any illusion that these services have a long-term future. The signal therefore of what would be enormous real price reductions gives end-users completely the wrong message and a total reversal of current incentives in the marketplace.

15.7 The fundamental issue that is at stake in this review is that of consistency in regulatory policy both between successive market reviews and within market reviews with respect to services and not one of absolute technical economic detail as such. Put another way, where there is a strongly trending decline in demand, it is well known that it is difficult to find robust answers to determining the relevant market as it becomes very difficult to establish a competitive price level to undertake a SSNIP test. This being the case, the exact extent to which TI services are affected by the relative prices of substitutes of broadband, EFM and Ethernet is in our view secondary to the correct policy to be adopted to the mandatory provision of TI services themselves.

15.8 Ultimately as we discuss below, we believe that Ofcom's market boundary analysis yields few if any useful insights as to the appropriate policy response to take when an assessment of the allocative, productive and dynamic efficiencies are taken into account in the context of the charge control. Even if we agreed with Ofcom's market boundary and market power assessments for low bandwidth TI services, we would not agree with the policy conclusions.

[72] http://www.btplc.com/Sharesandperformance/downloads/PDFdownloads/q315-slides.pdf

MARKET BOUNDARY FOR LOW BANDWIDTH SERVICES

15.9 We disagree with aspects of Ofcom's analysis on substitutability between TI and EFM, broadband and Ethernet services and respond to the individual parts of analysis contained in Section 5 and Annex 10 as follows.

(i) Qualitative assessment [5.19, A10.15-A10.25]

15.10 We consider that the suggestion that carrier Ethernet has any bearing on substitutability between TI and Ethernet is misplaced; BT's ethernet services have been class carrier grade for two decades and this has had little relevance to customer switching.

15.11 We agree that there are customer costs of switching from TI to AI services but as we explain in Section 10 of our response, these are less material than increasing bandwidth within AI itself. Customers will undertake the necessary equipment changes when they tender for service.

15.12 We disagree with Ofcom's assertion that 'Increasingly the consumers that remain on TI services are those with very specialised requirements that are least likely to move away'. We are not aware of any specialised requirements and nor has Ofcom found any in its survey.

15.13 Contrary to what Ofcom [A10.20] argues, we suggest that the survey provides absolutely no support for this position. Ofcom accepts that 79% of customers have no concerns at all so we are left at that stage with about one in five that has some concern; this suggests that the cohort of concern [5.19.1 third bullet] is a very distinct minority[73]. However this does not mean that the 20% figure is appropriate either as a benchmark that should be given weight. The issue of SLA is not directly a technology issue and reliability is not definitive of a material concern either[74].

15.14 Ofcom [A10.21] effectively tries to dismiss these findings which indicate no real concerns at all of moving to Ethernet, with an alternative hypothesis of failure to migrate from a SSNIP increase. This however takes us no further as Ofcom presents no direct evidence one way or another as to the size of this price response (we discuss price analysis below).

15.15 Ofcom [A10.22-A10.25] then identifies three sets of customers who might conceivably fall into the 'must have TI category' which forms the basis of the separate market theory. Our response is as follows:

- TI telemetry users with equipment configured for TI interfaces. In fact, these customers are predominantly moving to broadband based services. [redacted] Customers can also use telemetry

[73] That a customer may have a 'concern' does not in itself mean that this is objectively based. For example Ofcom [A9.34] cites concerns about bandwidth but broadband and NGA can easily deal with 2Mb in either direction. The fact that customers have seamlessly migrated to broadband from TI is testimony to absence of a real problem.

[74] To take another example, EPOS / ATM networks were provided historically on PPC and RPC based on service reliability and performance but as the market opened up with more fee paying cash dispensers and reduced service costs these networks were replaced by broadband based services. The structure of broadband is ideal for small data packets - the only issue is when the service fails the repair time is not as good so some CPs overcome this by having two broadband lines being provisioned. Other examples could be quoted of end-users and CPs replacing PPCs and RPCs with a mixture of Ethernet and broadband including smart metering, voice networks and local government. There is nothing inherent in TI which cannot be replicated across cheaper networks.

converters available from a number of equipment manufacturers which convert telemetry traffic into IP over Ethernet and these are available at around £500 depending on what features are required. So the most likely captured customers can in fact economically move not even to Ethernet but rather to broadband which Ofcom excludes from leased lines altogether.

- Contract period. We cannot see any particular relevance here of contract periods which will likely be less than a SSNIP period. Prices effects will inevitably have some lags associated with them.
- Critical national infrastructure. Again Ofcom presents no evidence of real customer lock-in but ends up in pure speculation that those who do not move must by definition have a problem. In fact the evidence shows that this is totally misplaced. In its consultation on VLB TI retail services, Ofcom [Section 3] discusses the results of its findings of how CNI Operators are responding to the withdrawal of sub 2Mbit/s services. Ofcom has found that most operators have migrated to alternatives such as broadband, radio or fibre build. It is noteworthy that Ofcom appears not to have found any CNI operator that switched from sub-2M to 2M as a solution. Crucially, Ofcom did not cite any CNI operator that had any specific issues that would prevent them from using other technologies in place of TI.

15.16 We are quite clear that the evidence shows that Ofcom's assertions on qualitative differences have no foundation in either telecoms engineering standards or in commercial real world experience. Ofcom now acknowledges for example that AI is able to substitute for TI in mobile backhaul and synchronisation is not a problem there either. The assertions are without any foundation in theory or practice and Ofcom's consequential speculation has no objectivity.

15.17 In practice there are a number of alternatives as shown in Table 1 below to a 2M PPC and the particular option that an end user would choose would depend on their application.

Table 1

Comparison of characteristics and prices for alternatives to low bandwidth PPCs

	PPC	Point- to Point Ethernet (carrier class)	National Ethernet Fibre	National Ethernet EFM/ GEA	Broadband Access (FTTC)
Contention	Dedicated	Dedicated	Dedicated	Dedicated	Shared
Distance Limitations	Not Limited	Not Limited	Not Limited	Not Limited	Not Limited
Service Availability	99.85%	99.93%	99.93%	99.93%	N/A
Coverage	99%	99%	99%	EFM 90%* GEA 73%	73%
Symmetry	Symmetric	Symmetric	Symmetric	Symmetric	At least 2M each way
Price**	£3,490	£6,770	£3,711	£1,875/£2045	£574

*** 90% by end of 2015**
****Pricing based on 3 year contract for 2M for 10km circuit**

(ii) Price analysis

15.18 We cannot derive the prices Ofcom [Table A10.2] quotes based on BT's price list. Specifically, we do not recognise the 2Mb/s EFM prices quoted of £614; the BT price for a service would be about £1900 and this is broadly similar to other CPs[75]. Table 2 shows our equivalent price comparison.

Table 2

Comparison of PPC and EFM prices for a 2M service

Product	Price
Partial Private Circuit	£3,490
EFM	£1,857

15.19 Given that EFM and TI prices are not so far apart as Ofcom has assumed in the Consultation it could be argued that there is a greater potential for substitution and in fact under the proposed TI charge control they will become a good deal closer. Ofcom's [A10.34] suggestion that subsequent cohorts who move to EFM from TI will be less price sensitive is speculation based on no evidence at all.

15.20 It is also important to be aware of the precise context of a SSNIP test here. The origins of the test are not actually in *ex ante* regulation but in merger control to evaluate a plausible impact of a merger in the relevant market. The price increase is modest but arbitrary and set at a level which is deliberately likely not to capture a wide economic market.

15.21 If it is the case that market definition is indeed a means to an end, then it is strongly arguable in this context that Ofcom should consider the economic efficiency properties of a much larger price change which would mirror the charge controls themselves. Whilst the current LLCC has TI prices rising in real terms and AI prices falling, the current proposal has both sets falling very strongly. We observe current migration forecasts based on an expectation of current incentives which is for a large reduction in TI volumes.

15.22 What Ofcom is now proposing however, when compared to continuation of the current framework as a reasonable counterfactual, is that the price margin between TI and EFM actually narrows in relative terms over a 2-3 year period somewhere in the range of 35-45%. Ofcom does not consider the impact of migration to a price change of this order of magnitude yet this is the relevant benchmark and not that of the SSNIP test of 5-10%.

15.23 On the one hand, Ofcom [5.24.2] argues that a wide differential gives a strong incentive for high bandwidth TI users to switch to Ethernet whereas for low bandwidth it is argued the opposite that the high differential means the services cannot be in the same economic market.

(iii) Barriers to switching

15.24 Our view is that the issues identified by Ofcom [A10.36] are not substantive barriers in that they are normal commercial and technical practice which all companies are doing on a regular basis and which apply to all interfaces and technologies. They do not give any useful policy insight as such as to how to treat TI services.

[75] This in itself is a simplification as there is not a single price for a customer it will depend upon distance from the exchange and the number of copper pairs that are needed for service.

15.25 Ofcom's [A10.40] distinction between low and high bandwidth does not capture market dynamics. A large number of PPCs were used to compete with the ISDN30 market and were used to deliver voice traffic and the PPC would be connected to a line card to provide dial tone. These have been replaced over the last 3-5 years by broadband and /or Ethernet delivered SIP trunks and hosted voice solutions. The access technology depends on site location and also the volumes of consecutive calls that need to be handled. The access will range from copper ADSL Broadband access to up to 100M fibre. We set out in Section 10 our view that Ofcom needs to look at multi-site connectivity not a single pair of sites.

15.26 Ofcom [A10.42] offers a highly ambiguous conclusion that 'barriers to switching may be important in low bandwidth TI segments' or more generally [5.19.3] that 'barriers to switching slow the rate of migration to alternatives'. In fact, the barriers to switching between TI and AI are not great and arguably less than the barriers to increasing bandwidth within an interface.

(iv) NGA and EFM are not sufficiently close substitutes

15.27 We consider that Ofcom's [5.20-5.21] reasoning is flawed and misplaced which has the consequence of leaving low bandwidth TI in its own economic market in perpetuity until the last TI customer ceases. This is in effect the outcome that Ofcom [5.27] uses to argue that medium and high bandwidth services no longer satisfy the three criteria test.

15.28 Ofcom effectively takes a series of pairwise comparisons between TI and potential substitutes which individually are assumed to fail the SSNIP test and because of this, TI must be in a separate market. This however does not recognise the underlying methodology of the HMT itself which can find such an outcome but which says little to nothing about underlying market power of a SSNIP[76]. Ofcom however on occasion considers price constraints from services outside the narrow economic market. We do not consider that this has been done adequately in this market review.

15.29 It makes sense to look at the facts here. The first is that there is abundant evidence that end-users and CPs are substituting TI services for a range of solutions of broadband, EFM and Ethernet often in conjunction i.e. TI circuits are replaced with combinations of broadband, EFM and Ethernet. In our view, the only sensible way to think of TI services is that they are 'contained' in a broader market of one-way substitution even if that broader market might be regarded as a distinct economic market in its own right.

15.30 The second material fact is that Ofcom has failed to identify end-users of low bandwidth services which are unable to substitute to an alternative network. Ultimately Ofcom's market boundary assessment is not yielding helpful policy conclusions by assertion of a need for

[76] Essentially Ofcom is undertaking an ordinal searching exercise on the presumption that the potential substitutes to TI services themselves are not economic markets in their own right. If Ofcom separately assessed that Ethernet and EFM formed an economic market, then it would not be legitimate under HMT principles even to ask the question as to whether TI could be added to these to form a wider market. By definition of the HMT, this wider set of services could not be further considered as a relevant broader market. Ofcom currently has EFM and Ethernet up to and including 1G in a separate economic market. The problem is that there is no benchmark of what constitutes 'the minimum size' of a relevant economic market. Convention has this based on the number of services but this is not definitive and alternative benchmarks could use revenue or services associated with profit/welfare loss. Different combinations of services can be combined to form 'smallest possible' economic markets but which then potentially ignore the remaining products and their price constraining impacts in their entirety. The HMT does not always give unique conclusions to market boundaries and is particularly limited when services are in rapid decline.

customer protection in the face of evidence of substitution and that this protection actually has to grow over time for the remaining customers.

WHY PRICE REDUCTIONS FOR LOW BANDWIDTH SERVICES WILL DISTORT MARKET INCENTIVES

15.31 Our ultimate goal is to migrate all customers off the TI platform and having the right price incentives is a key part of this. Ultimately, if we can close the legacy platforms this will allow us to release resources.

15.32 In setting regulation for TI services we understand that Ofcom needs to balance objectives of ensuring migration incentives are not distorted whilst protecting customers from excessive prices. In the 2013 Vodafone/Verizon Appeal, Ofcom stated that the following statutory duties were particularly relevant in the context of the pricing of TI services[77]:

> *(a)* promoting efficient and sustainable competition: by seeking to set prices in line with costs to improve allocative efficiency;
>
> *(b)* providing regulatory certainty: promoted by following consistent approaches in different charge controls and being reluctant to reopen charge controls; and
>
> *(c)* ensuring sustainability by providing BT with the opportunity to recover its efficiently-incurred costs: the charge control should not deny BT the opportunity to recover its efficiently incurred costs.

15.33 The CC Determination [2.70] then notes Ofcom's objectives in setting the level of the TI charge control were set out as being:

'efficient migration, the protection of consumers of TI services, and the opportunity for BT to recover efficiently incurred costs.'

15.34 We believe that this position is wholly consistent with Ofcom's Statement [A19.378] in the last BCMR that:

''An RPI + 2.25% control will mean that the price of TI services will rise in real terms over the charge control period. We consider that the level of the control reflects the loss of economies of scale as the network declines and provides the appropriate balance between allowing for efficient pricing signals and protecting customers from excessive prices.'

15.35 We also believe that this position was both held by Ofcom in the Vodafone Appeal and upheld by the Competition Commission:

[77] CC Determination of 12 December 2013 Paragraph 2.46. https://assets.digital.cabinet-office.gov.uk/media/5329dbffed915d0e5d0000dd/final_determination.pdf

2.96 Ofcom considered that the reallocation of 29 per cent of non-marginal costs to Ethernet resulted in an outcome that was consistent with its assessment of how TI costs would be expected to change given the large forecast fall in volume. Thus, in the Decision, Ofcom explained its basis for using the 29 per cent figure, and not reallocating further costs away from the TI basket, as follows:

> We consider it preferable to recover those common costs from the remaining TI customers. In our regulatory judgement, such an approach will promote efficiency in line with our regulatory objectives. As the legacy services decline, there is a loss of economies of scale such that unit costs rise. We consider it appropriate that this rise in unit costs is reflected in the pricing of TI services, subject to the adjustment for the common costs likely to be recovered from the Ethernet basket.[212]

2.97 At the Ofcom hearing, Mr Culham described the use of the 29 per cent as follows:

> We did a calculation based on migration to AI and we said, What does it look like if you re-allocate that quantum of costs? And we said, That looks more reasonable than where we started. That looks like a good balance, we will go with that.[213]

15.36 There is every reason to believe that unit costs will continue to rise and that this should be a relevant factor to take into account in setting TI prices as Ofcom argued[78]:

2.100 Both Ofcom (paragraphs 2.59 to 2.61) and BT (paragraphs 2.67 and 2.68) strongly disagreed with this approach. In its Defence, Ofcom said: 'It is well-known that economies of scale are significant in the telecommunications sector, and it is reasonable to expect some rise in unit costs in a declining service, just as it is reasonable to expect falling unit costs as markets grow.'[214] BT said that it would be wrong to treat all TI fixed and common costs as if they were variable costs (paragraph 2.67).

15.37 Since the last market review, volumes have continued to decline as expected, demonstrating that there are alternatives and we can see no reason to think this will change other than from Ofcom sending the wrong price signals to the marketplace. The sheer magnitude of the price reductions proposed will likely do this and cause considerable confusion in the marketplace.

15.38 In the Call for Inputs, we provided a report by Plum Consulting which considered the impact of regulation on efficient transition from legacy to new technologies[79]. This report identified three aspects of dynamic efficiency which need to be taken into account:

- The efficient time for each customer to transition given the costs, benefits and risks with legacy versus new services
- Efficient levels of innovation and investment in alternatives platforms/services to meet demand during transition
- The efficient time to close the legacy platform thereby eliminating dual running costs.

[78] See also paragraph 2.140 of the CC Determination where it is noted that Ofcom took a consistent approach to legacy Ethernet services.

[79] Plum Consulting, Leaving a legacy: enabling efficient network transition, a report for BT, February 2015. Section 2 details.

15.39 The Plum Report argued that in order to motivate efficient transition a mix of price and non-price signals can be used such as combining rising prices for legacy services with public timetables for platform closure and reduced support for legacy services during transition.

15.40 The general conclusion is that for markets characterised by transition from legacy to new counterparts, it is not desirable for regulators to in effect set the rate of migration between platforms by regulating prices for both new and old services. This is likely to result in inefficient outcomes and in the case of leased lines, allowing some pricing freedom for legacy services would allow the market to set the most efficient level of migration. Plum concluded that if legacy services are regulated there is a risk that the low pricing may result in inefficient transfer to new technologies.

15.41 In this market review, Ofcom has only partially considered the extent to which there is one way substitution between the legacy technologies and new technologies but has failed to address the extent to which the regulation of both will drive the transition or unnecessarily prolong the transition. Ofcom's [8.178] main justification for applying a punitive charge control appears to be that BT makes high returns in the TI market and this justifies a charge control. We respond separately on this matter which has precedent in for example ISDN30 services.

15.42 Ofcom presents no analysis of the impact of different controls on TI services may have on different outcomes such as different rates of migration to new technologies. Later, Ofcom [8.179] then states "*if BT's profits for these services remained significantly above costs BT (as the network operator) may itself have an incentive to artificially extend the life of the network, given the high ongoing returns*". However there is no evidence or analysis presented as to what Ofcom considers to be the appropriate lifetime of the network.

15.43 We do not consider that these reasons outlined are adequate for imposing such harsh charge controls on legacy services. When applying remedies, Ofcom has the duty to consider the extent to which the obligation is proportionate and the aim of the obligation and a balancing where objectives are potentially in conflict as was done in the last LLCC. Ofcom's aim of imposing a charge control is to curb high prices but has failed to consider to what extent a charge control is proportionate given TI is in the legacy stage of its lifecycle.

TI SERVICES AT HIGHER BANDWIDTHS

15.44 We support Ofcom's finding that these services no longer meet the three criteria test for *ex ante* regulation. These services are in great decline and at very low volumes. Low bandwidth TI services share the same characteristics and we are therefore surprised that Ofcom has not applied the three criteria test to these services in addition.

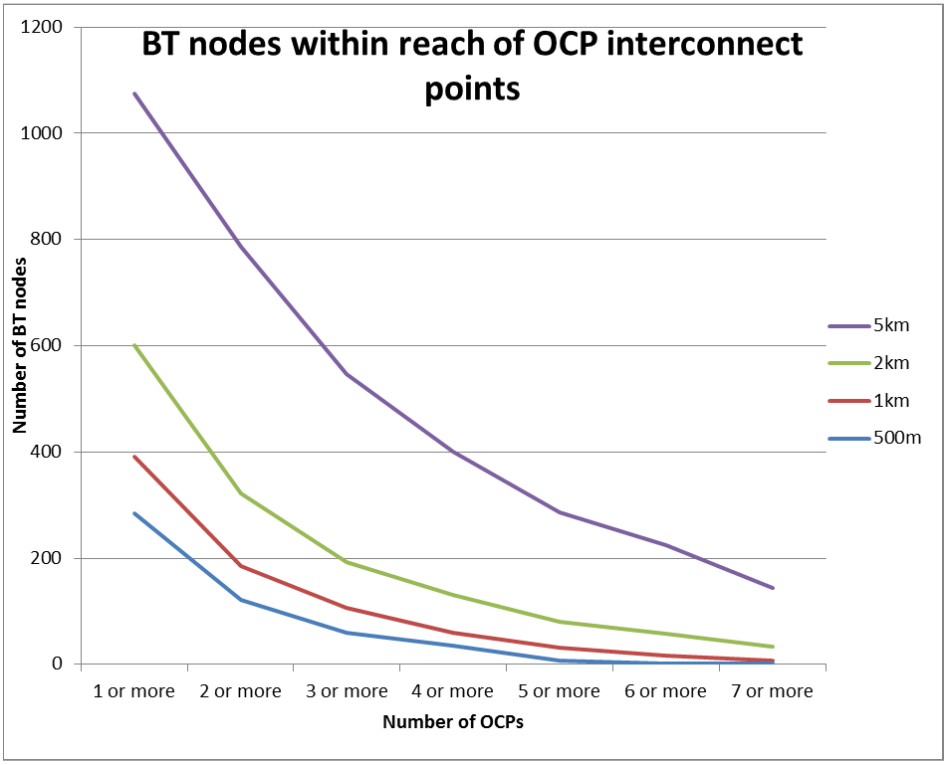
REGIONAL TRUNK CIRCUITS

15.45 We disagree with Ofcom's conclusion that the current regional trunk is now a terminating segment or indeed that this market should be subject to regulation at all. Ofcom has rolled over its previous analysis of the TI market using an approach that we pointed out is flawed. In its assessment of the CISBO market Ofcom has adopted a framework for core network boundary which is broadly line with Commission Guidance and other NRAs, so we are surprised that it has not done so for TI as well.

15.46 As part of our response to the 2013 BCMR we provided a report by consultants SPC Network which suggested an approach to defining the boundary between terminating and trunk by using the presence of other CPs at a BT Node. Figure 2 below shows the information on CP presence presented in the SPC Network Report.

Figure 2

OCP presence at BT exchanges



15.47 We are most surprised to note that Ofcom [19.25-A19.27] has declined to respond in any way to our detailed submissions on TI Trunk services including those of external consultants. We cannot think of any precedent where Ofcom has explicitly stated that it is simply putting to one side substantive and detailed submissions of both economic principles and empirical evidence which we believe casts serious doubts on the market boundary and market power assessments arising.

15.48 Specifically, we cannot find any analysis in Ofcom [Annex 19] to corroborate the findings of BT holding market power in the 'Regional trunk' market in 2016. NRAs are obliged to conduct market reviews taking into account updated information and to provide a forward look. No such evidence or analysis is present here and we cannot see how this is compliant with the requirements of the European Common Regulatory Framework.

15.49 Ofcom [A19.26] suggests that our main concerns were those of AI core conveyance. This is at best a misrepresentation of what we said but certainly what was not intended by these submissions. Our papers were detailed and fundamental to our case that Ofcom has consistently misapplied economic principles and analysis to this sector since it was first regulated by Oftel in 1999-2000. For avoidance of any doubt, emphatically our concerns were not limited to the carryover of TAN principles into AI services[80].

15.50 Ofcom [A19.6] raises concerns about the competitive conditions in these short routes would be more like terminating circuits. Ofcom therefore defined the Regional Trunk market which

[80] For the further avoidance of doubt we accept that Ofcom's [A19.25] quote is correct. For clarification, our positon on 'safeguard cap' should have been construed as implying continuation of the current policy of pricing all TI services to encourage migration away from this technology.

is based on connectivity to nearest neighbour TANs. However nearest neighbour connectivity is entirely arbitrary and ad hoc in nature for which there is no solid economic justification.

15.51 Ofcom's [A19.1] TAN areas shows that the geographic coverage of TANs varies enormously from small TANs such as London to larger TANs such as Cardiff which covers about a third of Wales and most of the south west of England. A circuit between Plymouth to Liverpool would be considered as containing a regional trunk segment. Yet a circuit from Chelmsford to London would be classed as a trunk circuit.

15.52 Ofcom [A19.35-19.38] argues that what are currently Regional Trunk segments should be treated as terminating segments and cites ComReg as an example of a regulator that has adopted a similar approach. However, the analysis by ComReg of the trunk segments is based on the presence of other CP infrastructure not dissimilar to that proposed in the SPC Network report and in Ofcom's own analysis of the CI market. This is not the case for TI Trunk which is really a redefinition of regional trunk as a terminating segment.

15.53 Ofcom [A19.29] does not recognise that to the extent there is any consolidation in PoH, this is actually resulting in a strengthening of the market position of Vodafone which, as we pointed out in our July 2014 submission to Ofcom, has freely admitted it can compete effectively against BT with interconnection way outside the regulated TANs. In any case, we believe that Ofcom has misunderstood the data on handover statistics published in the RFS which does not show rationalisation it imagines.

15.54 The conclusions of Ofcom's [A19.19-A19.24] analysis of PoH are not clear to us; Ofcom appears to be arguing that as volumes of PPCs fall it becomes more difficult to maintain PoH and cites data in Table 19.1 as evidence. In actual fact, what this Table represents is little more than the fact that most PPCs have a PoH and when the underlying circuit has ceased so has its PoH i.e. one less circuit is handed over at a particular PoH. But the physical location still remains and so Table 19.1 only indicates that PPC volumes are falling which is not in dispute. There has been a negligible reduction in the actual locations i.e. nodes where interconnection take place.

15.55 Ofcom then expresses concerns that CPs have to buy space in BT exchanges and high capacity interconnect links. We can confirm that CPs do not buy space in BT exchanges to establish interconnection. Furthermore PoH kit is paid for by CPs at the time of establishment and is therefore a sunk cost. There are small maintenance costs associated with the kit.

15.56 Taking these factors all into account, we therefore do not agree with Ofcom [A19.33] that 'the direction of travel' is any justification for not adopting a more rational basis for determining the boundary between terminating segments and a competitive core network. There are extremely good reasons to change the number of TANs contrary to what Ofcom [A19.34] asserts as laid out in the two Papers which Ofcom has declined to respond to.

15.57 We are therefore now not clear as to whether Ofcom continues to disagree with BT and its consultants on the material failures and errors in the regulation of TI Trunk services or if it agrees with us that there are such errors but due to the particular circumstances of decline in demand, it is not worth re-visiting any of the underlying issues involved. We therefore formally request that Ofcom clarifies its position here and responds to the point which we and SPC Network made in the Papers submitted in July 2014.

Conclusions

15.58 Fundamentally we cannot see any reason why TI services should be treated differently from CI services where Ofcom is starting to adopt an approach based on CP presence. This is important to achieve technology neutrality and consistency in approach. We do not agree

with re-classifying regional trunk circuits to terminating circuits absent proper economic analysis which addresses the issues we have raised in our economic papers.

15.59 Ofcom should apply the three criteria test to the low bandwidth services to determine if they are susceptible to *ex ante* regulation. We do not consider that they are in fact susceptible to *ex ante* regulation.

16. Benefits of Passive Remedies

SUMMARY

16.1 This section sets out our detailed views on Ofcom's analysis of the potential innovation benefits of dark fibre (in particular addressing Annexes 23 and 27 of the Consultation). BT does not consider that these benefits have been well evidenced or that they have been properly balanced by the costs and risks of introducing dark fibre. Section 17 of this response provides comments on the analysis of risks in the Consultation, and an overview of BT's position on the costs, benefits and the framework in which these are (and should be) assessed is provided in Section 3.

16.2 Business connectivity in the UK is already a thriving marketplace, with high growth in demand, high degrees of technology innovation and rapidly reducing prices as highlighted in Section [1] above and discussed in detail in Section [10]. Competition in retail markets, and increasingly in wholesale markets, is intense as Ofcom's market statistics have proven. As set out below, BT disagrees with the view in the Consultation that innovation would be further stimulated by the introduction of passive remedies.

16.3 Openreach has a track record of innovation in active business connectivity products (and other services) and strong incentives not only to expand its customer base but also to encourage migration from old to new technologies to manage costs and to compete with other major infrastructure players in the UK such as Virgin, Colt and others.

16.4 The role that Openreach plays in taking the upfront investment risks and in working through the prioritisation and standardisation of requirements from CPs should also not be underestimated. CPs often have conflicting demands and objectives between themselves (not just with BT or Openreach). The open and transparent Openreach development process brings about a degree of alignment which allows the whole industry to move forward and compete on a level basis.

16.5 Generally speaking, Openreach's services require a level of take-up across a wide range of CPs and not just downstream BT. In contrast, even if a significant technology innovation deployed by a CP over a new passive Openreach input product was viable, it would mean the benefits are likely to be reserved only to that CP's part of the downstream market, rather than across the market as a whole via an Openreach equivalent wholesale product set.

16.6 Openreach engagement with CPs and other stakeholders leads to a constant stream of change and innovation on all products and services supplied; be that copper, NGA or business connectivity. Some notable examples would include developments on the leading edge of technology supporting new services demanded by CPs and end-customers, such as:

- the widely acknowledged success of superfast broadband in terms of availability, take-up and competitive framework in the UK;
- the recent announcement of the new NGA2 investment programme to bring speeds of circa 500Mbps to 1Gbps to most homes in the UK within a decade;
- the introduction of friendly 'alien wavelength' technologies into Openreach's optical portfolio;
- the launch of Openreach's mobile 'small cells' product[81]; and

[81] Known as Mobile Infill Infrastructure Solution (MiiS).

- the recent extensive discussions with MNOs assessing their requirements and possible new applications of 'passive optical networks' to meet their future needs in terms of price, coverage and capacity.

16.7 In addition to these specific examples, Ofcom's own detailed analysis of the history of Openreach Business Connectivity Statement of Requirements (SoRs) requests has identified some 60 product developments which have been delivered in recent years (plus an additional 10 in progress). These are all requirements requested and supported by customers and delivering real benefits ranging from new order processing, fault management and T&D functions to new very high bandwidth services such as 10G EBD and Optical services.

16.8 In contrast to this, claims that passives would lead to faster and/or greater levels of innovation by either CPs or Openreach lack evidence and are not plausible. Under a passives environment, CPs would typically experience the investment risk directly, with a smaller addressable market over which to recover the costs of innovation and there is no evidence to suggest that time to market would be significantly reduced given the need for vendors to co-ordinate new product portfolios with established or evolving international standards. We are sceptical that any of the forecast new circuits which Ofcom predicts will arise in the charge control period will be stimulated by innovative (rather than simply price based) uses. The recent discussions with MNOs are a particularly apposite example (see discussion in Section [3] above).

16.9 In summary, the regulatory framework established for Openreach in 2005 continues to be appropriate and supporting innovation. It is promoting ever stronger competition and supporting major investment by BT, Virgin and others in the UK's infrastructure. The evidence that it is working is clear with rapidly increasing demand and reducing prices, all built on a highly regulated open access framework which allows CPs and their customers to benefit from the shared economies of scale and scope inherent in the Openreach model primarily around active services for businesses.

OFCOM ANNEX 23: BENEFITS OF PASSIVE REMEDIES

Dynamic benefits

Background

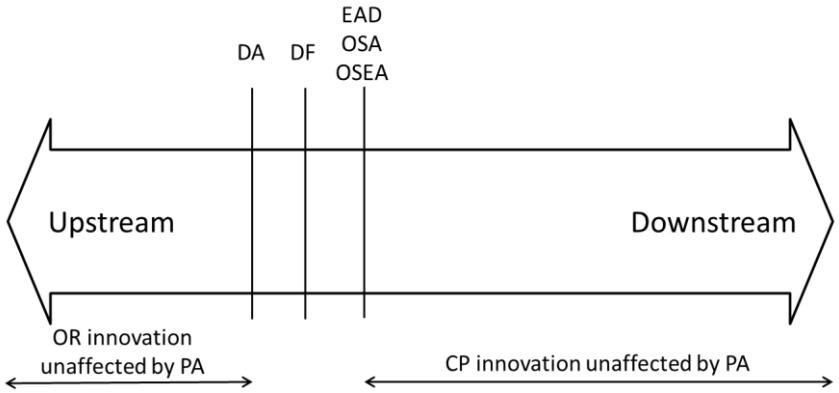
16.10 In reviewing all the inputs from the April 2014 CFI and November 2014 consultations, Ofcom does not make any direct reference to our scoping framework for innovation through passive remedies. We pointed out that the scope for innovation resulting from passive remedies sits in a very narrow slice of the production chain between innovation which must be carried out by Openreach even with passive remedies as they directly involve the passive infrastructure and innovation which can be carried out by CPs even with the current active remedies[82].

[82] BT Response to Passives Consultation of November 2014 dated 5th January 2015 Annex 4.

16.11 We reproduce this framework below in Figure 1.

Figure 1

Position of Openreach in value chain



16.12 The only innovation which is relevant is either innovation in the laying and routing of cables through existing duct (duct access only) or innovation in the functionality and operations associated with the EAD terminal equipment (both duct access and dark fibre)[83].

16.13 This provides a clear and simple framework for analysing the prospects for innovation and allows all suggested benefits to be categorised. While Ofcom has indirectly applied this logic in considering the specific benefits claimed would arise by different CPs, a simply summary categorisation would reveal that the majority of the claimed benefits cannot be achieved by passive remedies and especially not with Ofcom's proposed dark fibre remedy.

16.14 While Ofcom [A23.256] acknowledges the overwhelming practical difficulties and very limited geographic applicability of duct access, Ofcom does not acknowledge the very narrow opportunity for innovation presented by dark fibre.

16.15 As we set out in Section 17 of our response, the primary volumes of dark fibre usage would result from price arbitrage against the bandwidth gradient. For the reasons set out below, the evidence that there would be significant dark fibre usage to support innovation and differentiation by downstream CPs is weak.

Product and service innovation

16.16 Ofcom's [A23.79-A23.95] analysis only addresses the potential for innovation from passive access and does not at any point discuss the constraints on innovation. The discussion centres on 'innovation in the active layer'; however, there is no definition or discussion on what innovation sits in this active layer.

16.17 Innovation which may have been inhibited by the SoR process is discussed below in our response to Annex 27. In summary, we find practically no evidence of an innovation that would have been developed with passive access that was not developed under the SoR process or appropriately assessed by the SoR process. As regards the timeliness of the SoR process, we consider that Ofcom's comments in [A23.82] are highly misleading as these statistics are heavily influenced by Openreach generated SoRs and which necessarily took a considerable time to bring to market. The implication that passives would have resolved these issues is not established or, in our view, correct.

[83] See column B in Table 1 of our submission.

16.18 Ofcom's own analysis in Table A27.6 shown below highlights the differences:

Figure 1

Ofcom analysis of SoRs

Table A27.6: Time taken for SoRs to be delivered by customer (2006-2014)

	Number of SoRs Delivered	Time to deliver (months)		
		Average	Min	Max
BT	29	14	4	37
Other CPs	8	15	1	29
Openreach	22	22	1	65
OTA	1	17	17	17
Total	60	17	1	65

Source: Ofcom analysis based on Openreach data submitted in response to s.135, Q.A8 on 11/11/2014

16.19 Openreach sponsored SoRs have the longest average time to deliver with the two longest projects being essentially regulatory deliverables ('Externalising TILLBP – 65 months' and 'Optical Spectrum Service IBMC – 43 months') and not examples of CP innovation. The corresponding longest time for a CP sponsored request was 29 months - less than half of what Ofcom cites.

16.20 Ofcom's [A23.84-A23.85] discussion of CPs having "end-to-end control" is also erroneous as CPs already have end to end control with active products. The Network Terminating Equipment (NTEs) of the EAD product do not interfere with end-to-end control and innovation; in fact end-to-end control sits firmly downstream of the current active remedies. As regards the specific examples cited by Ofcom, lower latency is not feasible as the routing of the fibre is the same in the active remedy as dark fibre and the delay through the NTE is negligible in the overall end-to-end delay[84]. Synchronisation is available with the active products as Ofcom fully acknowledges elsewhere. Software Defined Networks (SDN) is fully realisable using active products and sits firmly downstream of the active domain.

16.21 Ofcom frequently refers to passives giving CPs the ability to "upgrade and/or reconfigure services". SDN is but one example of how this statement is highly misleading as the overwhelming majority of upgrades and reconfiguration lie downstream of the current active remedies. Price arbitrage of density and bandwidth cannot be classed as an innovation.

16.22 We note that other than those theoretical innovations dealt with above, Ofcom [A23.87] is unable to cite or give support to any putative innovation and effectively accepts this when stating that: "We do not seek to take a view as to the specific innovations that would occur with passive remedies. Rather, we recognise that in principle access to passive inputs would give CPs the flexibility to differentiate, innovate, and upgrade without being dependent on BT".

16.23 In our view Ofcom should have 'taken a view' [A23.87] on at least the generic types of innovation that could occur with dark fibre. We cannot see any consistency in this matter from the statements made by Ofcom in the last review and the current Consultation.

[84] Some improvement in fibre route length may be possible with duct access but Ofcom is not proposing this remedy.

16.24 Regarding C-RAN, we note that Ofcom [A23.89] now agrees with BT that this may not be based on dark fibre but then, without any specific evidence, suggests that its provision might allow for alternative solutions to emerge. We note that whatever solution may emerge will develop within the global industry where development timescales are considerably longer than Openreach's SoR process. Ofcom however does not recognise that the particular solution proposed by Ofcom of an EAD 1G minus will likely not be suitable either for this sector.

16.25 In fact, recent discussions between Openreach and MNOs now suggest that dark fibre is unlikely to deliver the efficiencies and cost points required for future expansion. The emerging view[85] is that there are potentially more efficient long term solutions based on active products (including Ethernet, WDM and passive optical networks/PONs) which may be a better fit. This is a new area of focus for the UK mobile industry but Openreach is already in the process of assessing their needs and actively discussing potential development options with vendors with international experience in this area.

16.26 Following initial industry workshops in January and April 2015, Openreach has now held detailed bi-laterals with all UK MNOs to assess likely volume requirements and suggested price points, and this has enabled Openreach to progress development of an initial business case and product specification. Further MNO bi-laterals will follow as will an additional industry wide session being planned for November 2015.

16.27 Ofcom [A23.92] cites an incentive on BT to innovate with active circuits. As is clear from the review of the SoRs discussed below, the scope for innovation is in the very narrow gap between passive remedies in general and especially that of dark fibre, and the current active products and it is extremely limited. Most innovation is either upstream of passives and must be undertaken by Openreach anyway or is downstream of the current active products.

16.28 We believe that Ofcom [A23.94] is completely misguided believing that smaller CPs will be able to effectively compete using dark fibre; in fact the costs to smaller CPs of moving to dark fibre will be considerable due to the need to develop systems for monitoring.

16.29 In summary, Ofcom [A23.95] asserts, based on very weak evidence, a belief that innovation in the active layer would be unlocked by passive remedies. Specifically with respect to dark fibre we supplied Ofcom with detailed technical explanations as to why this is highly implausible. Ofcom does not identify any specific innovations in the Consultation which were unlocked by dark fibre in any jurisdiction, nor provide any general reasons why dark fibre might do so in the UK.

16.30 In effect, Ofcom is proposing a total transformation of regulation in the sector with all attendant risks but has not identified a single meaningful innovation which would be unlocked as a result.

Improvements in service quality

16.31 First, and noting many CPs cite service provisioning as a major benefit of passive access, we agree with Ofcom that the passive remedies will make little difference to service provisioning lead times and that dark fibre would make no practical difference at all. The provisioning of the fibre is the time consuming process and the provision of NTE on the end only on rare occasions causes any additional delay. Moreover, the provision of the NTE automatically provides a line test and dark fibre would need a new process for line test almost identical to the provision of the NTE.

[85] See http://www.lightreading.com/roi-tco/altiostars-c-ran-steps-into-the-light-junks-dark-fiber/d/d-id/712169. Further vendor details are also available.

16.32 As regards fault repair, Ofcom [A23.99] is entirely wrong in its statement that "most reported faults seem to occur in the active layer". Over the last 12 months, which is reasonably representative of long run statistics, fibre faults exceeded NTE faults by more than two to one[86]. Ofcom here is incorrect to agree with Talk Talk that there is scope for improvement in service quality; there is no evidence that removing EAD will improve fault repair by removing a fault liability.

16.33 Indeed the opposite is the case as we have consistently pointed out. Over the last 12 months, and again in line with historic statistics, nearly two thirds of all faults reported to Openreach were not faults with the Openreach service. In these cases, the CP had in fact incorrectly diagnosed a network problem in their own network as being a fault with the Openreach service and this despite the fact the NTE has a clear indication of the service status which could have been checked before a fault was reported.

16.34 Under dark fibre, Openreach no longer has NTE and a number of consequences are inevitable which we set out below:

- The number of misreported faults will increase as there is no demarcation point to monitor to distinguish customer faults from Openreach faults.
- The time taken for Openreach to confirm a fault will increase substantially – it is almost instantaneous at present but under dark fibre is likely to require a more complex and time consuming process - perhaps requiring site visits to both ends of the circuit to carry out specific tests to confirm that there is a fault on the dark fibre element (and what is the nature of the fault) and as noted above this is likely to be the cause in only a minority of cases.
- There is considerable room for disagreement and disputes on SLAs as Openreach has no means of generating its own service statistics.

16.35 Given that even under the current monitored service nearly two thirds of all fault reports are incorrect and the service is in fact working properly, Openreach can have little confidence that the diagnostic process suggested by the likes of Vodafone is practical. These proposals inevitably lead to a need for Openreach engineers to be on stand-by around the country to test fully working fibres at the request of any CP - and at an operational and financial cost to Openreach. Clearly such an approach would not promote efficiency or investment and would lead to an unacceptable increase in Openreach's cost base.

16.36 The overall result is that repair times will inevitably be worse than with current active products and it would seem probable that the number of SLA disputes will increase. We also note that in Ofcom's BDRC customer survey, reliability was the service feature business customers cared about most[87].

Innovations in network design

16.37 Ofcom acknowledges that any innovations that might arise in network design will likely arise from duct access and not from dark fibre (A23.105). As regards dark fibre, Ofcom again makes the unsubstantiated statement that "Both duct access and dark fibre remedies would give CPs control over the choice of network equipment and therefore both would allow them to realise other benefits". As we discuss above under product innovation, no such benefits have been identified by Ofcom despite extensive consultation.

[86] Openreach fault reporting statistics June 2014 – July 2015.

[87] BDRC Report on Quality of Service Figure 5.15. We consider that reliability and responsiveness to faults are effectively a joint set of attributes where repair time will be critical.

16.38 BT agrees with Ofcom that there are considerable practical challenges with implementing duct access and notes that as a consequence, Ofcom is not proposing duct access. In regard to duct access in other countries, we note that Ofcom has not discussed the very different conditions that exist in different countries.

Provisional conclusions on dynamic efficiency

16.39 Ultimately, the only way any CP will ever be able to have complete control and have the ability to realise all the postulated innovations is if it invests in its own infrastructure network. Whatever Ofcom mandates as a remedy in the BCMR, this will not be something BT will provide with either dark fibre or duct access or both together.

16.40 Ofcom [A23.111] argues that the SoR process constrains some developments. In this context we suggest that Ofcom has singularly failed to provide any evidence that any of the rejected SoRs would have been commercially viable with passives. There is no reason to suppose that passives will have anything other than a minor totally inconsequential impact here and Ofcom's [A23.112] suggestion they may go 'some way' about alignment of incentives is nothing more than conjecture founded on no evidence. In this respect we also note the analysis we have carried out on Annex 27 below where little if any evidence exists that dark fibre would have resulted in any further innovation.

16.41 We agree with Ofcom [A23.114] in its conclusions regarding duct access but disagree that dark fibre will have any material impact on service innovation. Dark fibre does not make innovation easier than active services and the scope for innovation between dark fibre and the current active products is a very small slice of the product chain. It should come as no surprise to Ofcom, that despite over twelve months of consultation, no plausible innovation has been found.

16.42 Ofcom should use its formal powers of investigation to ascertain for which technical innovations CPs have firm plans to advance with dark fibre over the coming review period and the status and scale of those plans.

Productive efficiency

Competition on the merits and arbitrage

16.43 Ofcom [A23.144] cites BT's OSS costs as a barrier to CPs. These have been put in place to meet EOI regulatory obligations and would not change as a consequence of passive remedies. If as Ofcom [A23.145] suggests there are small projects of a niche nature then that is precisely what they will remain – niche and inconsequential in the overall scheme of the marketplace.

Equipment savings

16.44 Ofcom sets out this scenario as if there were material savings to be made when in fact the vast majority are actually sunk costs and any putative savings are unrealisable. Ofcom has in addition failed to factor in additional network investments BT has had to make in the monitoring of BT's end boxes which also is not recoverable. CPs will also have substantial new incremental costs which are not taken into account. Overall this can only lead to an understatement of true costs and an overly optimistic view of benefits.

16.45 In the context of the assessment of the economic benefits of dark fibre, it is apparent that Ofcom [A23.161] takes its forecast of potential cost savings as equivalent to complete migration to dark fibre at all bandwidths. Either this is a credible forecast in which case the ramifications are profound, or alternatively it is not credible, in which case it is at best highly

misleading[88]. It is also inconsistent with the volumes of dark fibre take up Ofcom has assumed elsewhere (for example, see paragraph 6.83 of the LLCC Consultation). What is not clear is the speed at which migration is assumed to take place; Figure 6.3 of the LLCC contains only two years up to 2018/19 and clearly there is a distinct possibility that within the following charge control period a very wide range of values could be chosen for take-up of passive services.

16.46 These costs have been incurred by BT plc. If Ofcom wishes to assess cost savings it would be necessary to take a forward look in counterfactual terms of actives being maintained. As it stands, Ofcom's [A23.161] long run upper range estimate of £120m is totally misleading and simply incorrect[89].

16.47 While Ofcom has considered the possible cost saving of passive remedies and in particular dark fibre, Ofcom has not considered new costs that arise as a result of the passive remedies. In particular, Ofcom has not considered the increased costs of test and repair which must arise from the removal of the boxes which automate this process. Put simply, dark fibre means that automated test and repair must be replaced by one of three options:

- a manual test process potentially requiring a site visit to each end of the dark fibre;
- a manual customer site of sufficient quality and reliability that Openreach engineers can sufficiently trust the information to start intervention in the physical network (for example this could involve an OTDR measurement and graphical report highlighting the exact fibre length to a break); or
- a fully automated OSS interface between the CP's real time monitoring OSS and Openreach's OSS to allow Openreach to test the fibre using the CP's facilities.

16.48 The first and second of these options, being manual, can only be appropriate for a limited number of circuits and would not scale to the >100,000 circuits which may be the case.

16.49 The third option, which is the only solution which would scale, would require expensive OSS development by *all* CPs including Openreach. BT expects that the size of such costs would likely entirely eliminate any costs saving from NTE capital costs.

Provisional conclusions

16.50 For the reasons set out above BT does not believe that Ofcom has actually identified any cost savings. As a result BT does not agree with Ofcom's provisional conclusions at paragraph A23.169.

Potential to withdraw or relax downstream regulation

16.51 Parallel sets of obligations [A23.187] will increase not 'reduce the overall burden on BT'. See the discussion on this point in Section [3] above. Additionally, the level of coordination, interaction and dispute between parties may in fact increase given the lack of an automated T&D process for the Openreach element of the service.

[88] Ofcom [A23.161] caveats its statement with the words of 'up to £60 - £120m'. This is no more than a statement of mathematical fact. It should also be noted that a considerable proportion of these cost savings are for BT's own use circuits and all the costs are sunk. Further, if a forward look is to be taken it would be necessary to look at the likely development of equipment costs and not historical costs to assess potential future savings. The cost of optical equipment potentially lost for >1G services is also highly relevant.

[89] Given that BT consumes a significant proportion of active circuits Ofcom is implying BT can save money on expenditures it has made for itself. This is illogical and unexplained.

16.52 We do not agree with Ofcom [A23.191] that CPs would only gradually move over to passive services. We set our position with regard to migration in Section 17 of our response in some detail and completely disagree with Ofcom [A23.194] that this would take longer than LLU.

Forms of passive remedies and allowed use

16.53 We again note that most interest for dark fibre according to Ofcom [A23.198] is actually for mobile and fixed backhaul and this is clear from the replies from most respondents. This negates any argument of innovation in technical features that has any benefit to business end users.

16.54 Further, in considering the scope of possible passive remedies, Ofcom has given no consideration to the boundary between access and core networks. The remedy as proposed would be equally useable to build core networks where no SMP has been identified.

16.55 In addition to LLU backhaul we note that Sky also suggest there would be opportunity to use passive access in order to deploy FTTP solutions and cites trials they have undertaken. First, we note that this suggestion is primarily based on duct access and not dark fibre and Sky's primary interest in dark fibre would appear to be LLU backhaul which in our understanding is simply an interest in price arbitrage[90]. Second, the cost and technical requirements for successful deployment of FTTP are extremely challenging and Openreach is already at the forefront of overcoming these challenges.

16.56 In this context we would make the following points:

- As proposed, while aimed as a universal investment, the FTTP is primarily focused on residential services and not the subject of this review which is of "wholesale high-quality access provided at a fixed location".
- It seems highly implausible that any possible gains from dynamic efficiency could outweigh the considerable productive inefficiencies that passive access would introduce when compared to the current NGA solution and developments (eg exploiting G.fast technology).
- The practical difficulties of managing duct inventory for duct access are at their most extreme in the outer reaches of the residential network.

Ofcom's provisional conclusions on passives

16.57 Ofcom [A23.250] appears to form its judgement on the merits of either or both passive remedies as dependent on an 'appetite' of CPs for passives. However, Ofcom has not considered whether such an 'appetite' is for arbitrage, especially in backhaul, or for real innovation. As we have argued both above and in the response to Annex 27 below, Ofcom has not identified any meaningful innovation which might arise from passives.

16.58 We repeat our rejection of Ofcom's [A23.253] assertion that dark fibre would allow innovation and new features such as technical standards. The Consultation has not established this and Ofcom's approach ignores the fact that any meaningful technical innovation is driven by the global industry not any one CP. We note that not one single CP appears to have identified any meaningful technical innovation whatsoever. Establishing the existence of any benefits of dark

[90] In this context we note that Ofcom [Table A27.12] mischaracterises Sky's assertion that NTE does not allow for access to capacity of underlying fibres. All this is saying is that they can avoid the bandwidth gradient of an active service by taking dark fibre. This is emphatically not an innovation related to technology or service features.

fibre is fundamental to justifying such a remedy and Ofcom requires hard evidence to underpin this rather than general assertions.

16.59 Finally, we note Ofcom's [A23.259] summary conclusion "In our view, the key opportunity and competition from passive access lie at the active layer." We again restate that the only meaningful opportunity that lies at the active layer is price arbitrage, especially for mobile and LLU backhaul.

OFCOM ANNEX 27: INNOVATION

Overview

16.60 We agree that technological innovation is an important element of any well-functioning market and therefore recognise why Ofcom has found it necessary to consider this important element in its BCMR analysis. However, having reviewed Annex 27 of the BCMR consultation in considerable detail, we find that it does not show any evidence at all that the availability of passive remedies (including dark fibre) would have contributed to further major innovations in the Ethernet space.

16.61 We also find that Ofcom's analysis does not consider the negative effect of dark fibre on innovation for the Openreach active portfolio[91]. In our view, Ofcom's analysis only looks for evidence of developments which dark fibre might have enabled rather than consider the topic in the round which would be a balanced approach and essential for any assessment of appropriateness as a remedy and proportionality.

16.62 By definition, it is true that the provision of dark fibre exposes more parts of the Ethernet value chain to an individual CP's control than an active remedy, but this is a superficial conclusion which says nothing in itself[92]. Ofcom's analysis lacks any appreciation of the consequential issues for example:

- how such control is utilised;
- the costs of implementing the required process changes and network management systems;
- the implications and costs of procuring new equipment and so forth.

16.63 It is clear that any material new innovation is only likely to be tenable through either active or passives remedies if the market forces, level of demand, maturity of standards, equipment availability (and many other factors) all combine together. Telecoms companies do not generally innovate individually as they have to interconnect and be interoperable, and hence Ofcom has not really addressed the fundamental nature of innovation in the telecoms sector in its analysis. Clearly it may be possible to physically connect any specified device to dark fibre but to conclude that this constitutes a quality solution to a business connectivity requirement, and hence a meaningful innovation, is not correct.

16.64 Hence many of the factors which influenced the cancellation or rejection of individual SoRs in Ofcom's analysis would have a similar effect whether or not dark fibre was available. The implementation problems may have been shifted from Openreach responsibility to the dark fibre user, but Ofcom's counterfactual statements are presented without any of this deeper analysis of operational, commercial and technical factors and there is no effort to assess whether there would be a business case at an individual CP level for such developments.

[91] That is, that the presence of dark fibre may have undermined active developments which could only take place given the critical mass, multi-CP appeal and open access nature of the Openreach active portfolio.

[92] Our response to the Passives consultation of January 2015 provided technical detail on this matter.

16.65 Ofcom's high level review of SoRs does not demonstrate any material evidence that the availability of dark fibre would have led to significantly more innovation in the business connectivity market than that which has already taken place with active remedies and driven by the existing market pressure, CPs requirements and Ofcom's current regulatory framework.

16.66 In opposition to the counterfactual analysis we have the reality that business connectivity in the UK is already a thriving marketplace – with high growth in demand, high degrees of technology innovation and rapidly reducing prices. Competition in retail markets, and increasingly in wholesale markets, is intense as Ofcom's market statistics have proven. Active remedies provide a level playing field supporting strong downstream competition amongst several hundred CPs ranging from very large multi-national players such as Vodafone to niche UK business or regional operators and it is against this already successful competitive background that Ofcom's assertions of the incremental innovation benefits of passives should be tested.

Ofcom's SoR Analysis

16.67 The central part of Ofcom's analysis in Annex 27 focusses on the historic record of SoRs provided as part of a formal information request in November 2014.

16.68 Ofcom's conclusions on the selected SoRs are presented in an overly definitive way which cannot be justified by an analysis of the evidence[93]. The implication is that there would have been circa 30 *additional* examples of innovation in the Ethernet portfolio had passives been available. However this is deeply misleading and our analysis shows that:

- For many of the SoRs, the availability of dark fibre would not have made any significant difference to the development or otherwise of the change requested under the SoR.
- Some SoRs identified in the Ofcom list are in effect double counted. Requirements were resubmitted as part of subsequent and better specified SoRs and delivered. Where subsequent SoRs were <u>not</u> delivered we have found little evidence to suggest that dark fibre would have affected that decision or enabled the "innovation" to be delivered.
- Some SoRs requested changes which could not reasonably be described as major innovation, but were focussed specifically on Openreach operations or in some cases effectively seeking price reductions.
- Some were for legacy technology or very low volume numbers (in some cases affecting only <u>one</u> circuit).

16.69 In fact, the majority (67%) of the 30 cancellations/rejections listed by Ofcom were cases where the sponsoring/lead CP was a part of BT Group (see Table 3 below). If an economic case was really present for significant innovation, and our incentives were not aligned with regulation as some CPs have asserted, then it would be even less likely that Openreach would have turned these down. On the contrary they should have been the most likely SoRs that Openreach would have undertaken to benefit BT at the expense of its downstream rivals.

16.70 Notwithstanding these points, we have undertaken a detailed consideration of all the SoRs where Ofcom finds a potential problem. In all the cases we reviewed, the conclusions reached by the SoR process at the time still appear reasonable in retrospect. This should not be too surprising given the level of regulation and governance which applies to the process, and the

[93] For example in paragraph A27.40 – 'In each of the above cases we consider that a passive remedy <u>would</u> enable a CP to meet all or much of the need of the SoR with varying degrees of benefit…' (underlining added).

personal scrutiny applied by the EAO, OTA and Ofcom on a regular and detailed basis as detailed below.

16.71 The results of our SoR review are summarised in Table 1. We find there is little to no evidence that the non-availability of dark fibre has prevented any meaningful innovation in the supply of active services.

16.72 The detailed SoR by SoR review leads to some fairly clear conclusions. There is no substantial evidence apparent from the SoR analysis which points to innovation being held back a lack of dark fibre. Even for the two SoRs where we have tried to give some benefit of the doubt, it is highly questionable whether they actually represent significant innovation in networks/services other than being a transfer of some specific network management responsibilities between parties.

16.73 Taking a wider view of the total SoR base, our analysis indicates that from an initial total of 181 past SoRs, 10 are still in development, 60 were delivered, 52 were rejected and 59 were cancelled. Of the 111 cancelled/rejected SoRs, Ofcom identified 30 examples where they concluded that the absence of dark fibre may have prevented innovation from taking place. Table 2 provides the relevant statistics including our SoR analysis.

Table 2

SoR analysis by status

SoR Status	No of SoRs	% of total
Delivered	60	33.1%
In Development	10	5.5%
Rejected	51	28.2%
Rejected - DF may have supported development	1	0.6%
Cancelled	58	32.0%
Cancelled - DF may have supported development	1	0.6%
Total	**181**	**100.0%**

16.74 Analysis of these 30 SoRs in more detail shows that perhaps only two might be argued as including some innovation from a technology, network or CP perspective. These were SoRs 8166 and 8374. These were particularly complex and some elements of the request do demonstrate some innovative benefits to the CP. However it is questionable how much value was placed on the developments by the sponsoring CPs given their reluctance to pay a higher charge, and also by industry in general given the lack of industry agreement on the solutions proposed and inability to commit to volume forecasts. It is also arguable to what degree a transfer of the Openreach network management function constitutes real innovation.

16.75 Hence our analysis concludes that barely 1% of SoRs may have been delivered in addition to the existing base had dark fibre been available and this is without considering any of the possible negative innovation impacts of dark fibre on the development of the active portfolio.

16.76 Of the 30 SoRs which were not progressed and which Ofcom cites as having dark fibre potential, 20 of them had a BT downstream division as the sponsoring CP as in Table 3. Although possible, it is unlikely that had any really significant market led innovation been taking place that there would have not have been a strong incentive on BT Group to address the market appropriately though either a downstream LoB or through an Openreach service.

Table 1

Review of Cancelled/Rejected SoRs

[redacted]	SoR-Title	[redacted]
	Loop-back on WES circuit as part of a co-op request on assurance.	
	Loop-back on a downstream Ethernet product (MEUK) as part of a co-op request on assurance.	
	BNS (BSC STM-4 Site) Resilience options	
	Launch of 10G WES LA	
	BNS Enhanced Resilience Option – Access Links	
	Changes to the Broadcast Access Product	
	Synchronous WES/Backhaul	
	FSP3000 R7 NTE enhanced services	
	Single Channel Digital CCTV Transmission Service	

[redacted]	Connectivity solution at BT Nodes	[redacted]
	WES Diagnostic request	
	RO2 Product Enhancement	
	Ethernet OAM Requirement	
	Additional Interfaces for the OSEA Ciena product	
	In-band Standards-based Ethernet NID Access	
	IEEE1588V2 on ADVA NTEs	
	Facility Looping Capability	

[redacted]		[redacted]
	Sync-E timing source in an exchange Access Locate space	
	Collection Hub	
	Ethernet Access Direct (EAD) plus Multi-CP Aggregation Service	
	Upgrade Ethernet Aggregation Phase 1	
	Interim Aggregated Local Handoff of EAD Circuits	
	Aggregation Phase 1 Backhaul	
	High Density Method of Handover for EAD circuits + Enhanced OAM Capabilities	

[redacted]		[redacted]
	Fibre Connectivity to/from BTW 21C Fibre MSANs	
	Street Access	
	Street Furniture to Local Exchange backhaul product	
	Street Furniture to Local Exchange backhaul product	
	Extension of Ethernet Access Products back to Aggregation Points or TANs	
	PPC & RBS Transfer to Connectivity Services Ethernet products	

Key:

Some elements of innovation may be assisted by provision of dark fibre	
No innovation or little innovation which would have been assisted by dark fibre	

Table 3

SoR analysis by CP

CP/CP Group	Number of SoRs
[redacted]	**20**
[redacted]	1
[redacted]	1
[redacted]	4
[redacted]	1
[redacted]	1
[redacted]	2
Grand Total	**30**

16.77 Ofcom's [Figure A27.1] SoR analysis also demonstrates another significant and positive change which took place over the review period. In circa 2009, the process for submitting and sharing SoRs was changed. This resulted in fewer confidential SoRs being submitted by individual CPs – which were often poorly specified – and a greater use of the industry forum to pre-evaluate SoRs. This collaborative approach of reviewing SoRs through the Industry forum before submission has had the direct effect of reducing the number of submitted SoRs and helped identify poor commercial proposals at an early stage and this is reflected in the statistics.

16.78 As Ofcom [27.35] notes, the time taken to deliver SoRs does vary significantly and is influenced by individual complexity. This is correct and there is a direct correlation between the complexity of developments, be that technical or commercial, and their delivery timetables. For example:

- Performance Report on Ethernet Early Life Failures (ELF) Specific to [redacted] This was largely an IT based reporting development without significant operational and technology impacts – delivery time 1 month.
- Olympic Broadcast Services – significant technology, commercial, security and process impacts and negotiation with Olympic authorities, CP and other parts of [redacted] – delivery time 37 months.
- Externalising TILLBP – this was a result of introduction of the Undertakings and applied to legacy SDH service sold on EOO basis to [redacted] by [redacted]. Very little demand and complex to implement – delivery time 65 months.

16.79 Openreach has worked collaboratively with CPs since the introduction of the shared CP SoR process introduced in 2009. This means that CPs understand the different levels of complexity and that taking appropriate time to assess and develop SoRs will result in greater success and less pressure to reject/cancel. Therefore this has helped establish a more beneficial and efficient process for all including CPs and Openreach.

16.80 As Ofcom's detailed analysis of the SoR history has established, Openreach's already wide ranging portfolio of active open access products is under continuous review. Openreach examines all possible developments, both technical and commercial to the Ethernet and Optical portfolios to meet evolving customer needs. These developments are achieved through the SoR process, as well as through regular commercial dialogue and engagement to ensure that the range of active products can continue to support and drive forward innovation and competition in business connectivity markets for the benefit of all CPs.

The SoR process is already heavily regulated and scrutinised

16.81 As Ofcom's analysis demonstrates the SoR process has been used extensively to bring about product changes, some 37% of SoRs submitted were delivered or in development. It achieves a fair balance in that requests are assessed on whether they are commercially viable for Openreach and technically feasible, but also by whether they align with Ofcom's regulatory

framework and policy. This means a focus on equivalent and industry wide changes in scale and scope of products at the appropriate layer of the value chain where key infrastructure investment decisions are made.

16.82 The SoR process is a regulatory requirement on Openreach and is heavily scrutinized by CPs, regulators and internal auditors. We believe that the existing SoR process (in tandem with other obligations in BT's Undertakings such as EOI and information sharing rules) has worked well and already mitigates strongly against the risk of Openreach discriminating in favour of downstream BT businesses. Passive remedies will put this framework under severe strain as Openreach will be in direct competition with other CPs for the provision of active services.

16.83 Openreach's transparency in dealing with SoR requests can be seen in the following processes:

- Openreach holds a monthly review of SoRs and provide any reasons for rejection in order to validate them, with participation by representatives from OTA2 and the EAO. All SoR changes, rejected, cancelled and delivered are reviewed as part of this meeting (although 'In development' SoRs will be discussed if an issue is raised) to ensure an agreed set of data on which discussions are held.
- A monthly report is issued based on all updated SoRs to Industry chairs, OTA2 and the EAO.
- Any amendments made on the SoR tool are transparent and accessible by all CPs via the Openreach portal.
- Any issues concerning SoR response times (or any other concerns) are also open for review in a monthly review held with OTA2, the EAO and Ofcom.
- All meetings and discussions are recorded and the Minutes are issued to the EAO, OTA2 and Ofcom.

16.84 Openreach has also implemented (with the Copper, Fibre and Ethernet Forums) the use of a programme plan view which provides a clear overall view of all CP and shared Openreach SoR status positions which has been well received by industry.

16.85 We are not aware of any parallel in the telecoms world anywhere which has anything like the degree of transparency and fairness which is now firmly established in the Openreach supply model through the SoR process. Openreach has several hundred CPs buying Ethernet services and the downstream end-user market is acknowledged as highly competitive. There are no material problems that need to be addressed through a fundamental shift in regulatory strategy from a new regime based on the introduction of passive remedies.

16.86 In summary, BT believes that the Openreach SoR process is working well with most of industry and it is no surprise that the vast majority of SoRs identified as cancelled/ rejected have been thoroughly reviewed and assessed before decisions were made to progress them or otherwise.

Innovation on other networks

16.87 Ofcom also analyses submissions from other CPs on potential innovations on their networks using dark fibre. Of the 15 examples cited by Ofcom, 7 are redacted. Our views on the remainder are as follows.

- Ethernet NID, Fault Management and Diagnosis: 3 of the remaining 8 listed relate to NID service monitoring and fault management. These appear to offer nothing new in terms of innovation beyond the observations made regarding SoRs 8347 and 8166 above. As noted, these offer very limited proof of significant service and network innovation given

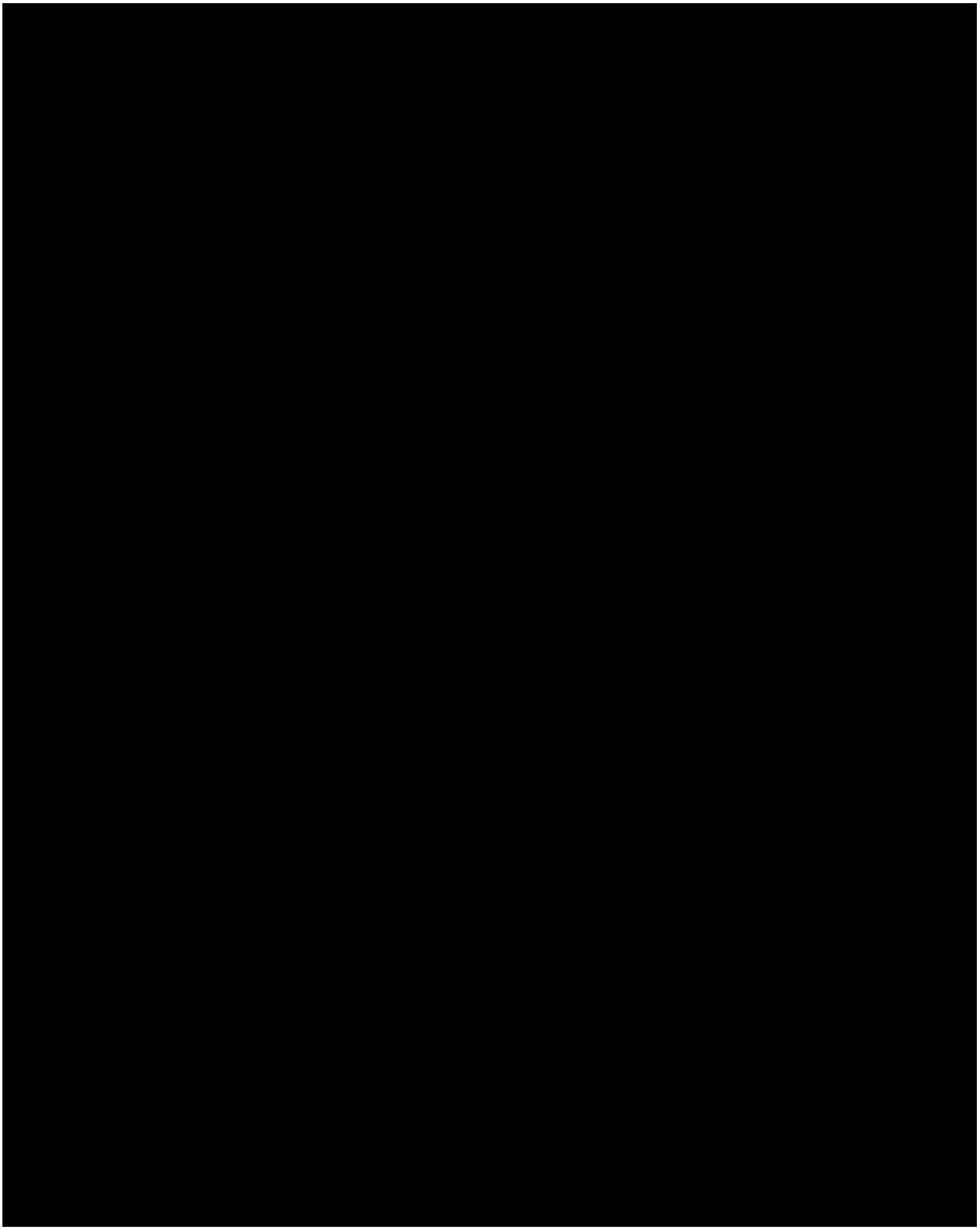
Openreach's existing high and consistent fault repair performance and CPs apparent reluctance to pay any incremental charge.

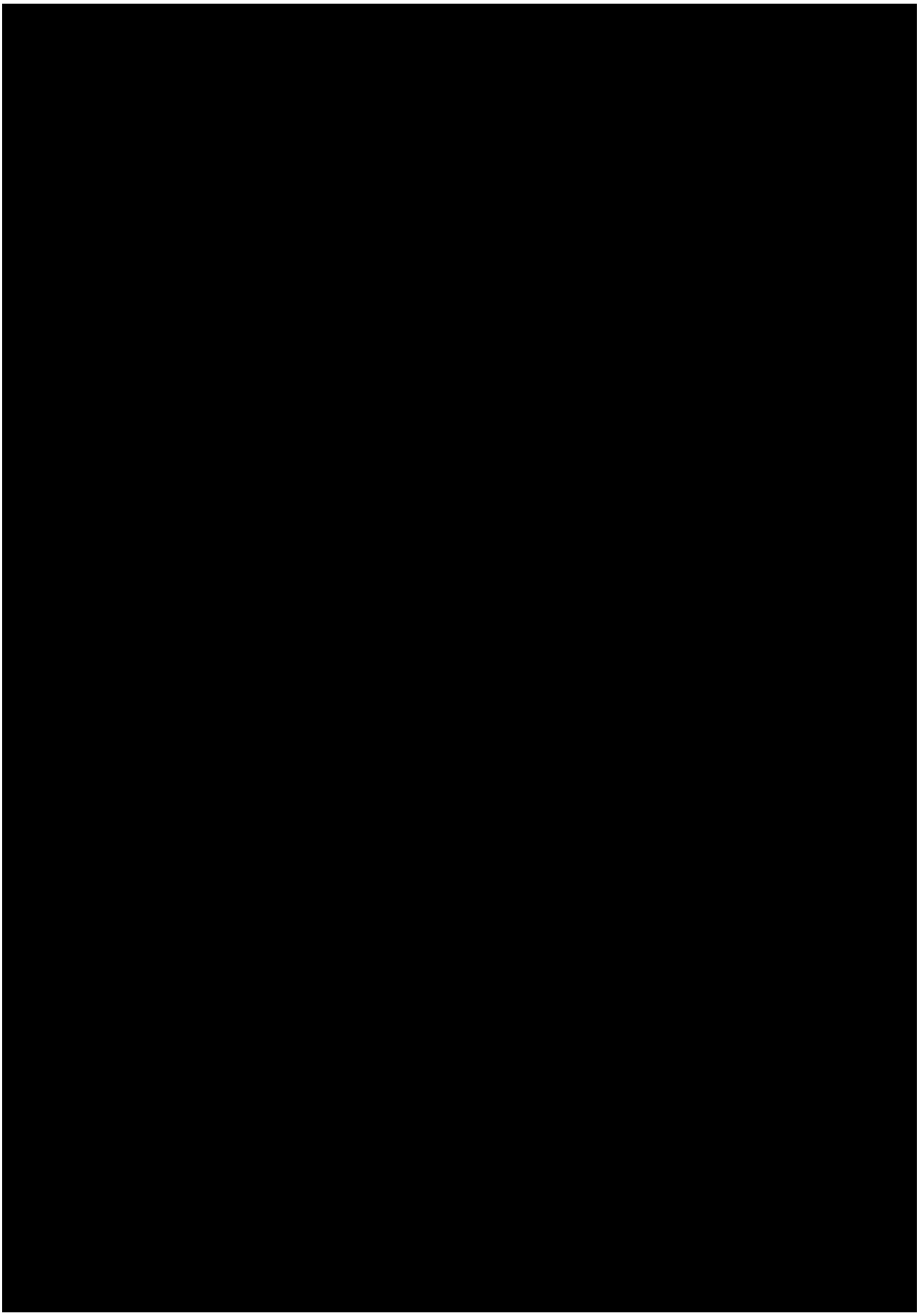
- FTTP-GPON technology: this technology has already been developed and deployed by Openreach for NGA services both as a pre-built FTTH service and as a Fibre on Demand (FoD) service throughout the UK in its FTTC footprint. Openreach has also held detailed workshops with mobile network operators looking at possible uses for WDM-PON and GPON to service their future growth requirements. Additionally, a newly engineered FoD service will form an important part of Openreach's NGA2 programme which is looking to bring ultra-fast broadband speeds to the majority of the UK within a decade. As such, this innovation will be made available based on active remedies and does not require dark fibre to be provided. Critical to all these developments is the need to have sufficient wholesale aggregate demand to generate take-up levels which enable scale and scope economies to take effect and which will also ensure customer choice and strong competition downstream. The nature and maturity of the Openreach model is such that it already has over 500 downstream CPs which take its broad range of services on an open access/equivalent basis and hence are already physically interconnected into its network. In contrast vertically integrated NGA networks underpinned by Openreach dark fibre will not offer anything like this type of competitive framework.
- Circuit Upgrades: by definition CP ownership of all equipment attached to a circuit would allow them more control; however this is a very limited example of 'innovation' given the wide range of equivalent and price controlled services offered by Openreach, Virgin, Colt and others. There is also a question of how significant this benefit is likely to be in practice given the current Ofcom dark fibre pricing approach.
- Handover: this is an important issue. Additional boxes from Openreach serve a very important function in terms of demarcation, diagnosis and repair as indicated by our Mean Time Between Failure (MTBF) and Trouble to Resolve (T2R) statistics. Openreach's automated monitoring and repair processes plus its associated service guarantees are significant benefits which are undermined by the removal of the monitoring capability. CP will necessarily have incremental costs in terms of systems developments, process changes, training etc. should such functionality be removed from the Openreach service.
- Control of network equipment: as noted above CP ownership and operation of NTEs by definition enables greater control of those elements, if it is assumed that all relevant systems and new processes have been developed and implemented. However, whether this leads to greater efficiency and hence lower costs, plus an ability to manage fibre capacity and improved QoS is not clear and not established. Arguably these are all areas and activities better served by the Openreach open access model. Additionally, there is also a question of how significant this benefit is likely to be in practice given the current Ofcom dark fibre pricing approach.
- Optimised Network Architecture: it is unclear how 'box less EAD', the Ofcom proposed solution, would allow for any significant innovation in this space which Ofcom [A27.51] accepts.

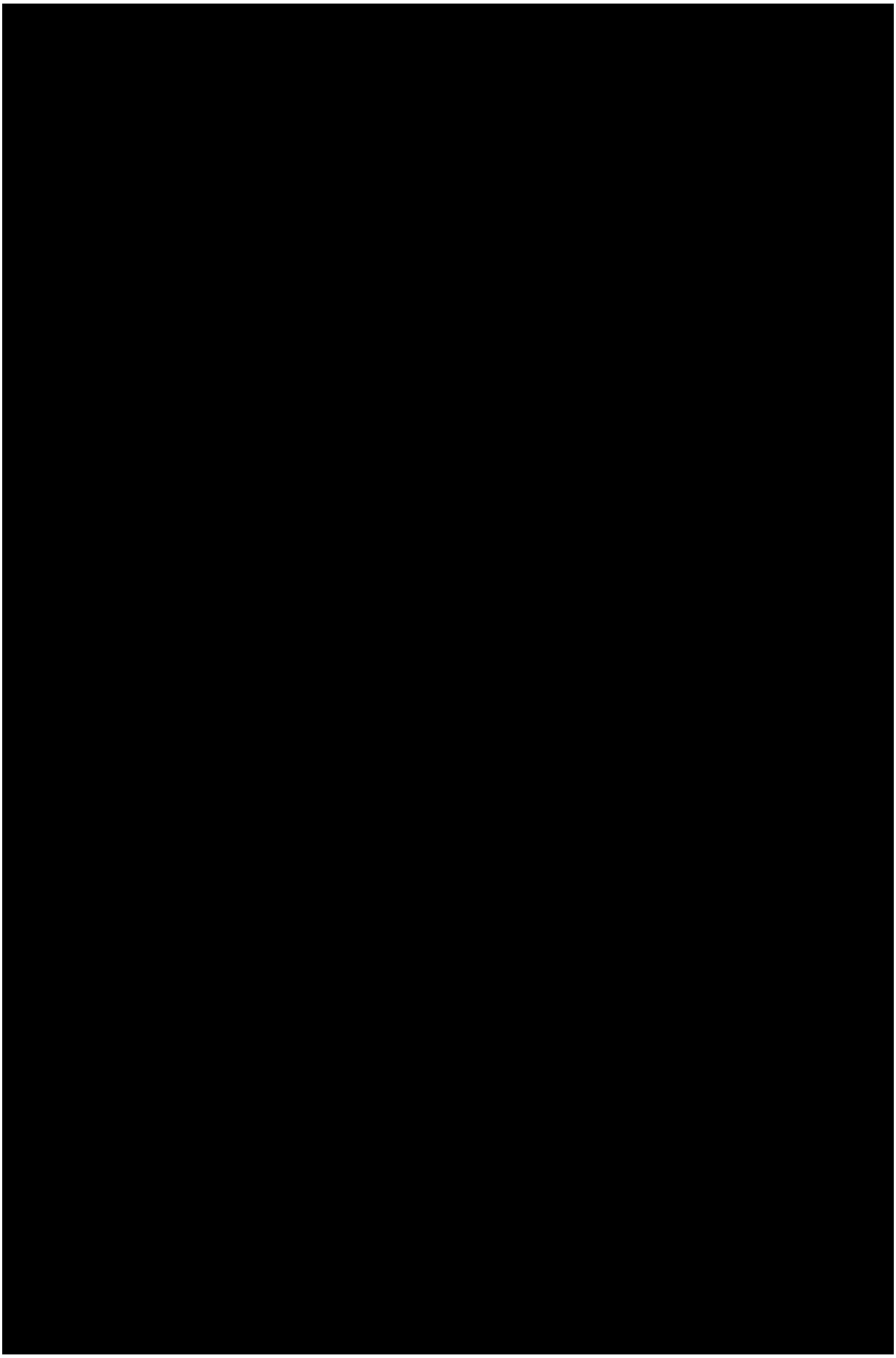
16.88 As with Ofcom's analysis of SoRs, we find the conclusions here to be superficial regarding innovation on other networks. It is a truism that Openreach provision of dark fibre removes the Openreach equipment from the value chain and therefore all equipment becomes CP controlled, but this does not constitute innovation in itself. Telecoms companies do not generally innovate individually as they have to interconnect and be interoperable, and hence Ofcom has not really addressed the fundamental nature of innovation in the telecoms sector in the Consultation. Ofcom's own analysis has in fact demonstrated there is very little evidence that absence of dark fibre has prevented any major innovation in the market. In

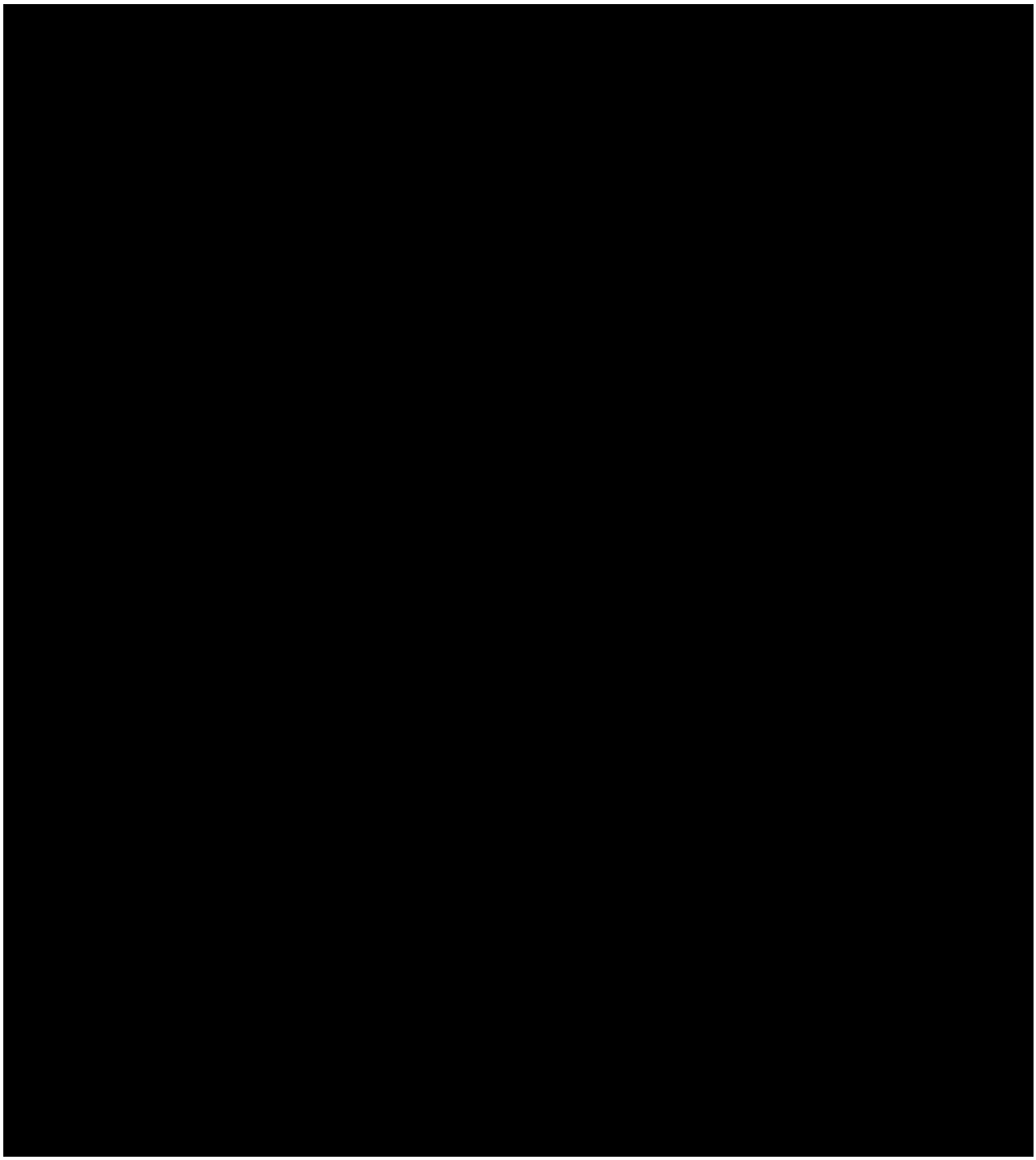
reality, the contrary is true, the UK business connectivity market is thriving as evidenced from the BDRC research.

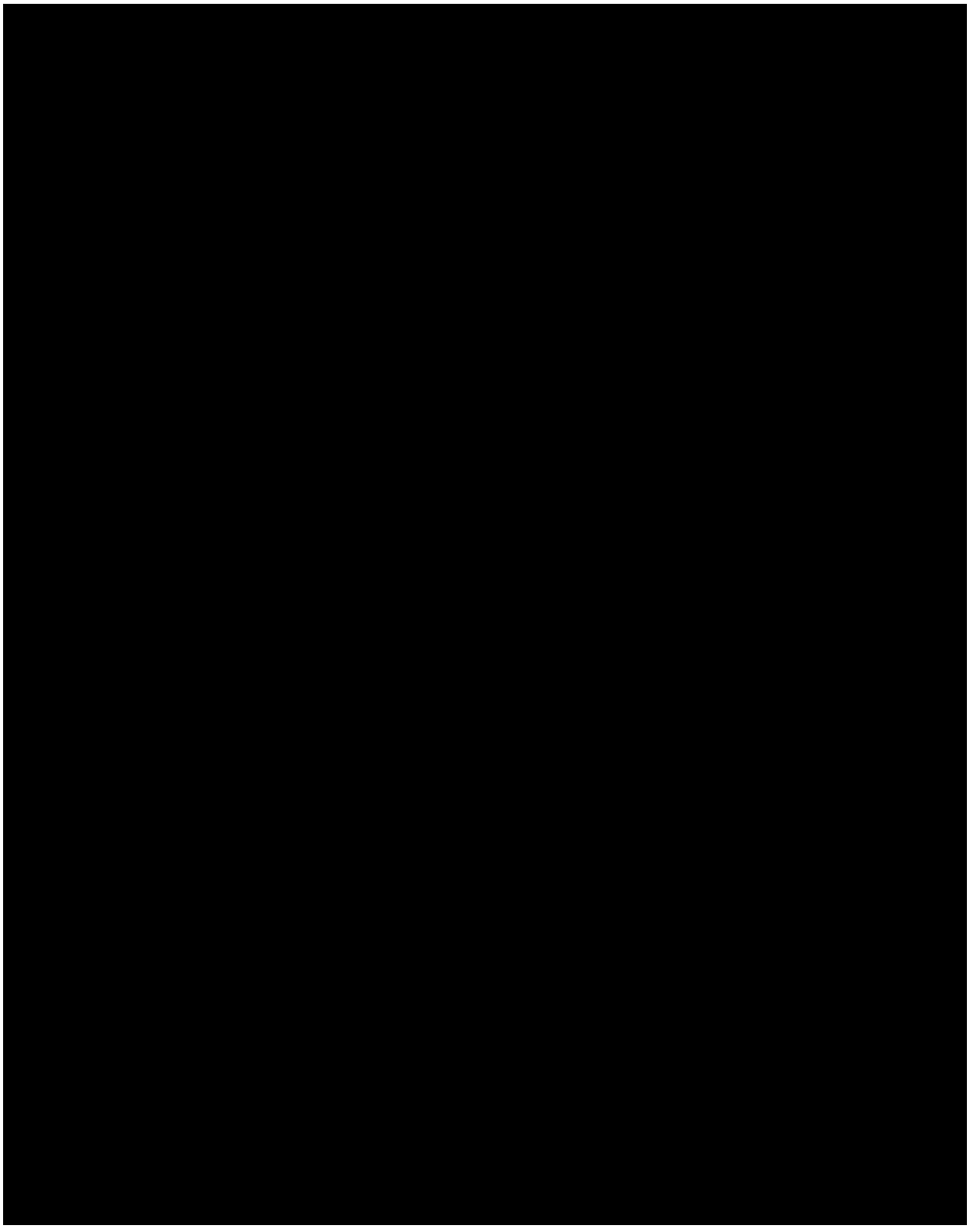
17. Costs and Risks of Passive Remedies

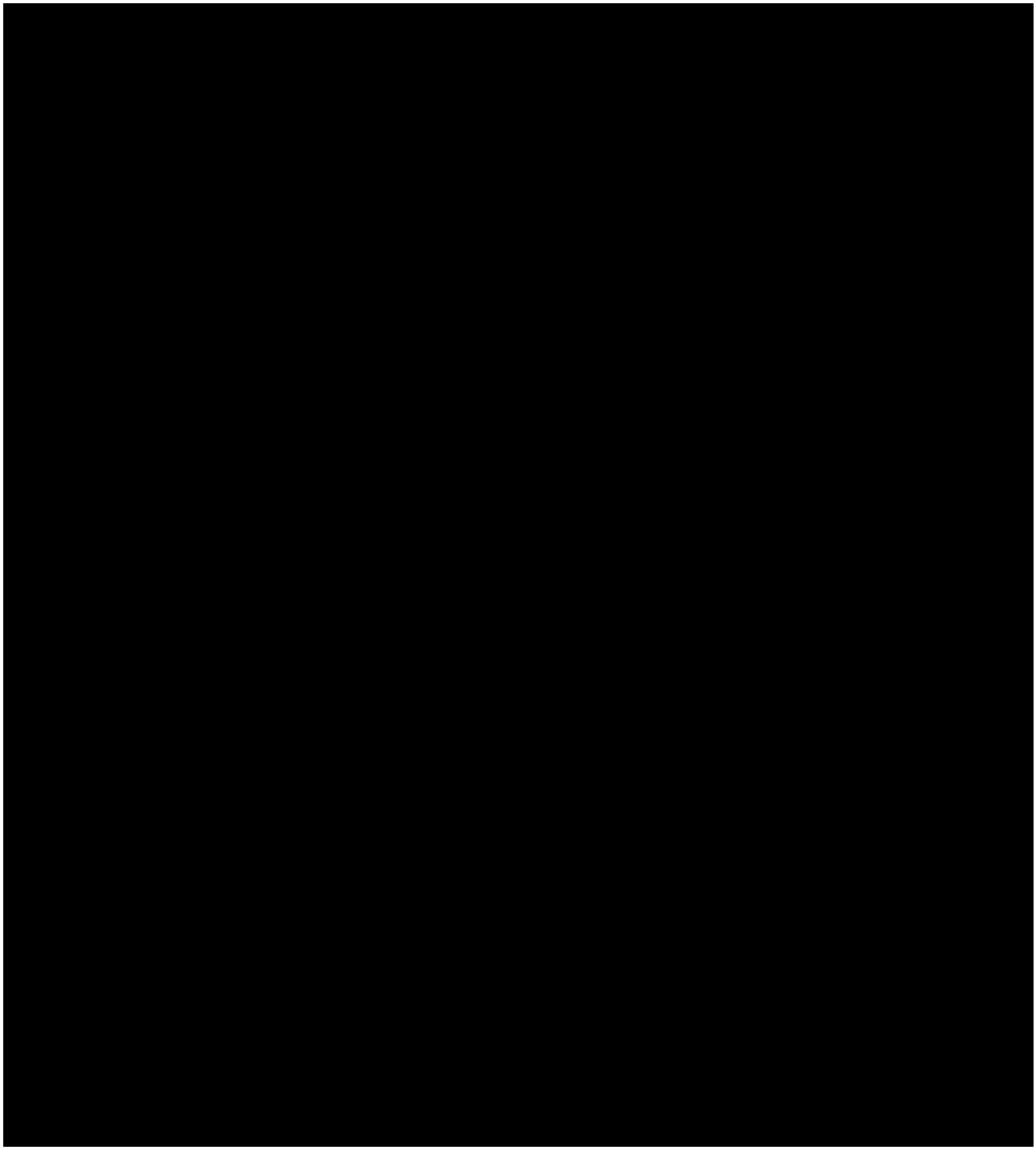


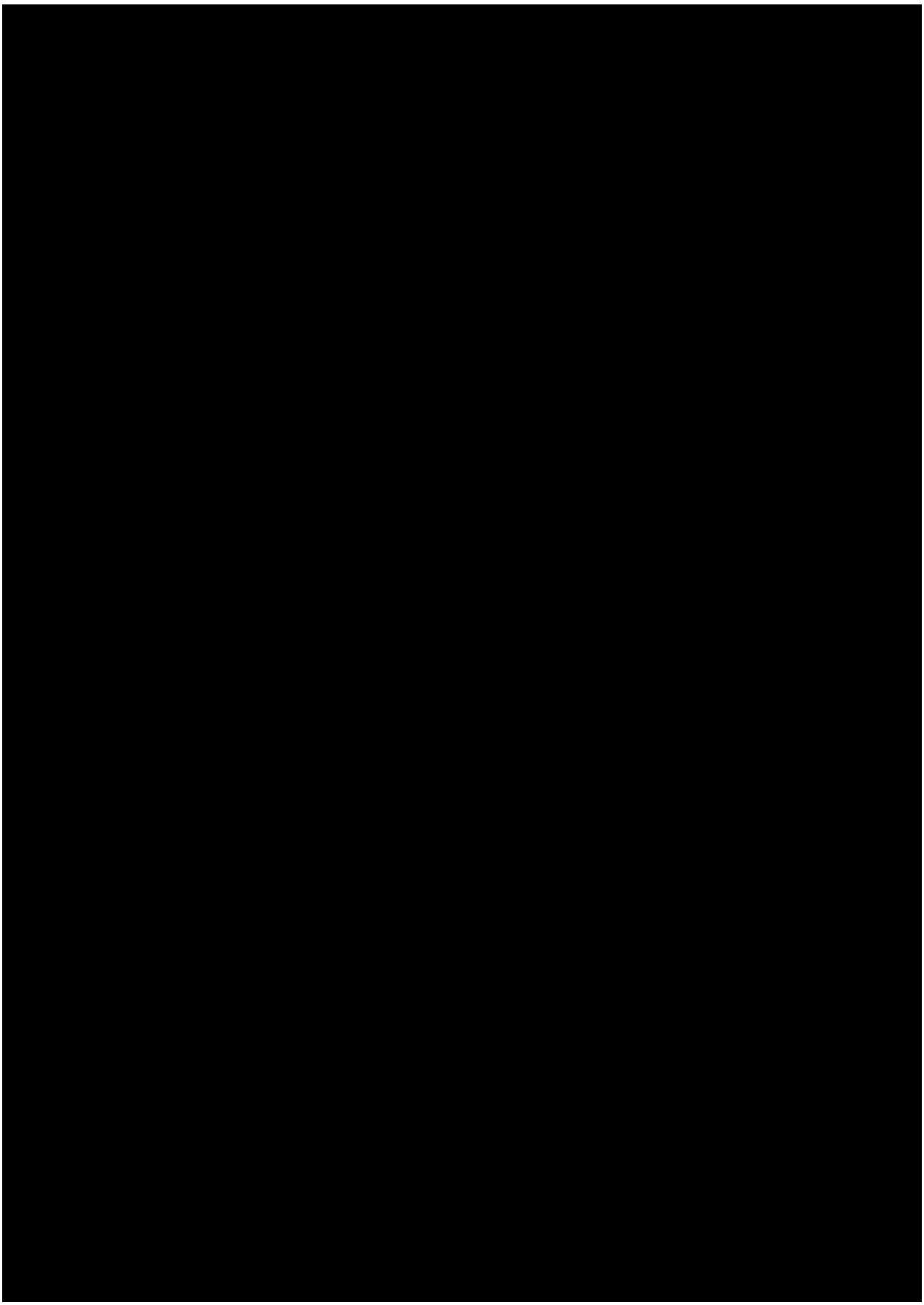


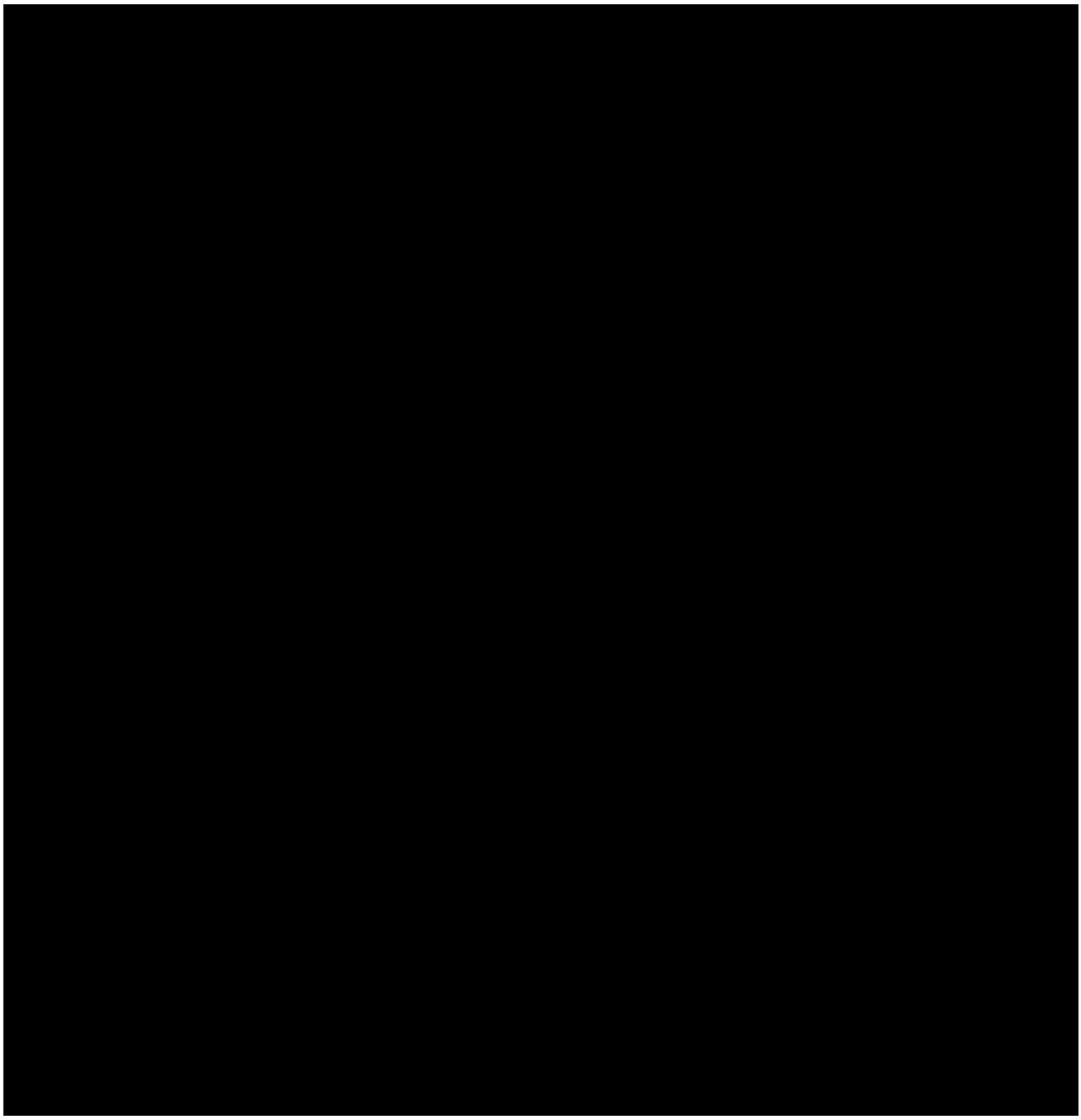


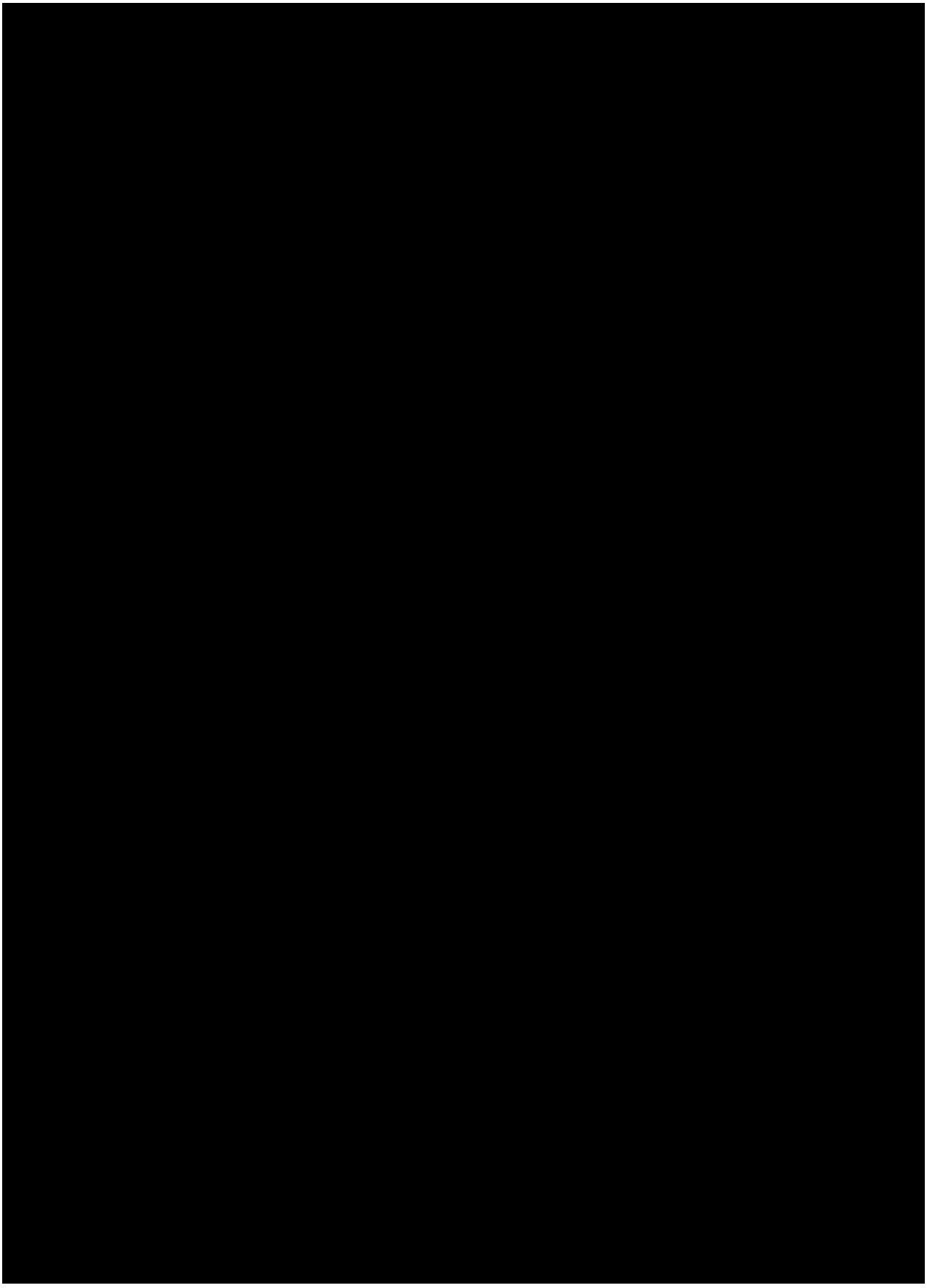


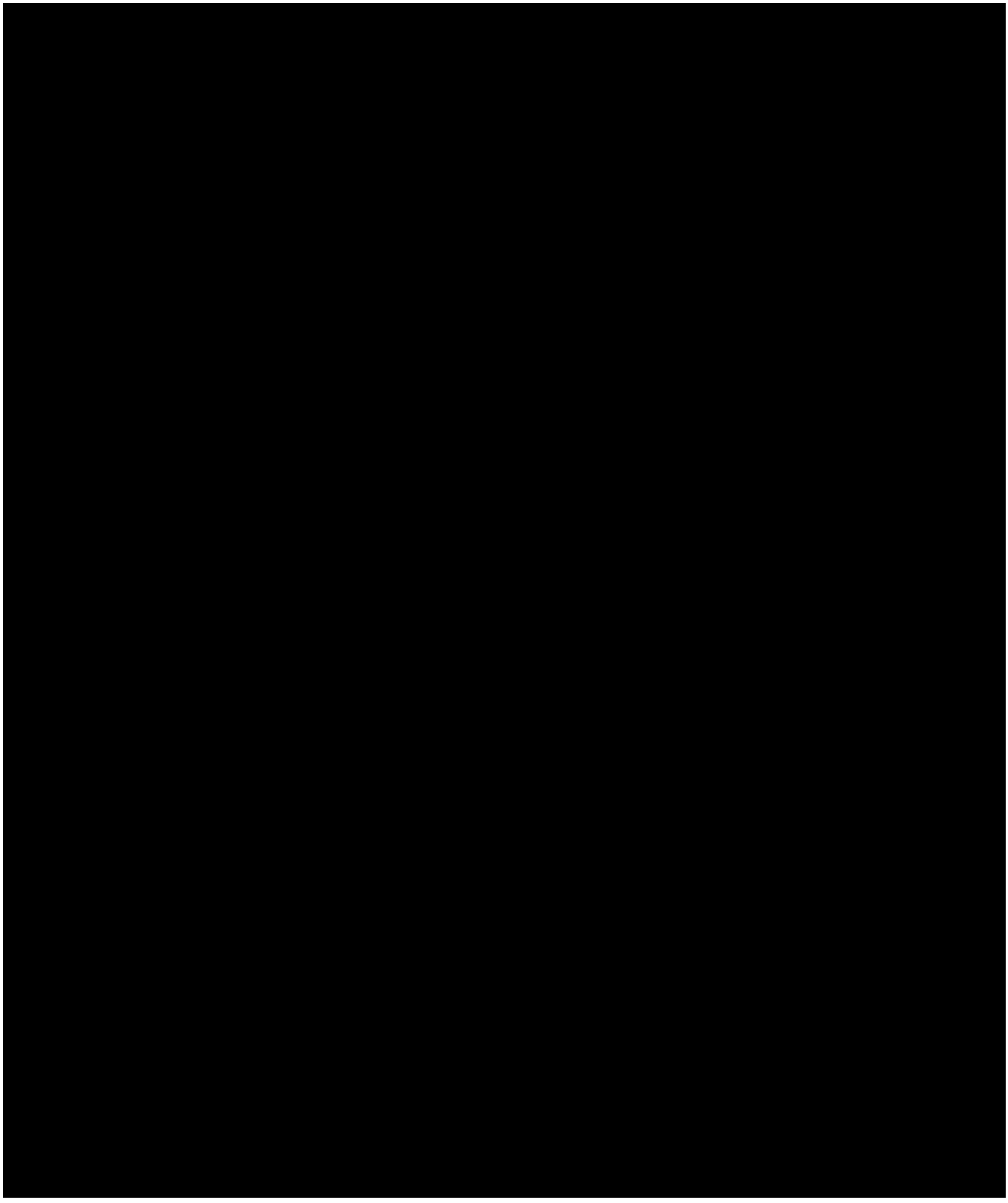


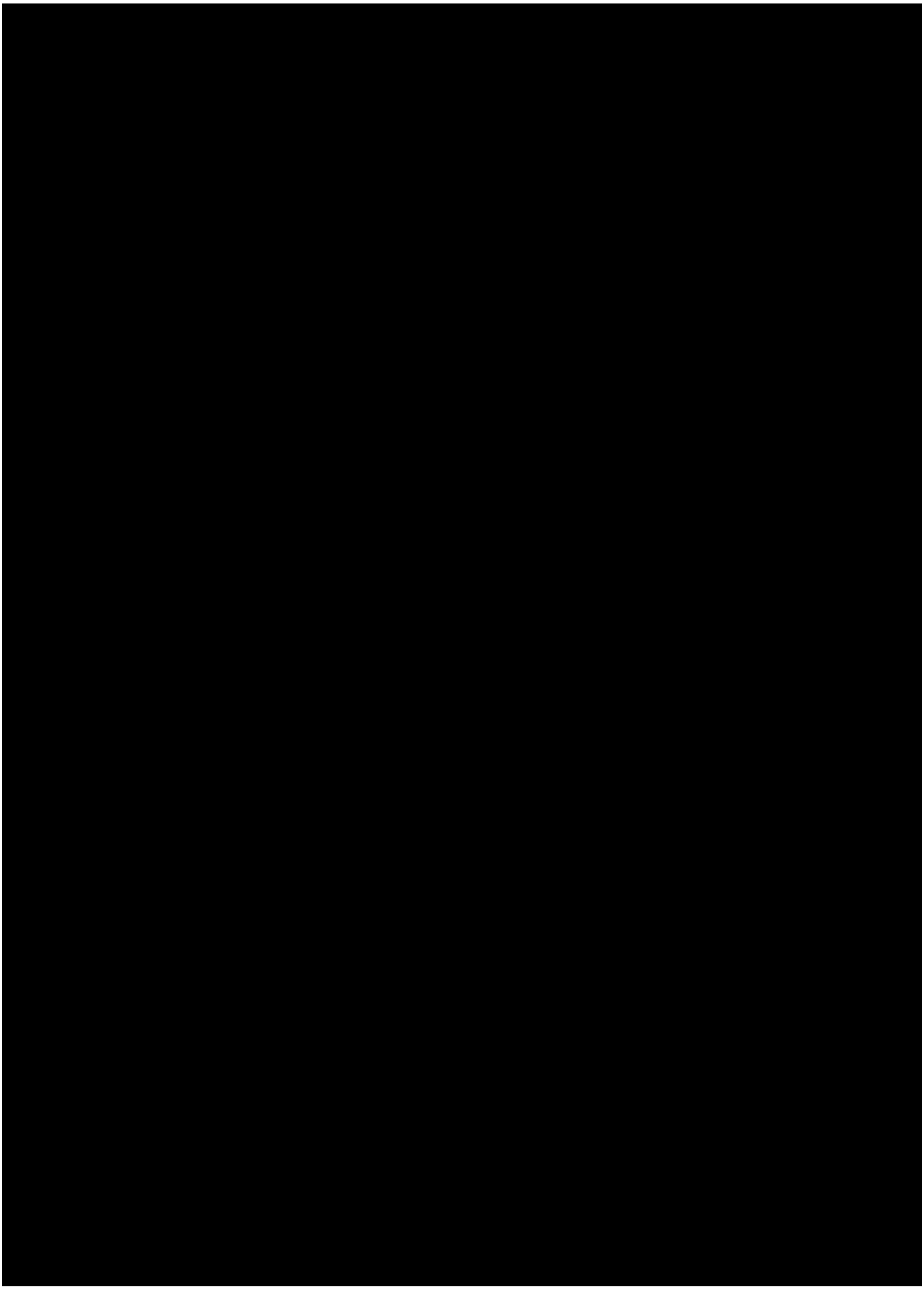


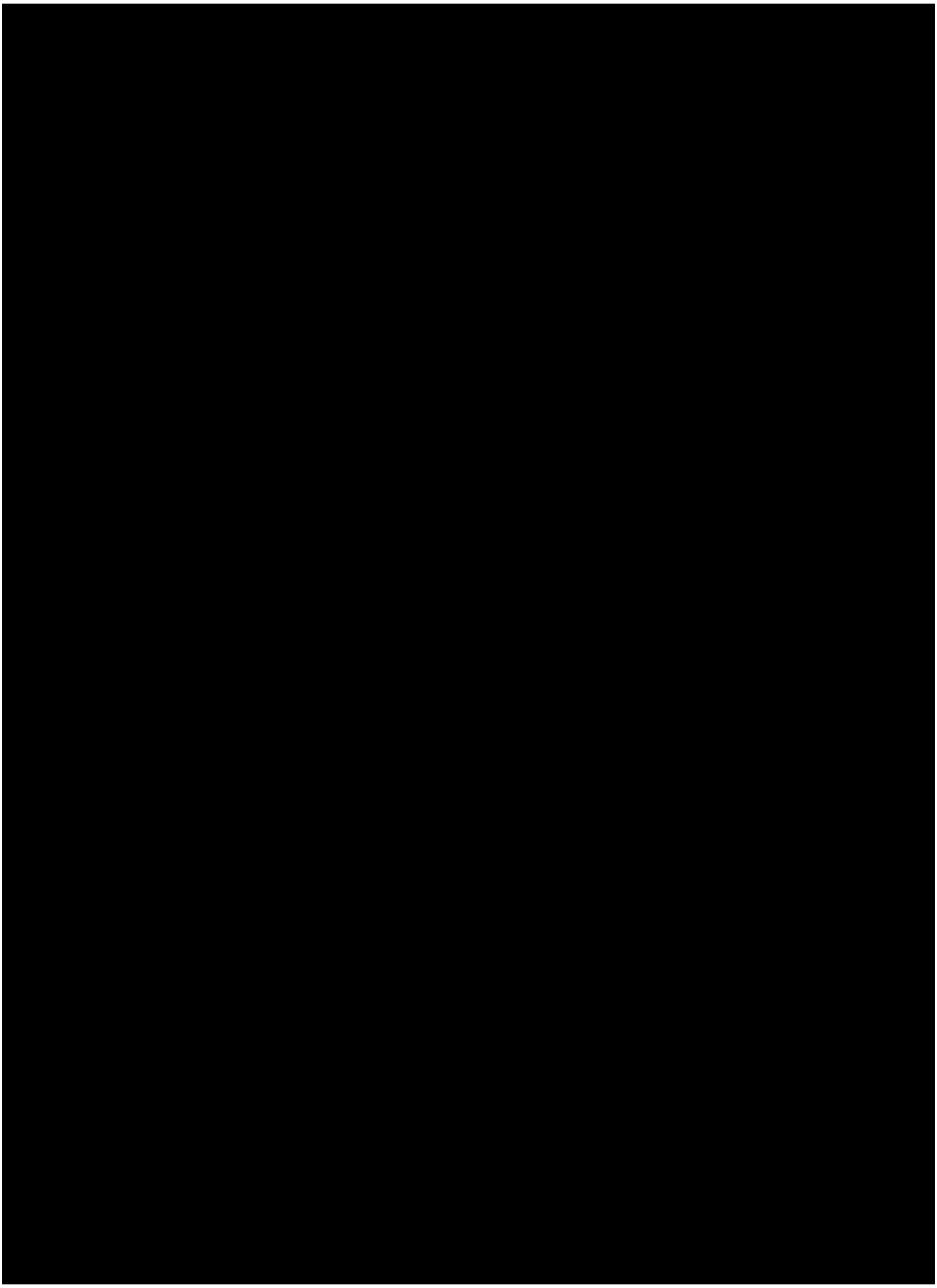


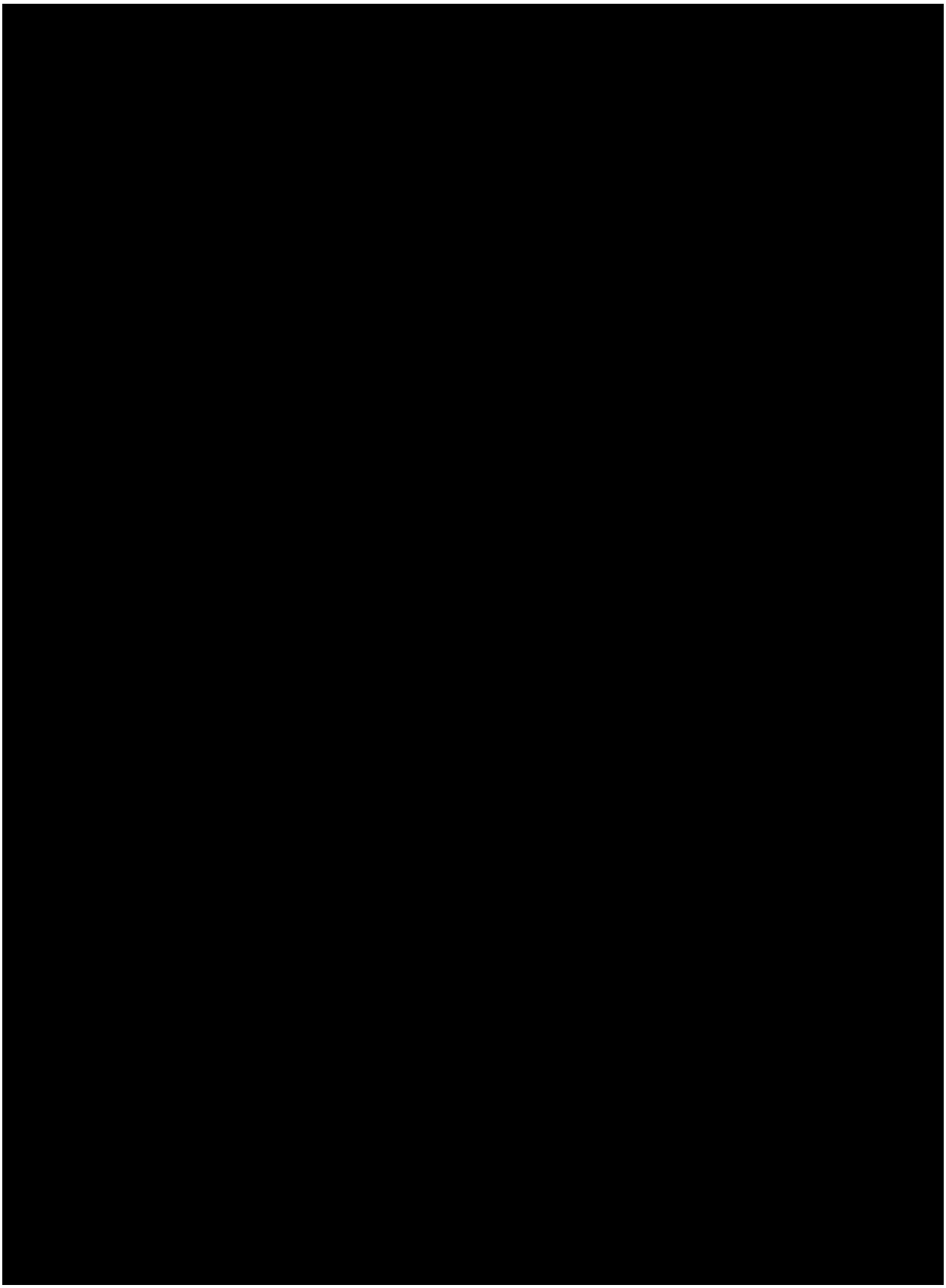


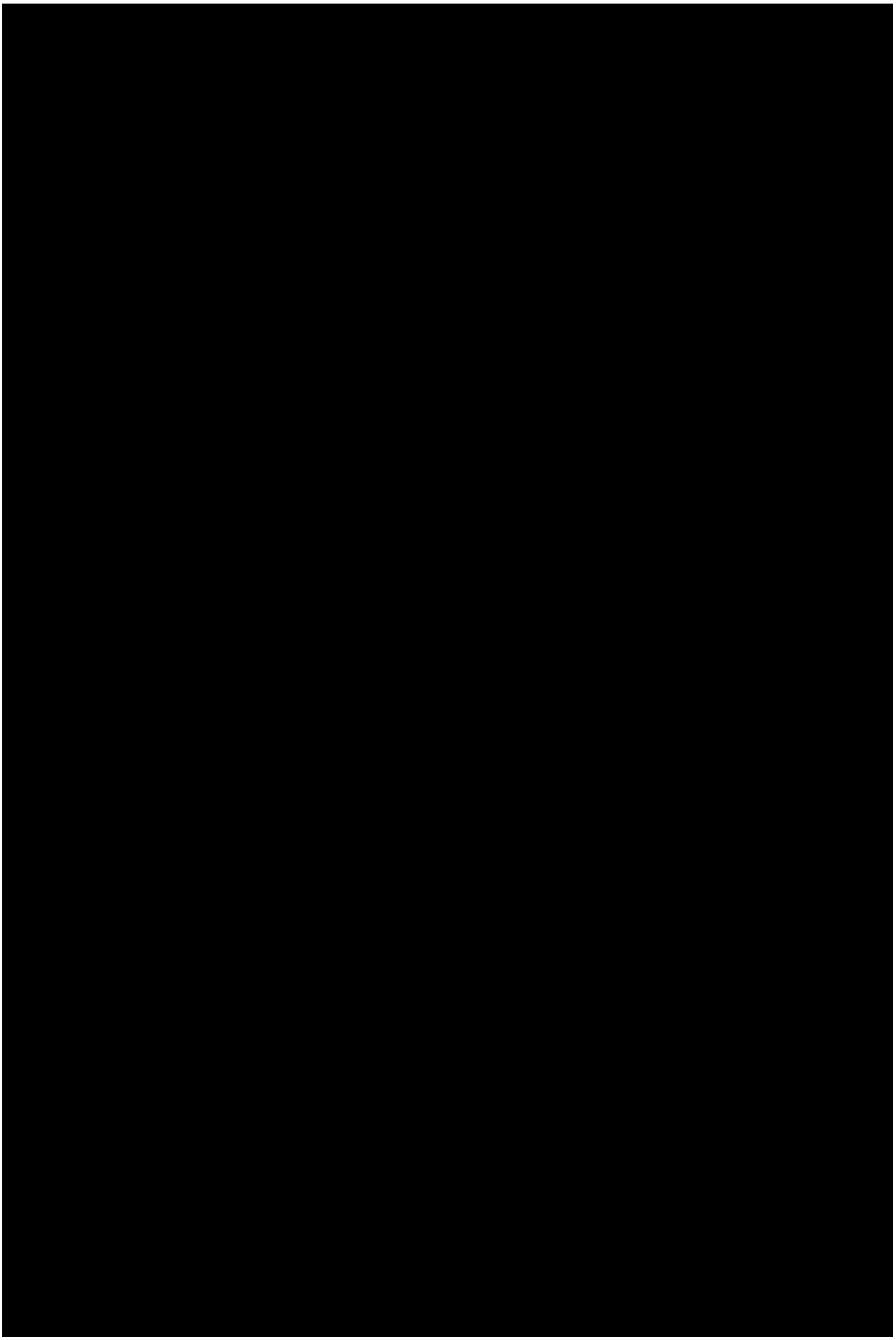


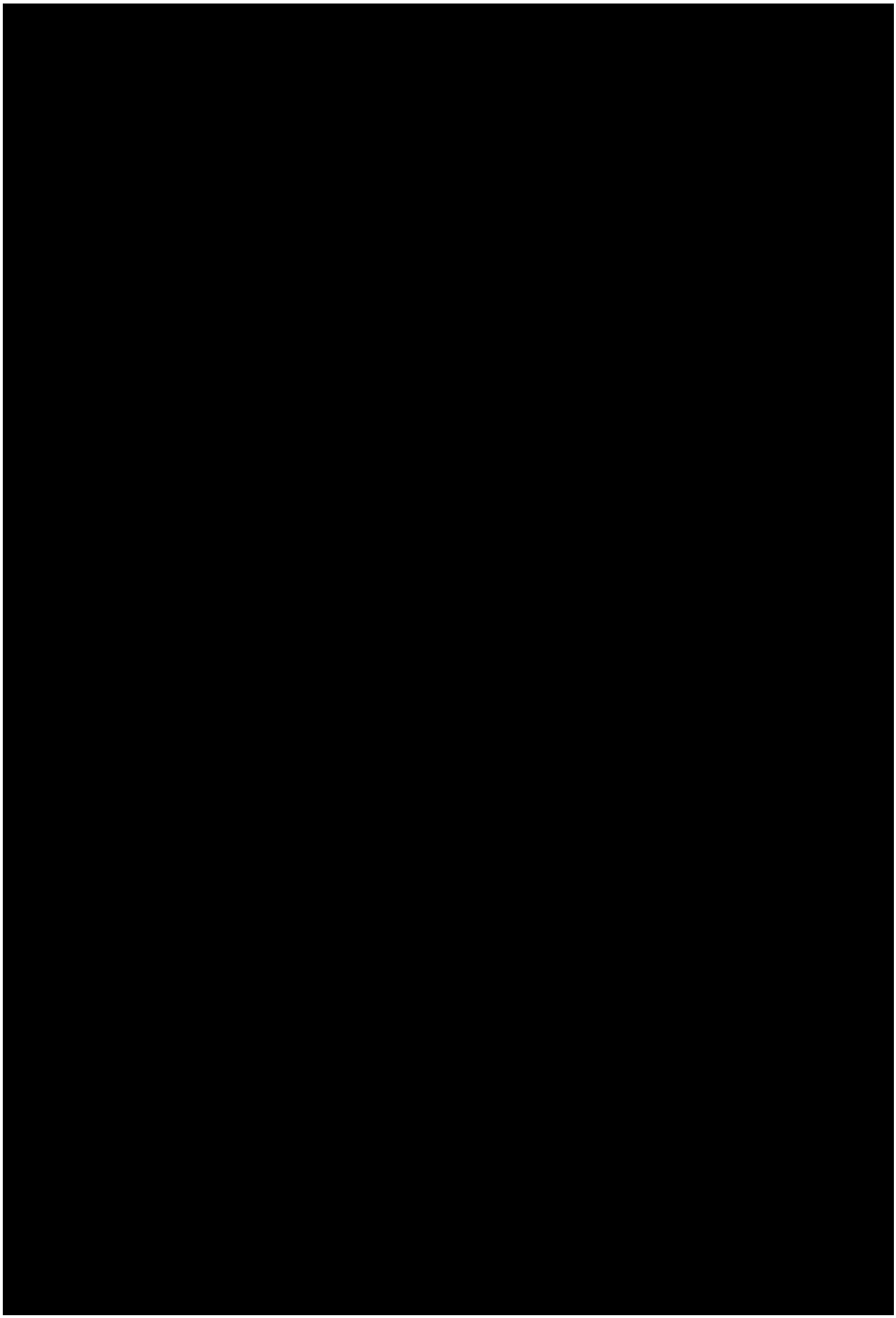


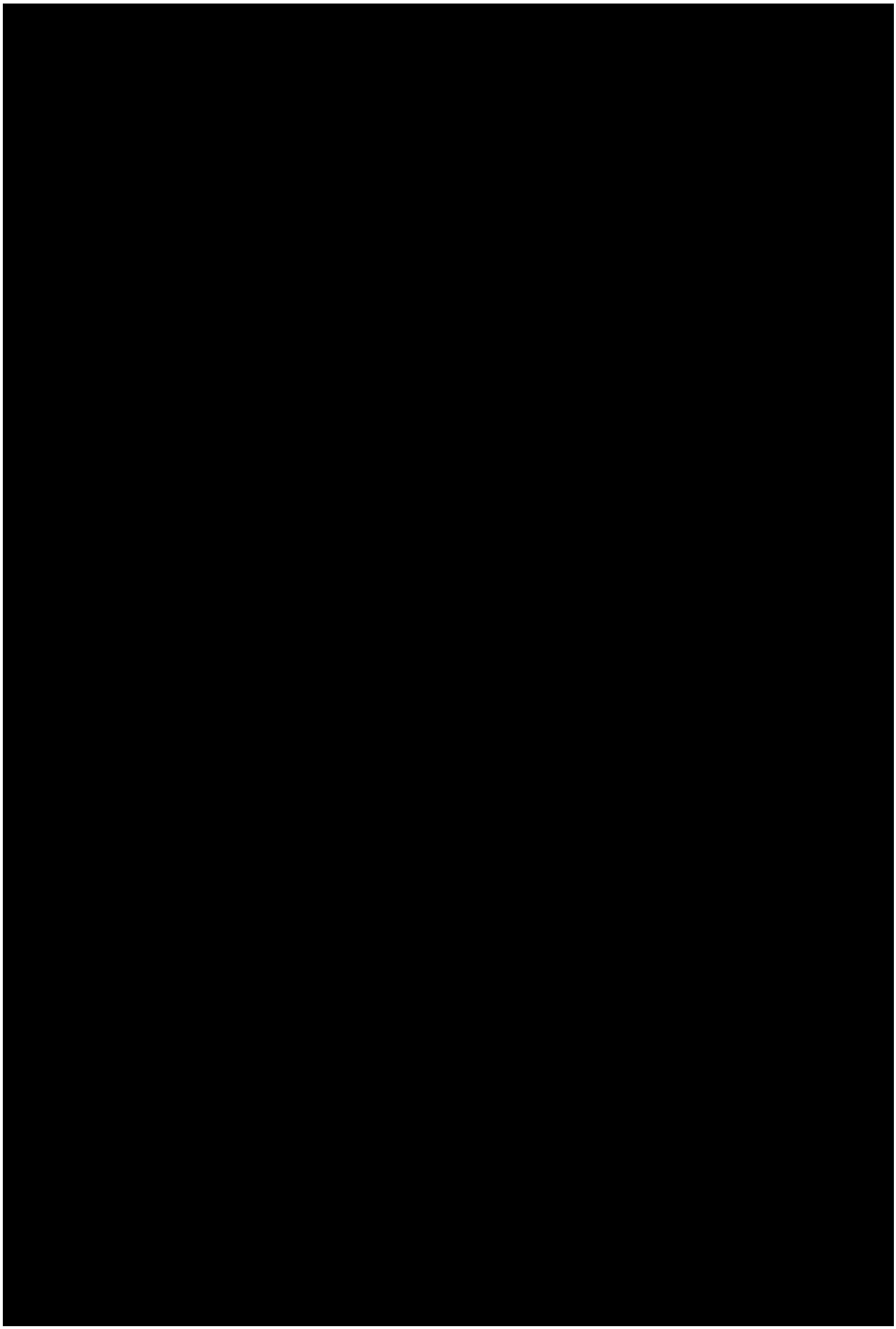


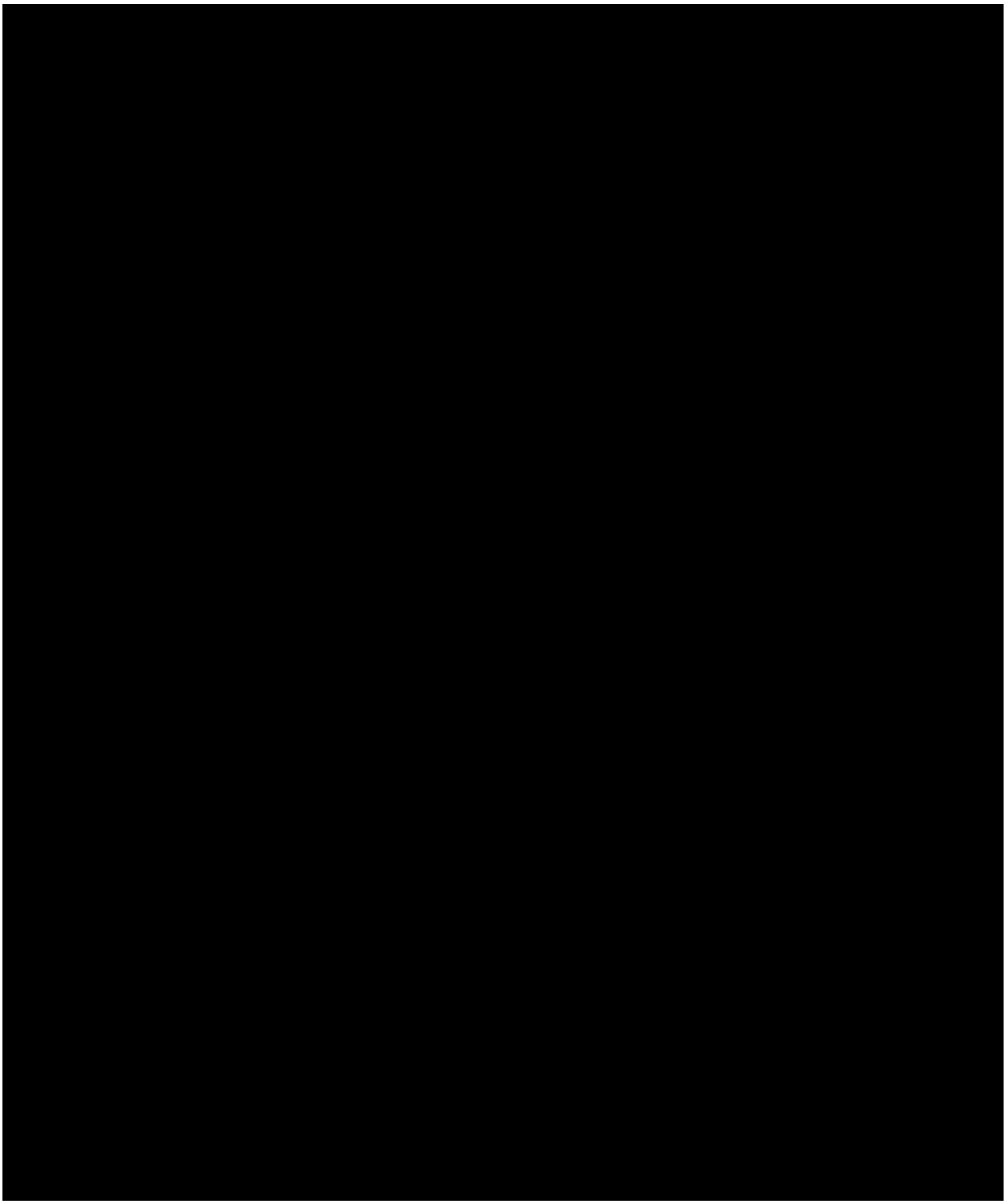


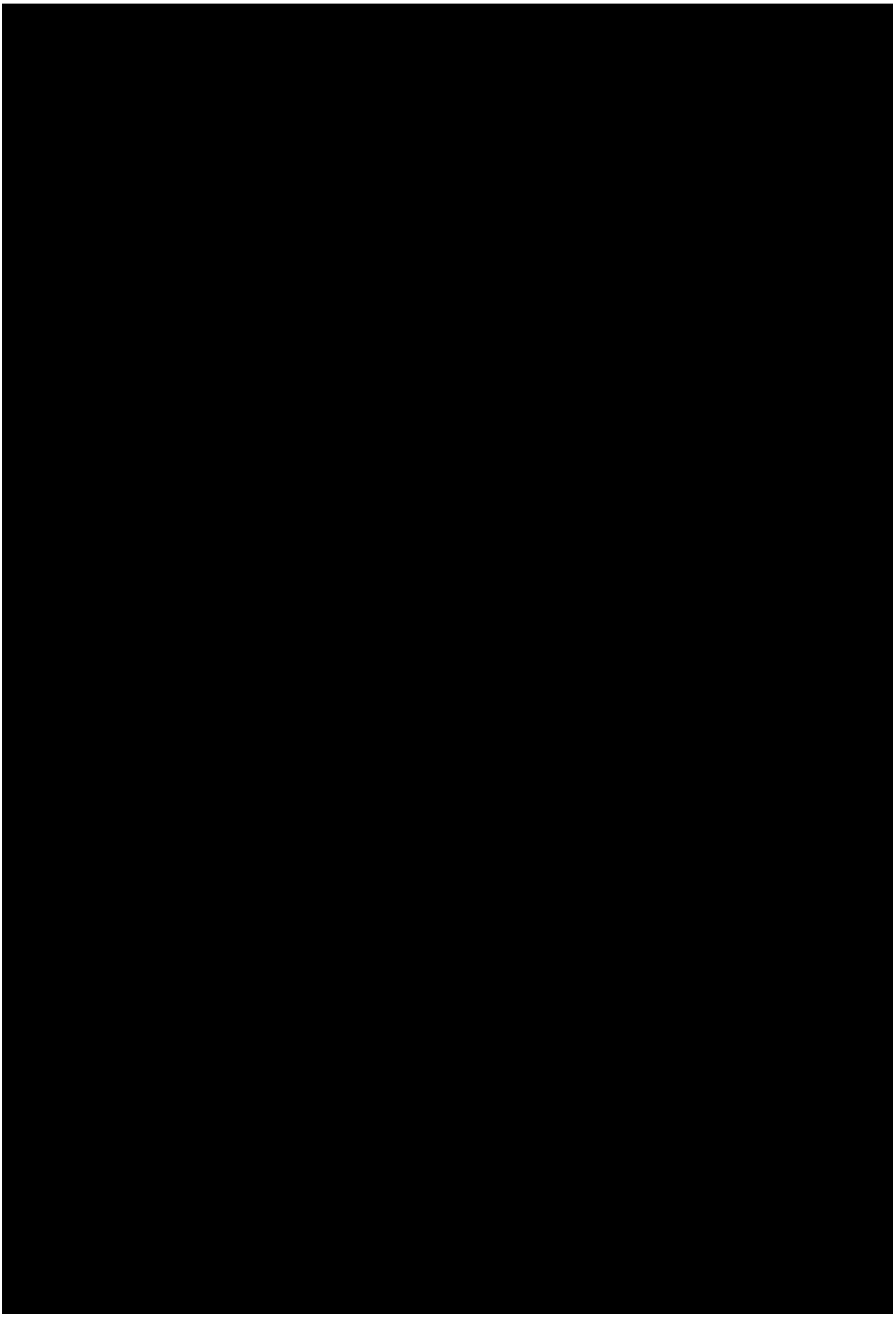


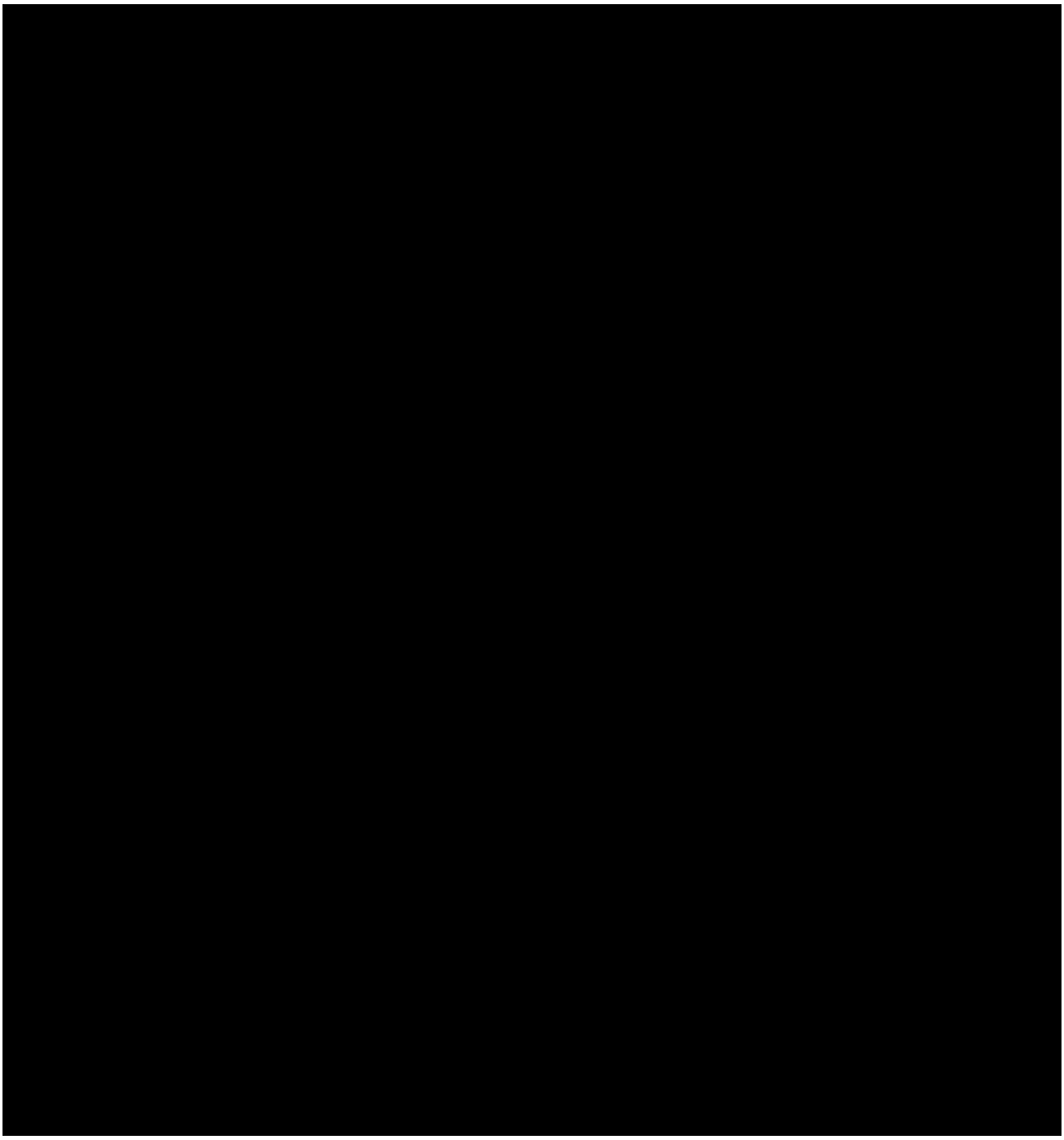


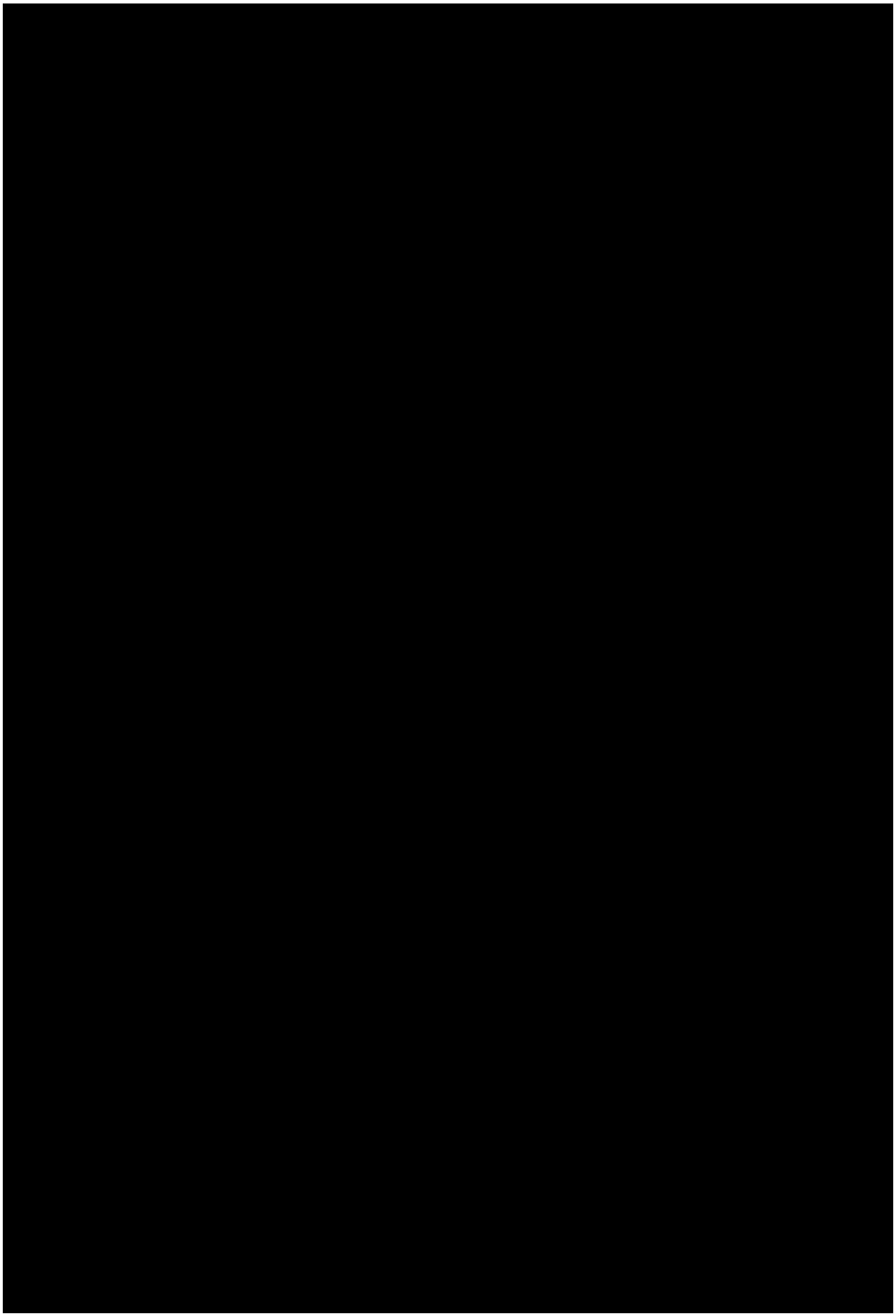


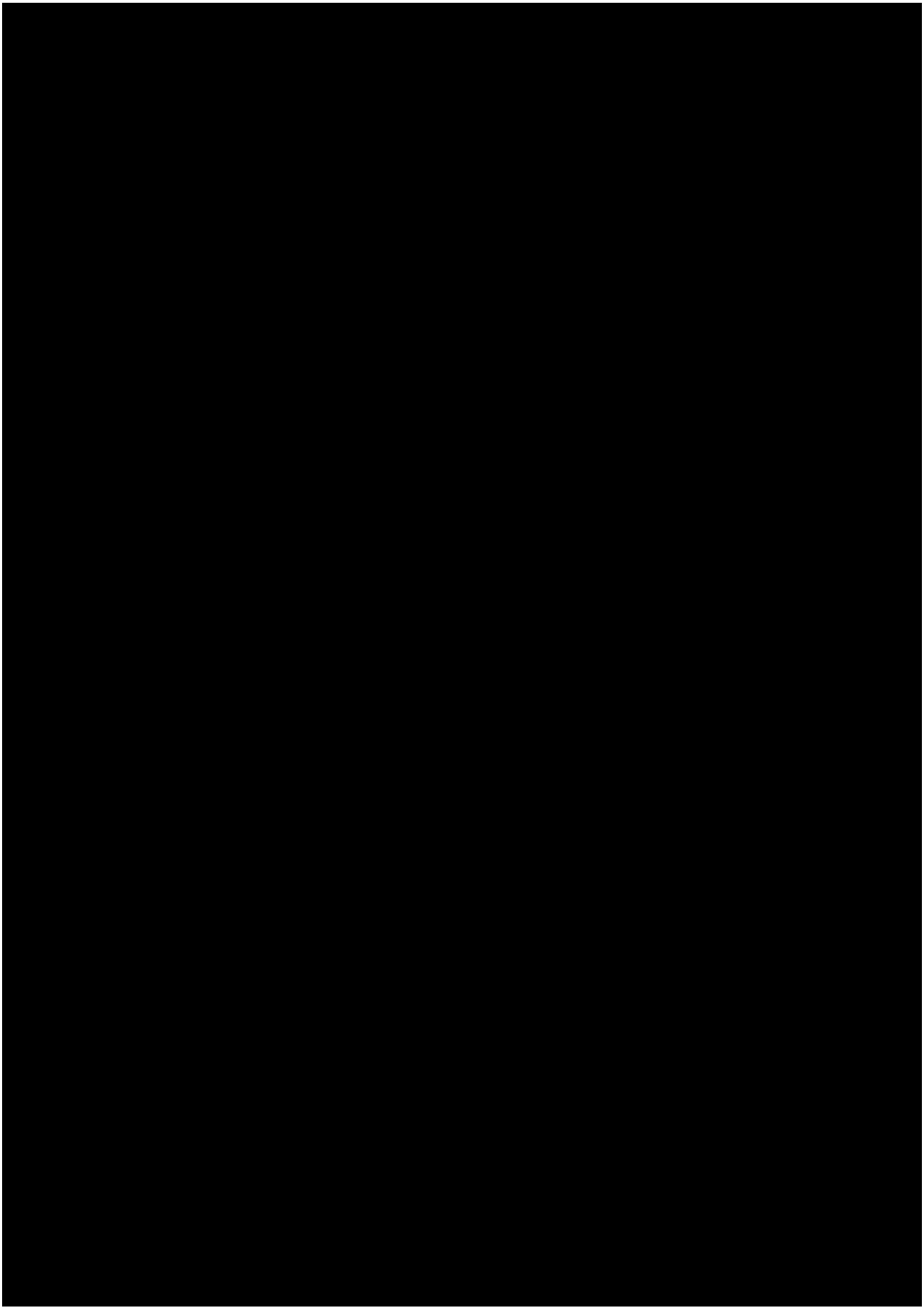


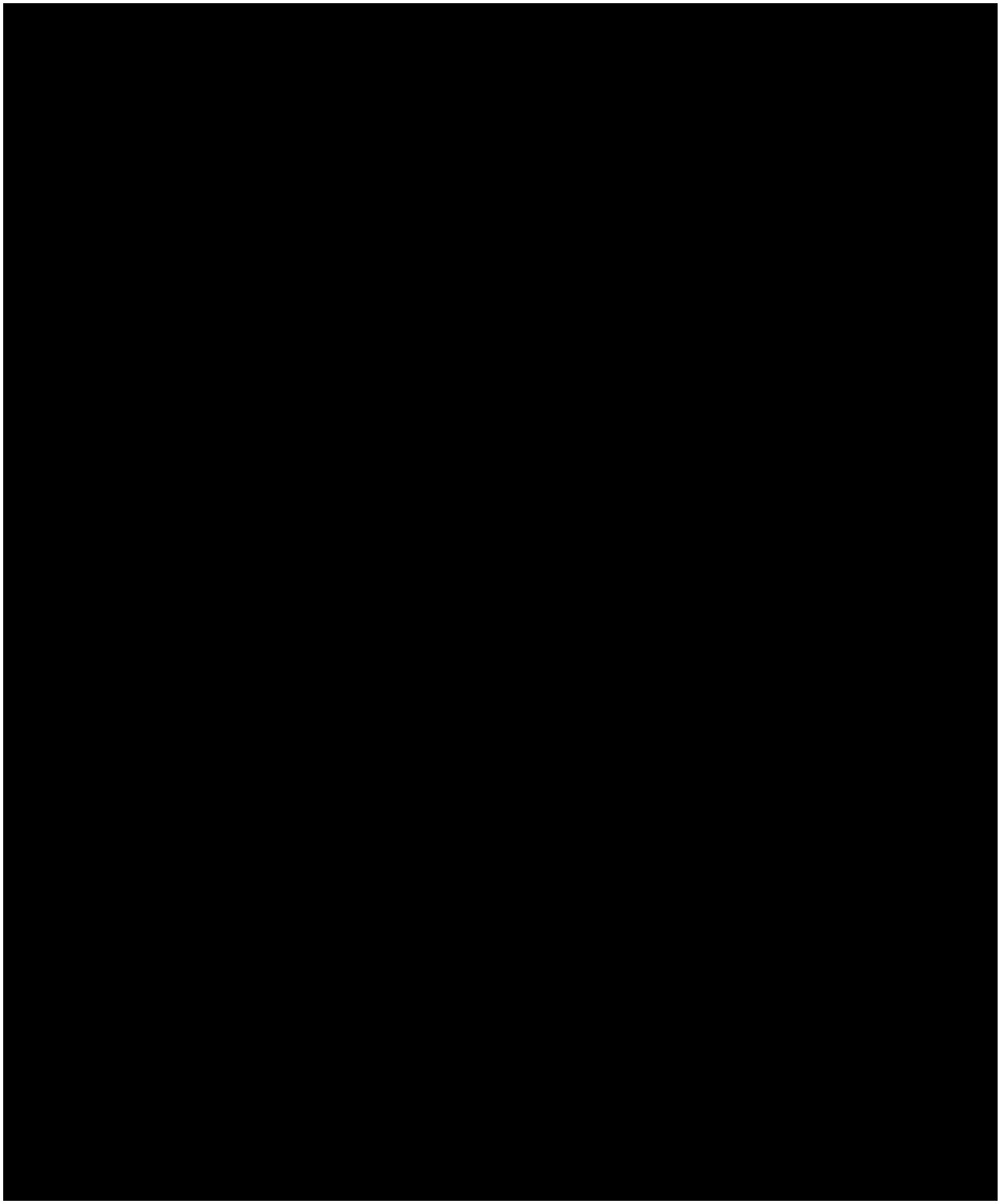


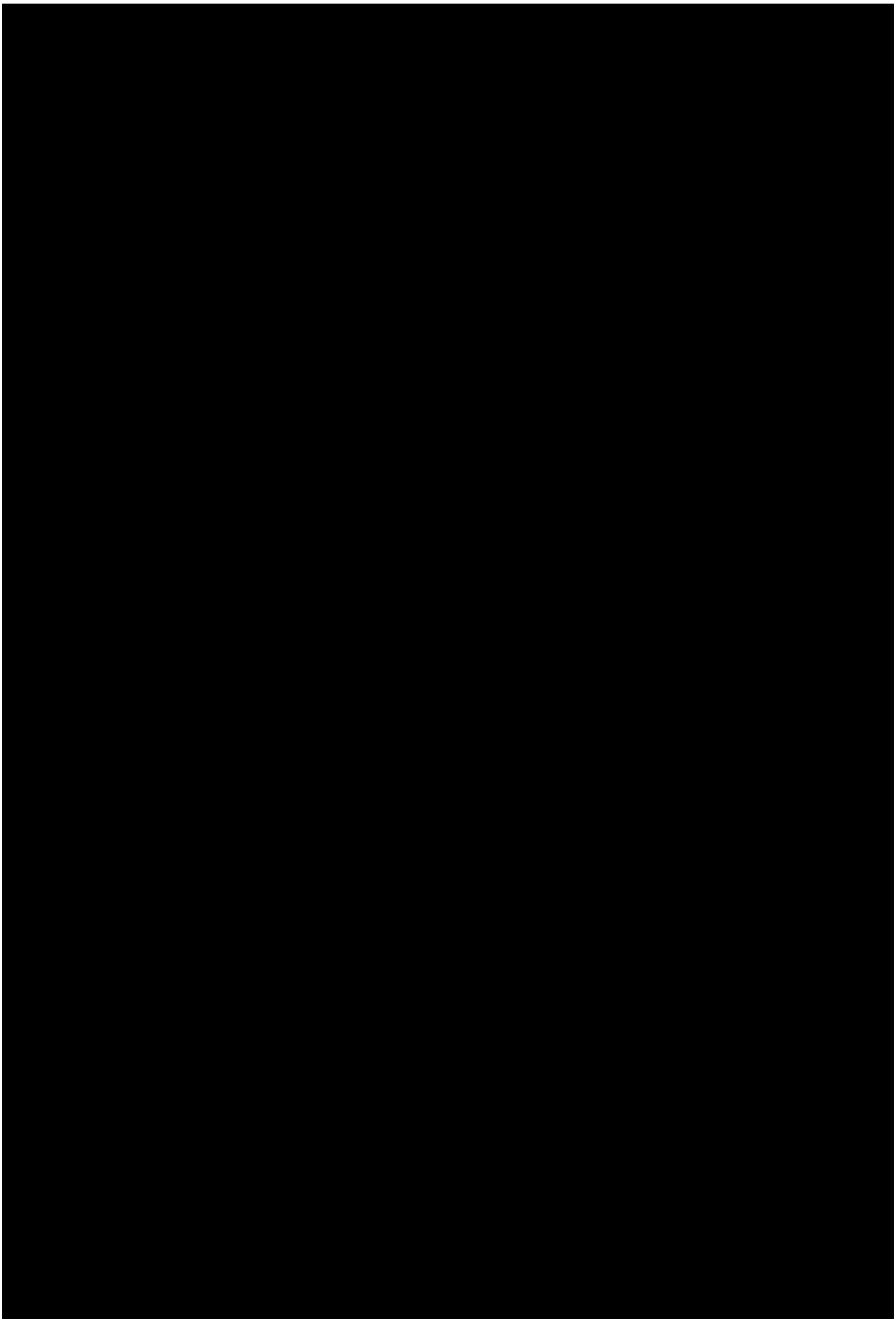


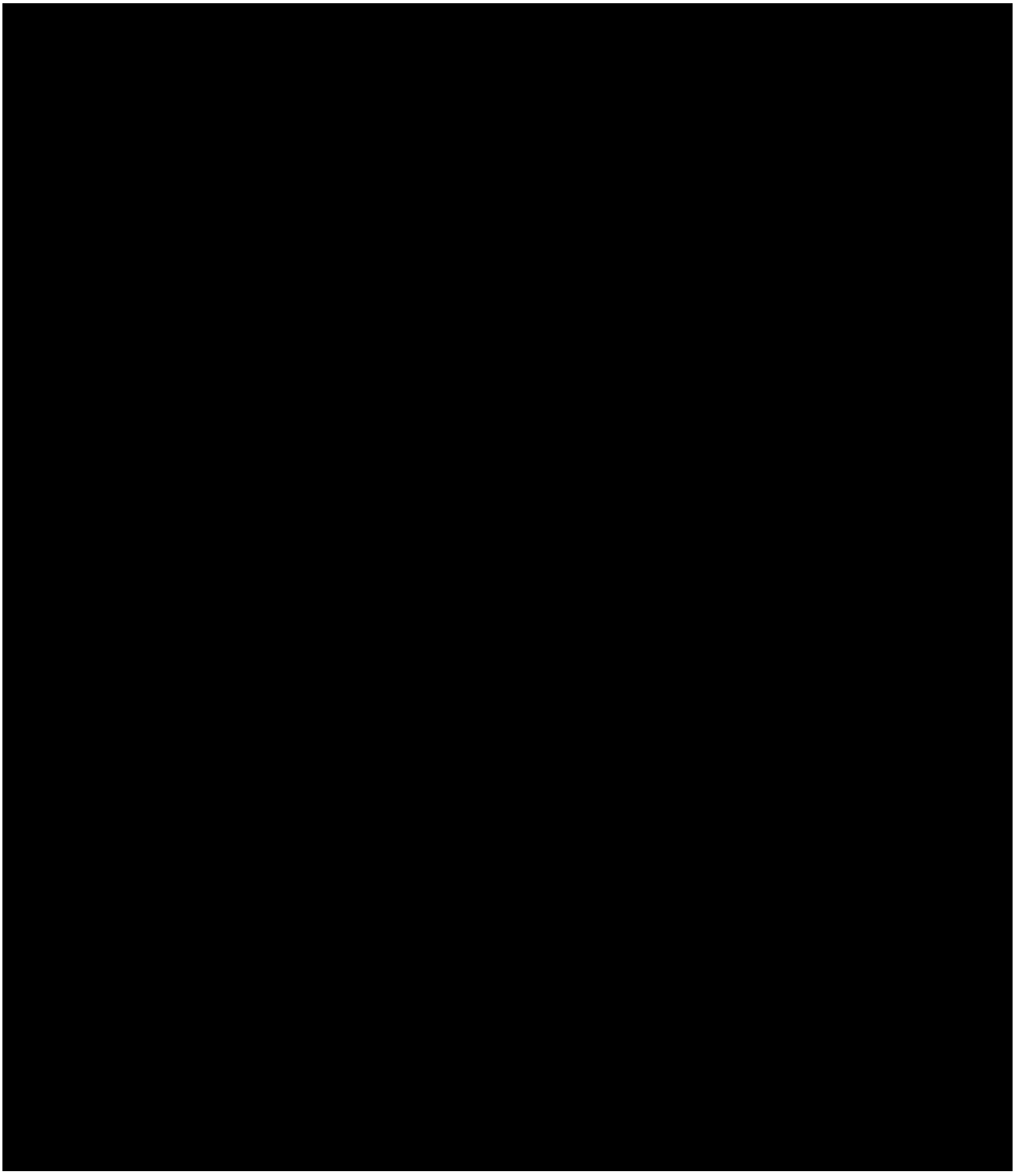


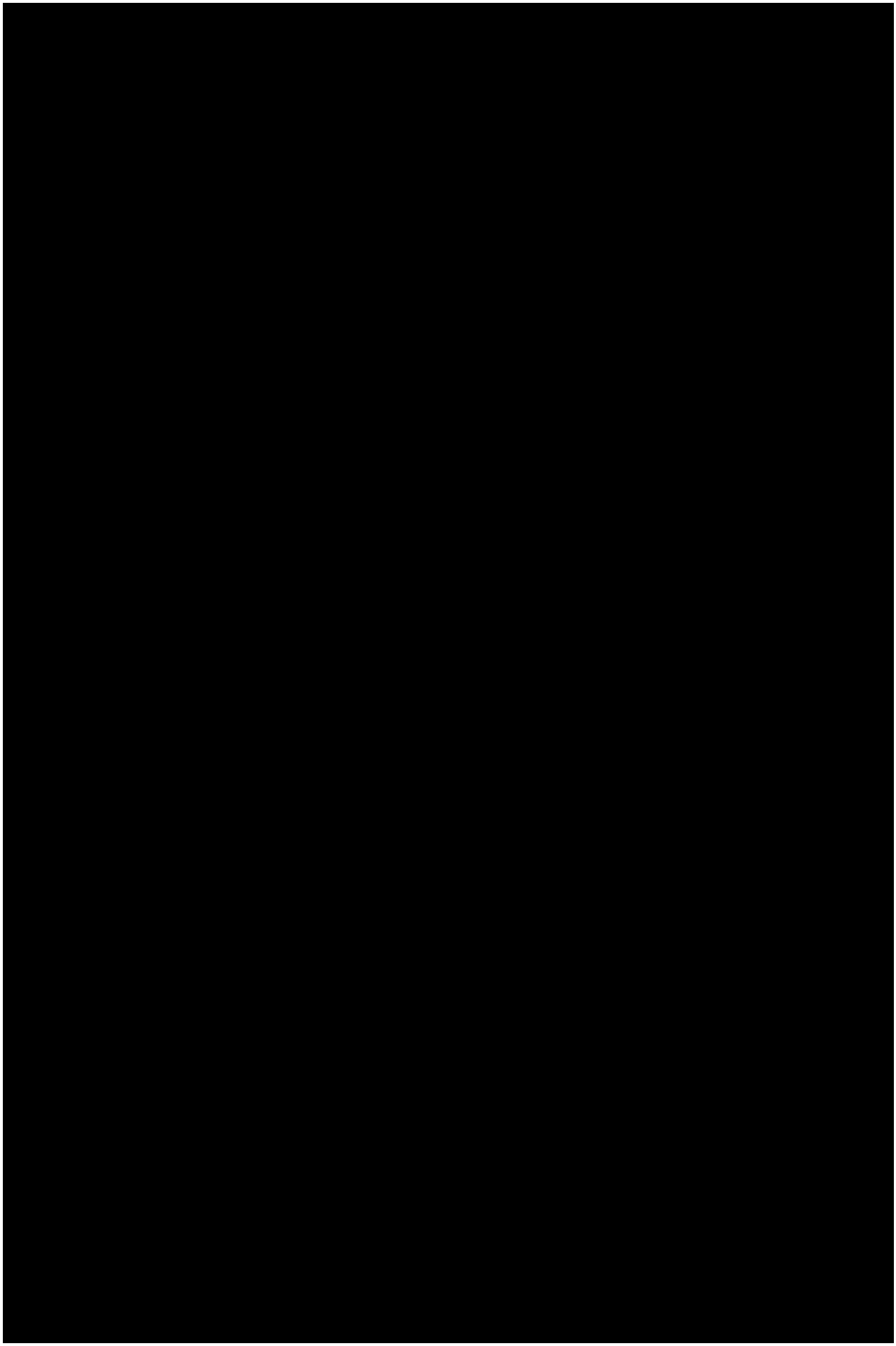


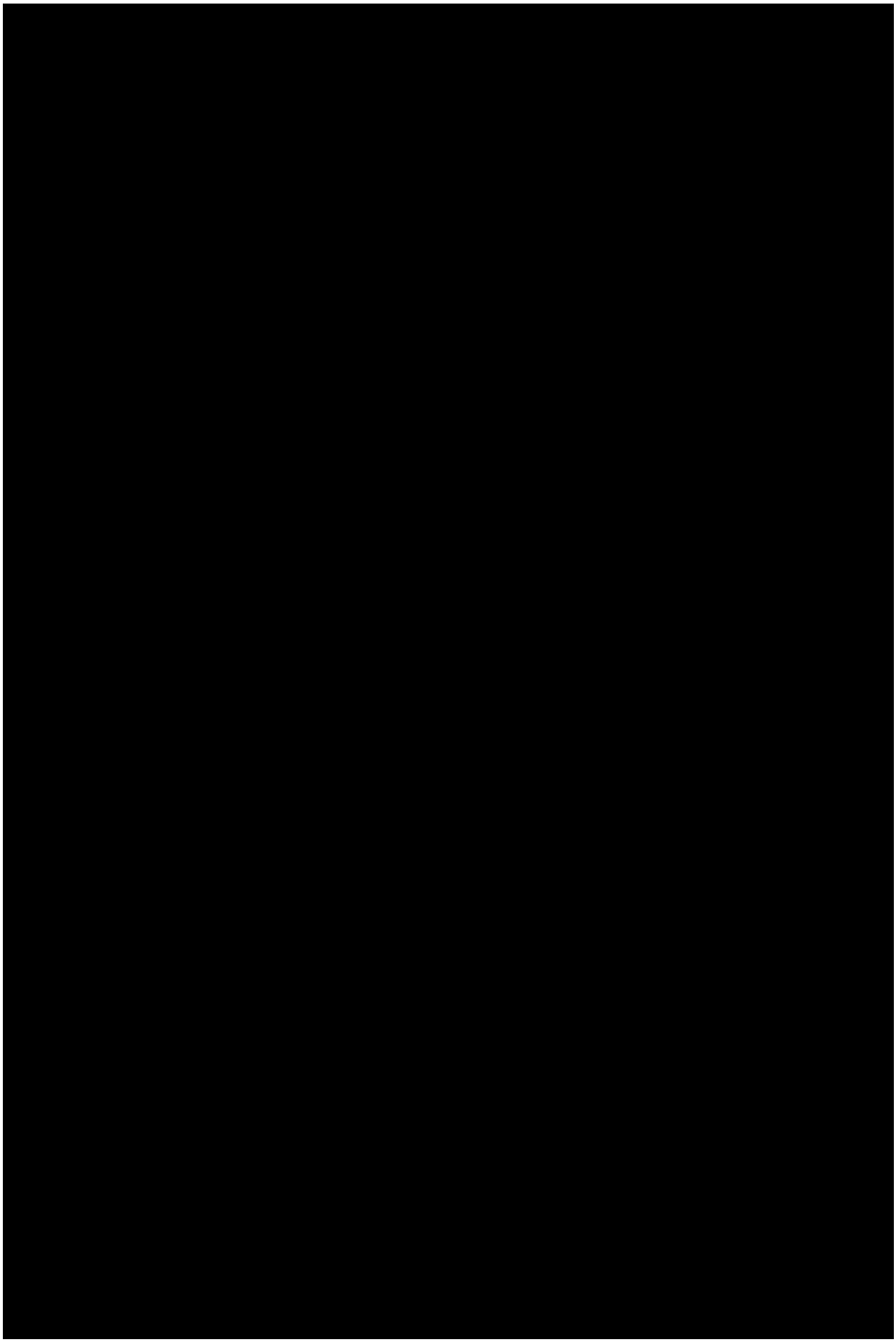


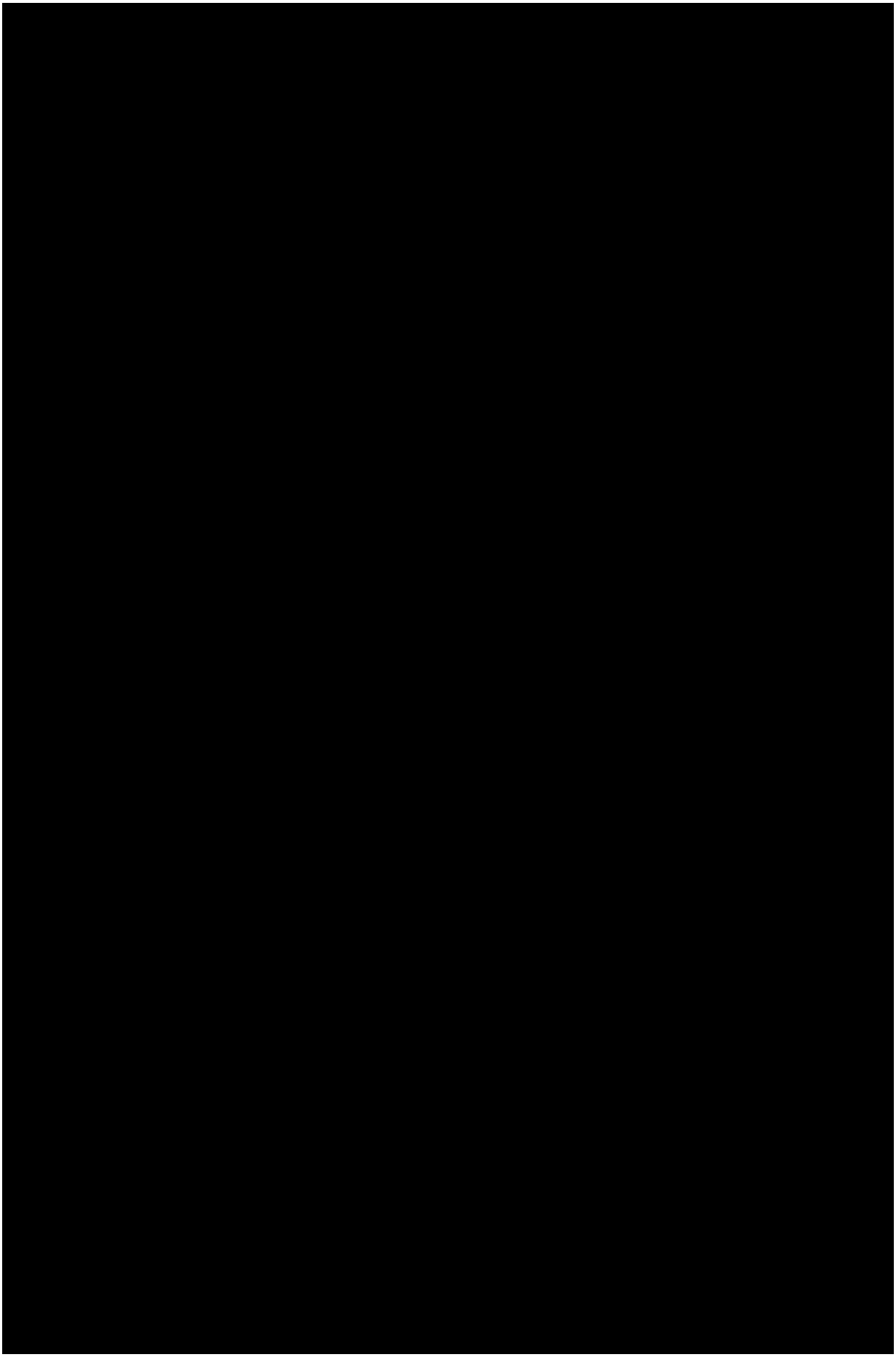


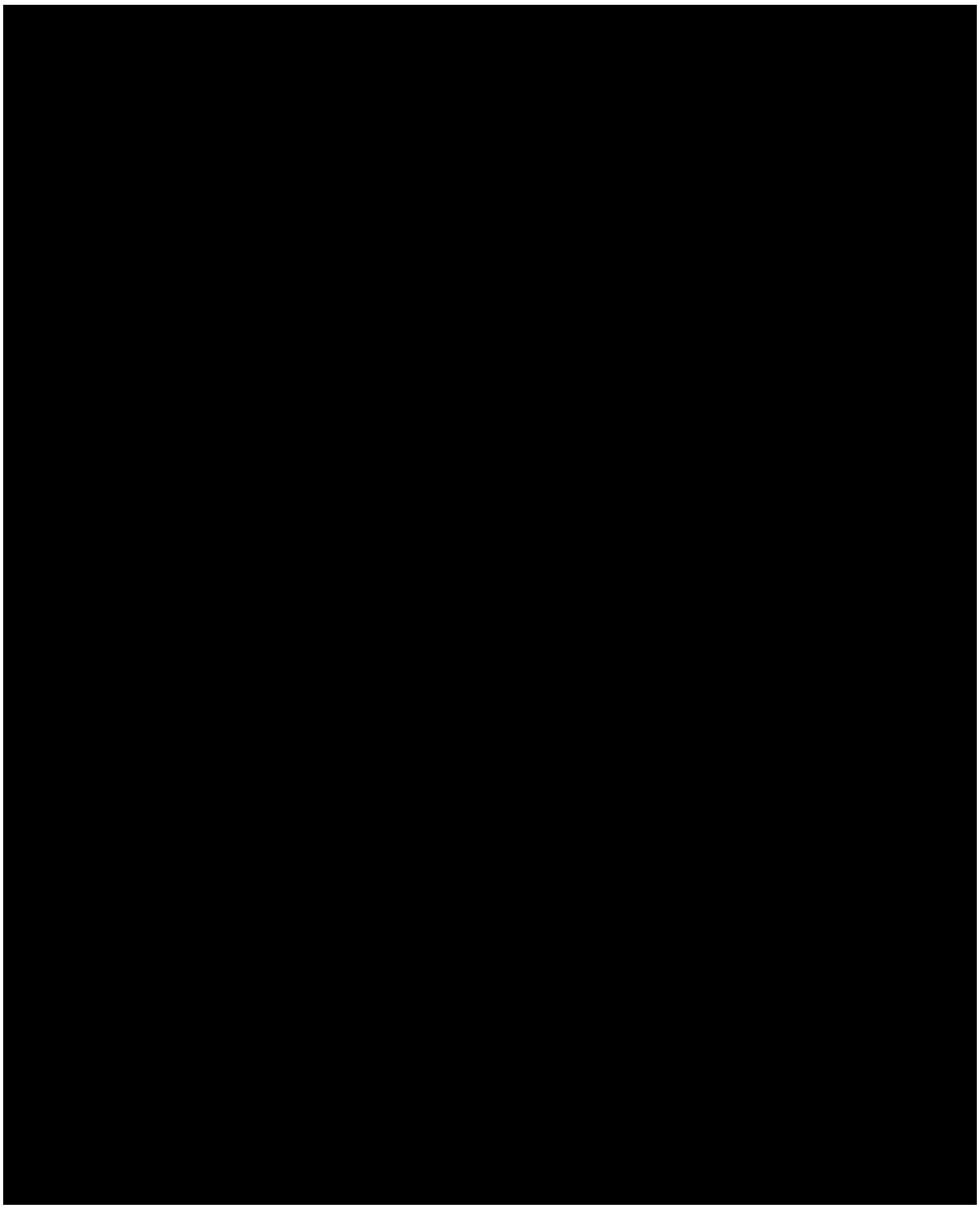


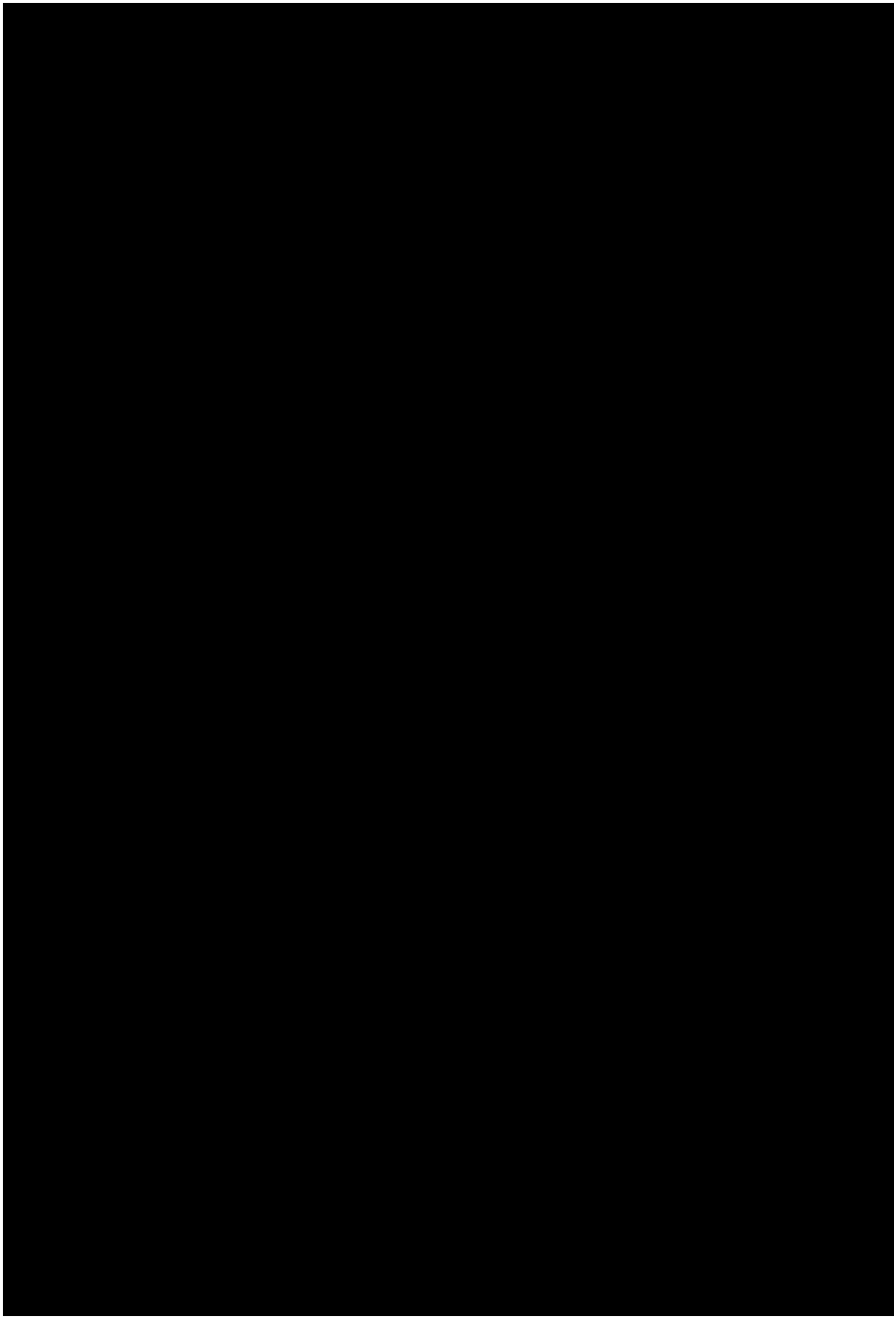












OFCOM ANNEX 26 PRICING APPROACH FOR DARK FIBRE

Introduction

17.111 We have very serious reservations about all of the analysis and conclusions drawn in this Annex with respect to dark fibre pricing and availability as we fundamentally disagree with the premise on which it appears to be based, namely of limited and smooth transition from active to passive services. Section 4 of this response sets out our current thinking on the approach to dark fibre pricing contained within the Consultation and the associated guidance in the LLCC Consultation. The rest of this section sets out our views on Ofcom's analysis in Annex 26 of the Consultation.

17.112 Ofcom [A25.127] argues as follows:

> Service migration processes
> 'Several stakeholders emphasised the need for processes to facilitate migration of their current active circuits to a dark fibre product. In our current view, many end-users are likely to be deterred from migrating during the course of an existing service contract if doing so would involve risk of disruption to their services. We therefore consider that CPs are likely to focus initially on using regulated dark fibre to connect new services rather than to migrate existing ones. Minimising the risk of disruption to end-users' services is likely to be a key requirement in designing migration processes. We consider that requirements for migration processes are best agreed by negotiation between CPs and BT as part of the implementation process.'

17.113 It is our clear understanding with CPs (set out above) and based on extensive research, that many plan rapid migration of existing services likely in advance if not at the same time as new circuits and that any issues of monitoring and fault repair notwithstanding (which will be regarded as something that BT alone has to deal with) - that this could be very rapid indeed well underway within the charge control and accelerating thereafter. Depending on how Openreach deals with the limited freedoms to ameliorate the degree of loss to aggregation, the speed will be faster or slower.

17.114 Ofcom essentially abstracts from all of the scenarios in which migration is widespread and causes disruption to pricing at both layers even in the short-term; there is no discussion whatsoever at any level of granularity in the Consultation of the incentives and impacts in the

long term. In our view, CPs who have not invested in access or backhaul infrastructure will consider that they can only win in the scenario that Ofcom has presented, freely able to migrate back and forth as it suits them.

17.115 Fundamentally, Ofcom's costs and benefits analyses are essentially abstract pieces of thinking not anchored in any framework of commercial decision taking which reflects the options that dark fibre would provide. We set out in Section 10 how Ofcom has not correctly characterised the retail market and that its technical model of the network does not include multiplexing. The capability to multiplex is another way of saying there is an incentive to aggregate. Aggregation involves a trade-off in network design between various components including fibre and electronics. This trade-off is complex and can be strongly influenced by the relative prices of different components and their price structures. Very frequently analysis leads to what may be described as a 'border solution' i.e. to completely centralise or decentralise electronics.

17.116 In particular, the substantial reduction or even removal of the price gradient is a profound change in price structure of upstream supply and this will cause a major shift in the optimal network structure for CPs. As the effect is wide reaching for the CPs, this may take time to be fully revealed in the marketplace and quite likely in a timeframe beyond that of the current review period. However, the incentives will have been set and the consequences will have been set in train in this review period. The risks for the industry are substantial and Ofcom has given this no consideration in the mistaken belief that their 1G minus formula will avoid such profound consequences.

17.117 The merits and risks of regulating multiple points in the value chain must be seen in this context. Further, major investment decisions themselves can be highly sensitive to minimum take-up thresholds for example BT's NGA rollout had to have a minimum volume share to be viable. If as seems highly likely, Ofcom will become deeply entangled in complex pricing decisions, this will cast serious uncertainty over these investments.

17.118 We have seen no evidence in the Consultation that dark fibre will actually stimulate any downstream markets whatsoever. Nor is there the slightest evidence that there will be any innovation arising of any meaningful nature; Ofcom has not cared to identify any such outcome even for the limited take-up it imagines will be the case within the proposed charge control.

17.119 We are then left with the overriding expectation that this is nothing more than an opportunity to arbitrage between tariffing structures and levels and all in a framework which will break down very quickly indeed. Ofcom [A26.43-47] sets out BT's position on these issues, as set out in our response to the preliminary consultation on passive remedies. We continue to believe that these concerns are valid (especially the risks to which the proposed pricing approach exposes investments as described in paragraph A26.45 of the Consultation).

17.120 We have shown above that Openreach faces a very unpalatable situation here to either devalue the UK infrastructure to limit arbitrage within BCMR services or alternatively to try to maintain the bandwidth gradient and infrastructure value but allow a very rapid migration of active services. In either scenario, there are major questions as to the commercial viability of the active services themselves and in both scenarios, re-balancing of active services would lead to second and then third round effects.

17.121 The likely outcome is probably a boundary solution of some sort implying radically different outcomes from at present but to a large degree unpredictable other than a strong move to dark fibre in general. It has to be emphasised that it is the interaction of bandwidth, density and distances which determine network structures and Ofcom wrongly compartmentalises these in just a short term framework and which is in any case incorrect.

17.122 Ofcom's Annex 26 misses all of this by wrongly focussing on the comparatively lesser differences that different pricing options would do in a static world of 'nothing much changing'. There is no way these alternatives can be properly assessed absent some appreciation of the long-term incentives on access infrastructure providers be that for customer sites and MNO fronthaul. In this context, we argue that LLU backhaul is rather different and essentially one of core network design and where dark fibre is totally inappropriate and no case is presented for its justification.

Pricing options/Proposed pricing approach/Benchmark product

17.123 Our position on pricing is that Ofcom's proposal for a 1G EAD minus benchmark is self-evidently inadequate and flawed to be a stable and relevant price to encourage real innovation in networks and services. On the contrary it is going to lead to rapid migration undermining the entire regime as has been developed and will not be sustainable into another market review[103]. The active minus approach will emphatically 'not allow BT to keep consistency in the tariff gradients between active and pricing products' where Ofcom [A26.77] quotes Sky believes will be the case.

17.124 We have made clear our position on the other pricing options in the Appeal following the last market review and in fact subscribe to the very objections that Ofcom itself put forward in its own testimony.

17.125 With regard to the three main options which Ofcom [A26.3] provides, it is obvious that: a) no specific pricing obligation and b) FRAND – would quickly lead to disputes with Ofcom imposing its own prices according to formulae which are not known. If the alternative is a cost-based charge control, we would agree essentially with Ofcom [A26.12] there would be massive re-balancing immediately and we believe that it would be a hugely expensive and complex task.

17.126 The choice of a value-based ('active minus') approach is one of affecting the degree to which arbitrage happens sooner rather than later. The only way of ensuring that any harmful effects of arbitrage and wrong investment signals are avoided is to set the price at a sufficiently high level. See the discussion on our current views on this in Section 4.

17.127 Ofcom [A26.86] quotes CityFibre as saying that they too use a 'value-based approach to pricing' and that if Ofcom wishes to incentivise investment and competition then they would have to take a standard based on a reasonably efficient operator.

17.128 We wish to make the following comments at this stage. Ofcom itself has now discovered that third party fibre operators are playing a key role in the provision of high and very high bandwidth services. Quite possibly they are selling to integrators and CPs in the same volume as BT itself is providing in this market. It is not reasonable for Ofcom to give equal weight to the assertions of CPs who have clearly not invested in access infrastructure and indeed who clearly have absolutely no intention of doing so - to those who have done such investment and have clearly stated goals to continue to doing so.

17.129 Ofcom's [A26.113] balancing exercise is fundamentally misconceived from a failure to appreciate the short and long term incentives on what it is proposing. We have the following comments to make on the specific considerations made by Ofcom:

- Transitory inefficiencies are not going to be minor here and Ofcom has found absolutely no evidence whatsoever that either there are permanent inefficiencies in the current regime or that there are any new efficiencies to be derived from dark fibre.

[103] We note that according to Ofcom [A26.58] this position is also taken by Vodafone.

- Inefficient entry is a serious concern and Ofcom has completely misunderstood the nature of incentives in the short and long term.
- It is well-nigh impossible for BT to demonstrate how dark fibre will affect the economics of our new investment plans as so much depends on the detail of how dark fibre would be priced and what downstream BT divisions would be permitted to do. We are however absolutely clear that there will be new opportunities for arbitrage and it is this which can only have a negative impact on our business plans.
- Stranded assets would not be limited to duct but also equipment and fibres.

17.130 Ofcom's qualitative assessment of three broad pricing options in Table A26.2 to Table A26.8 provide rankings which are extremely imprecise. All of the alternatives expressed have complex associated issues and Ofcom has not set out how it would address these concerns but simply provides a ranking. Each of the three options could have significant variants some of which may address some of the issues with them to some extent.

17.131 However, Ofcom's approach fails to make any assessment of these. It is hard to draw any conclusion from the overall "ranking" provided in Table A26.8 as none of the options seems to be clearly superior from this approach. This simply enables any option to be justified and Ofcom [A26.148] picks an option without setting out why this provides the best balance. We do not think this is a robust or sufficient analysis for an issue of this importance. Whilst Ofcom [A26.145] states that has taken into account the trade-offs which exist, but it is not at all clear how this has been done.

17.132 BT considers that Ofcom needs to rank the various issues in importance and set out a firmer basis for the exercise of its regulatory judgment. This also needs to be in the context of the impact of the choice of pricing mechanism on the assessment of the costs and benefits of dark fibre. That is, Ofcom has stated that a key factor in proposing to introduce dark fibre is that the pricing approach can reduce the risks associated with dark fibre. The choices made about the level and structure of the price of any dark fibre product therefore needs to take this into account and it is important that these choices are made explicitly to minimise the risks.

17.133 The choice of pricing approach also needs to consider the extent to which existing active price and remedies would provide alternative ways in which the supposed benefits of particular pricing approach could be achieved (especially for example what Ofcom terms active dynamic efficiencies). On this basis, we firmly believe that the most important criteria are the impact on fibre investment incentives and common cost recovery. In the terminology of Annex 26, this means primacy should be given to the approaches which support allocative efficiency and infrastructure dynamic efficiency. Issues of productive efficiency are already accommodated in the charge control on active services. Ofcom should be considering which approach and design achieves these aims rather than simply comparing broad categories of pricing approach across a range of different criteria.

17.134 Regarding costs and ease of implementation, we simply state the following. Ofcom in Annex 26 presents an abstracted and largely fact free discussion of what would be an extremely difficult and expensive exercise for BT to undertake. Ofcom misleadingly here suggests that implementation of dark fibre is a simple one-for-one substitute for an EAD circuit: the evidence presented in this response clearly establishes this not to be true. The detail of BT's obligations extend well beyond this and are in no sense limited or future proof to alternative networks and services we may wish to offer.