Property Model Overview

This document is relation to *Property footprint allocation **CI[ ]** (20082020) with calculation.xlsx* (**Property Model**).

Context

Background

Chorus developed the Property Model to allocate the value of buildings between fibre fixed line access services (**FFLAS**) and non-FFLAS for the Initial Asset Valuation (**IAV**) Model.

The model estimates, for each Exchange Service Area (**ESA**), the amount of floor space within exchange buildings that is utilised for FFLAS and non-FFLAS, then aggregates by Building Block Model (**BBM**) geography.

The FFLAS area (**Fibre Floor Area**) and non-FFLAS (**Copper Floor Area**) for each ESA are estimated from the average floor area used by each major network asset that supports the relevant service. The Property Model calculates floor space required for each major network component to either FFLAS or non-FFLAS by ESA, or in the case of Optical Fibre Distribution Frame (**OFDF**), apportions the area based on the individual fibre.

The Property Model takes into account the footprint required for each piece of equipment, or OFDF / Main Distribution Frame (**MDF**) areas, the number of pieces of elements that can be installed in each footprint, and the relative sizes of each equipment types footprint.

Methodology

Internal subject matter experts (**SMEs**) workshopped approaches for allocating building assets, identifying two options:

- Full audit of Chorus-owned ESAs, and timestamp the results for a static view; or
- Desktop modelling exercise, utilising network records.

Due to time and cost constraints, the full audit wasn't possible. In addition while it could be replicated in future, it couldn't recreate historic information to best estimate Chorus' financial losses. Therefore, the desktop modelling exercise was adopted as most likely to best give effect to the requirements of the Telecommunications Act and the Input Methodologies.

The Property Model:

- Where available, the property information has been extracted from Chorus' network systems or relevant weekly download of network records and compiled into input sheets.
- The input data provides property footprint requirements for each piece of equipment (including footprint size, power requirements), along with our Asset Managers' knowledge, is used to decide how many pieces of equipment can be installed in each rack footprint to obtain the overall area that asset utilises per ESA.

These steps are repeated for all major FFLAS and non-FFLAS asset types, noting that Spark Public Switched Telephone Network (**PSTN**) is excluded because leases are treated differently in Chorus' financial accounts.

For 2021 and beyond, the model forecasts how the network elements will change overtime, based on Chorus' Board-approved business plan.

Certification

As part of the Commission's notice dated 26 February 2021, and responded to by Chorus on 26 March 2021, Chorus provided a description of our internal certification process (ref B11). This explained the three-tier certification process that forms part of Chorus' assurance framework and was applied to the whole IAV Model, including the Property Model.

More specifically for the Property Model:

- Technical Lead – Asset & Investment Manager developed the desktop modelling exercise, using the methodology developed with a number of internal SMEs, and endorsed by senior management.
- Technical Review – was completed by Head of Network Technology, who reviewed the logic of the modelling, including methodology and assumptions applied.
- Quality Review – completed by Head of Technology Strategy & Architecture, by reasonable enquiry that the Property Model accurately represents, in all material respects, the operations of Chorus.

The certifiers relied on further assurance completed by:

- Regulatory & Costing Analyst and an external modelling consultant – reviewed the mechanics of the model.
- Senior Finance Manager – reviewed the model to ensure the methodology had been applied as agreed.

In addition, the data inputs to the model were also subject to our internal certification process. We provided the internal certificate of Chorus' CFO, David Collins (which related to the IAV Model as a whole), to the Commission with our 26 March response. The Commission's notices did not require Chorus to provide any accompanying certificates such as director certificates (in contrast to, for example, the expenditure proposal, which is subject to specified certification requirements in the IMs). We did however provide an extraction of the risks and limitations from those certificates (see below).

Limitations, risks and assumptions

Workshops with internal SMEs were held to discuss the approach, logic, mechanics, assets, and information required to enable the Property Model to be developed in a prudent and efficient manner.

In December 2020, we recorded the limitations and assumptions used in collating the information as follows:

- Information has been sourced from both financial systems, network systems and our network records. While the data appears to be largely consistent, it does not align perfectly. The implications of the differences are not material.

- Expert knowledge was used to assign assets into the respective asset categories for attribution and allocation.

The limitations (if any) in collating the information or relating to the use of the information:

- The historic use data was derived from that available today and is our best estimate of the usage changes over time.
- The data is operational in nature and is generated and held by us in our systems for particular purposes. It is also often intended to be used by staff and third-party contractors familiar with the information, the systems and their limitations. Accordingly, caution is necessary before utilising information for other purposes or in selecting particular elements of information for use outside of its business context.

Risks:

- Information for the Property Model has been sourced from both financial systems, network systems and Chorus' network records. While the data appears to be largely consistent, it does not align perfectly. The implications of the differences are not material.

Assumptions:

- The building space is used by either FFLAS or non-FFLAS services.
- The usage of the building space can be determined by using equipment details from the network records systems.
- Non-FFLAS equipment has lower equipment densities and hence result in a higher utilisation of the building space.
- The building space used by shared equipment such as the OFDF have been allocated based on the use of the asset by FFLAS and non-FFLAS services.
- Forecasted building space usage reflects current plans for investment in equipment for fibre services and decommissioning of equipment copper services. The Property Model has used the plans that were available at the time.
- The space leased by Spark in Chorus buildings was derecognised from the book value of the relevant buildings at demerger, in accordance with GAAP, and therefore it is not appropriate to include the Spark space when allocating Chorus NBVs.
- The use of the building space by colocation services is not material and is not included in the calculations.
- Detailed technical assumptions are in the Calculations section below.

Further context:

- It's not possible to identify every asset in every ESA, as Chorus doesn't have a complete set of network records on how the buildings are used. Hence it was derived.

- Dense Wave Division Multiplexing (**DWDM**) assets are shared, and extremely challenging to allocate between FFLAS and non-FFLAS, so has been excluded from the modelling. Power plant, batteries and air conditioning assets are shared, and treated the same as Transport/DWDM. As a result, building space allocated to FFLAS is conservative.
- Factor of 3 to allow for the space required around the equipment for access and to complete tasks, is consistent with Chorus' design rules for copper and fibre. If this is removed (i.e. assumed to be zero) for all asset types, it makes no difference to the outcome of the Property Model.
- Operational data is a snapshot in time.

General

Outputs

The Property Model provides the following outputs (refer to worksheet *Summary_Output_SPACE*):

- Chorus-owned sites, the percentage of floor space utilised by FFLAS by geography; and
- Spark-owned sites, the percentage of leased floor space utilised by FFLAS by geography.

Outputs for Chorus-owned sites are then used:

- IAV Model – to allocate assets that are "shared with copper property space"; and
- Opex Model – to allocate "accommodation relationship driver".

Where outputs for Spark-owned sites are used in the IAV Model to allocate assets that are "shared with copper property leased space".

Inputs

The model uses a number of sources for data inputs:

Chorus Board Approved Business Plan	Forecast assets by ESA
	Forecast connections
Chorus Data Warehouse	Copper connections by ESA
	Fibre connections by ESA
Element Manager	Digital Subscriber Line Access Multiplexers (**DSLAMs**) by ESA
	Fibre Aggregation Network (**FAN**) switches by ESA
	Passive Optical Line Terminators (**POLTs**) by ESA
	Regional Ethernet Network (**REN**) switches by ESA

NetMAP	Copper cables per ESA
	Fibre cables terminating on POLTs by ESA
	OFDF footprint by ESA

Scope

Following summarises the scope of the model:

Services	FFLAS is as per scope of the regulated service definition.
Timeframes	Actuals 2011 to 2020
	Forecast 2021 to 2025
Assets	DSLAMs (copper)
	FAN switches (predominantly fibre)
	MDF (copper)
	OFDF (shared with copper and fibre)
	POLTs (fibre)
	REN switches (predominantly copper)
ESA Ownership	Chorus-owned ESAs and Spark-owned ESAs (as assets relating to Spark leases are treated differently for accounting purposes).
Geography	Won – aggregation of ESAs in which the main provider of Ultra-fast Broadband (**UFB**) services is Chorus. Not all premises in the ESA are necessarily passed by FFLAS.
	Partially Won – aggregation of ESAs in which the provider of UFB1 services is another local fibre company (**LFC**), but Chorus is the provider of UFB2/2+ (or vice versa).
	Lost – aggregation of ESAs in which the main provider of UFB services is another LFC.
	Non – aggregation of ESAS where there is no provider of UFB.

Calculations

The calculations of FFLAS and non-FFLAS are in the worksheet *Method 1 (F C)* by ESA. Where the *ESA* worksheet classifies each ESA as Won, Partially Won, Lost and Non consistent with the IAV.

Fibre floor area by ESA

To calculate the floor space occupied by FFLAS, the formula is:

Fibre Area = POLT Area + FAN Area + (OFDF Area x %-FFLAS)

Where:

POLT Area	Footprint is calculated on the basis of a maximum of 2 POLTs (also referred to as OLTs) per rack, where the standard footprint of 0.8m x 0.6m is multiplied by a factor of 3 to allow for the space required around the equipment for access and to complete tasks. Actual POLTs by ESA are sourced from Chorus' network records, element manager, a system that records assets to enable services to be provisioned and assured. Forecast POLTs are sourced from Chorus' UFB build programme (as per Board approved business plan). Refer to worksheet *POLTs*.
FAN Area	Standard footprint is 0.8m x 1.0m, then multiplied by a factor of 3 to allow for the space required around the equipment for access and to complete tasks. Actual switches sourced from Chorus' network records, element manager, a system that records assets to enable services to be provisioned and assured. Forecast switches sourced from Chorus' Board approved business plan. Refer to worksheet *FAN Switches*.
OFDF Area	OFDF footprint by ESA sourced from Chorus' network records, NetMAP, using the install date to estimate the time-based profile. Factor rate of 3 to allow for the space required around the equipment for access and to complete tasks. Refer to worksheet *Method 1 (F C)*.
%-FFLAS	Estimated via a year-by-year analysis of the percentage of fibres used by FFLAS for allocating OFDF space, and allocated based on use at the time it's sourced from Chorus' network records, NetMAP. Forecast FFLAS fibres estimates are based on splitter count provided by Asset & Investment Managers. Refer to worksheet *Method 1 (F C)*.

Copper floor area by ESA

To calculate the floor space occupied by non-FFLAS, the formula is:

Copper Area = DSLAM Area + REN Area + Copper Area + (OFDF Area x (1 - %-FFLAS))

Where:

DSLAM Area	Copper broadband shelf (ISAM/DSLAM) can have a maximum of 2 ISAMS/DLSAMS per rack, and a footprint of 0.8m x 0.6m. This is multiplied by a factor of 3 to allow for the space required around the equipment for access and complete tasks. Actual DSLAM numbers sourced from Chorus' network records, element manager, a system that records assets to enable services to be provisioned and assured. Forecast DSLAM numbers sourced from Chorus' Board approved business plan. Refer to worksheet *xDSL DSLAMS*.
REN Area	Rack footprint is 0.8m x 1.0m, and multiplied by a factor of 3 to allow for the space required around the equipment for access and to complete tasks. Actual switches sourced from Chorus' network records, element manager, a system that records assets to enable services to be provisioned and assured. Forecast switches sourced from Chorus' Board approved business plan. Refer to worksheet *REN Switches*.
Copper Area (or MDF)	Footprint is calculated by 350mm x 600m, with 800 pairs per vertical. Factor rate of 3 to allow for space required around the equipment for access and to complete tasks. We only consider the distribution side of the copper MDF as the equipment side is associated with Spark PSTN switch is excluded (i.e. has no value on Chorus' financial asset register). Utilisation of the copper MDF will reduce over time as copper services migrate to fibre. For each ESA, based on the copper count, the required MDF is calculated (assuming 100% utilisation), then scaled to reflect actual utilisation by year. Where the copper count is the total number of copper pairs per ESA from network records, NetMAP. Refer to worksheet *Copper Count*. % of Non-FFLAS Usage of MDF is the percentage of non-FFLAS connections per ESA, based on copper and fibre connections from the Chorus Data Warehouse. Refer to worksheet *Copper to fibre Split (*taking inputs from *Source Copper* and *Source Fibre*).
OFDF Area	OFDF footprint by ESA sourced from Chorus' network records, NetMAP. Factor rate of 3 to allow for space required around the equipment for access and to complete tasks.

	Refer to worksheet *Method 1 (F C)*.
%-FFLAS	Estimated via a year-by-year analysis of the percentage of fibres used by FFLAS for allocating OFDF space, and allocated based on use at the time it's sourced from Chorus' network records, NetMAP. Forecast FFLAS fibres estimates are based on splitter count provided by Asset & Investment Managers. Refer to worksheet *Method 1 (F C)*.

Allocation to FFLAS by ESA

To calculate the percentage allocation to FFLAS by year, the formula is:

Property Allocation FFLAS = Fibre Area / (Copper Area + Fibre Area)

Allocation to FFLAS by geography

The percentage allocation to FFLAS by year is then aggregated by geography – Won, Partially Won, Lost, and Non, and whether the ESA is owned by Chorus or Spark.

Appendix

Worksheet purposes

ESA-CSA Mapping	**Not used**
Sheet1	**Not used**
Method 1 (F C) Marginal	**Not used**
Chorus Site Category	List of ESAs and identifies those owned by Spark
ESA	Lists of ESAs and their geographic status
Exch_fibre_count (002)	Lists all fibre cables per ESA and when the cable was installed
Spark	Lists the number of fibres per site
Fibre Count	Sums the number of fibres in place per year, by ESA
Copper	Lists all copper cables and size per ESA
Copper Count	Sums the number of copper pairs per ESA (used to size MDF)
REN Switches	List of all REN ethernet switches, ESA location, footprint and date installed. Used in *Method 1 (F C)* to Calc REN Area. Future REN switches have been added based on forecast in Forecast *REN_New_Switches*. Basis taken from *REN_power_by_Switch-20*
Forecast REN_New_Switches	Lists when new REN switches will be installed and where
REN_power_by_Switch-20	Extract taken from Management records
FAN Switches	List of all FAN ethernet switches, ESA location, footprint and date installed. Used in *Method 1 (F C)* to Calc FAN Area
Forecast FAN_New_Switches	Lists when new FAN switches will be installed and where
FAN_power_by_Switch-20	Extract taken from Management records
xDSL DSLAMS	List all DSLAM that were installed and when, and when we plan to remove (1 = installed, 0 = removed) Used in *Method 1 (F C)* to Calc DSLAM Area
POLTs	List all POLTs that were installed and when, and when we plan to remove (1 = installed, 0 = removed) Used in *Method 1 (F C)* to Calc POLTs Area

Copper to fibre Split	Calculates the % of the MDF that will be used as a function of time
Source Copper	Estimate of copper in future and current count. Forecast based of geographic forecasts.
Source Fibre	Estimate of fibre in future and current count
Source Copper verse fibre split	Actual and estimate number of copper and fibre per ESA
Sheath Master	Used to get basis for Exchange fibre count
Forecast GPON	New GPON POLTs per ESA pa
Forecast ISAM	Number of ISAM to be removed pa
Summary Output Space	Output from model
Method 1 (F C)	Detailed workings