FLLRIC Model for the Cayman Islands
Fixed Network Document Draft Costing Manual

Cable & Wireless Cayman Islands

Submitted 14 December 2005

Table of Contents

FLLRIC Fixed Network Model

1. Introduction

1. This document is the second part of a submission representing C&W latest contribution to the development of the LRIC model in the Cayman Islands and, in particular, its fulfillment of requirements set out in the Authority's *Public Consultation on Costing Manual* (CD 2005-1), dated 27 October 2005, to submit a draft LRIC costing manual. As required by the Authority, the submission includes

   a) our proposed costing manual along with supporting rationale and explanations;

   b) two example costing studies developed using this manual, the first being mobile termination service, the second being the residential fixed line access service;

   c) our proposal on how to allocate common costs, proposed determination and level of expense factors, and proposed economic asset lives;

   d) additional information from other jurisdictions where competition exists regarding the determination and level of expense factors as well as any information supporting the applicability of such factors to the Cayman Islands; and

   e) any supporting asset life studies used in developing its proposed economic asset lives.

2. We also use the opportunity to propose two WACCs for use in the fixed and mobile network models.

3. The submission is divided into three parts:

   1. The Background Document:

      - explains our understanding of the principles and guidelines set out in the Authority *Decision for the Forward-looking Long-Run Incremental Costing Consultation* (ICT Decision 2005-4);

- describes the overall methodological approach and treats issues common to both the fixed and mobile issues, including the cost of capital, expense factors, asset lives and treatment of retail costs; and

- provides definitions for terms and acronyms used in the other parts of the submission.

2. The Fixed Network Model Manual, which describes the structure and functioning of the fixed network model. The Manual includes a Retail Case study—Residential Fixed Line Service, which traces the inputs and calculations of costs relevant to the retail residential fixed line service to identify how outputs are determined.

3. The Mobile Network Model Manual, which describes the structure and functioning of the mobile network model. The Manual includes an Interconnection Case study--Mobile termination, which traces the inputs and calculations of costs relevant to mobile termination to identify how outputs are determined.

4. This document describes the structure and function of the LRIC Fixed Network model. The services, assumptions and calculations are identified. Appendices are provided which contain the template input and workings sheets. The manual concludes with a case study that demonstrates how the inputs flow through the model to determine incremental costs.

5. In the figure below we have grouped the fixed services in the model into different groups. We have split the fixed services into access, traffic, data and other services, based on the type of service. Traffic services fall into three groups:

- Retail traffic services: services Cable & Wireless offers to end users;
- Wholesale services: services Cable and Wireless offers to other operators and resellers; and
- Interconnect services: services which provide Other Licensed Operators (OLOs) with either terminating or originating access

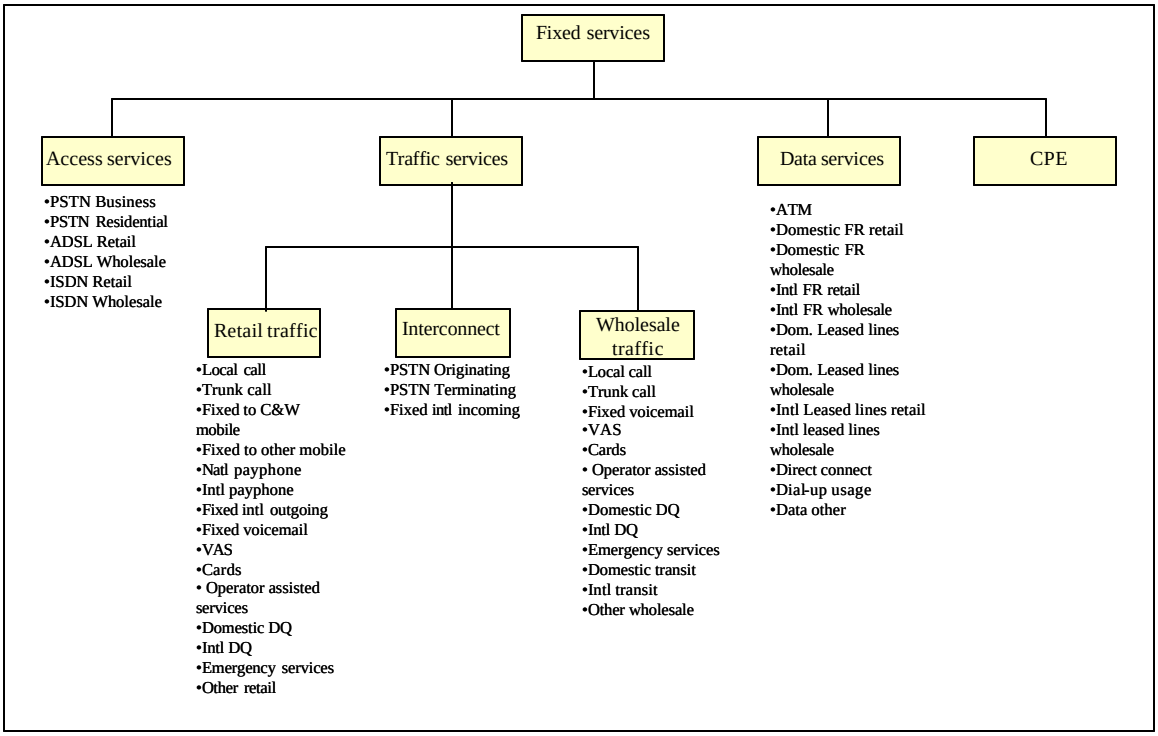


Figure 1 Fixed services in the LRIC model

2. Methodology

6. The fixed network that currently exists in Cayman is based on traditional technology, with a division into a core network and an access network (see figure 1 below). The core network is based on circuit-switched technology, incorporating digital local switches and concentrators and SONET -based optical transmission rings.

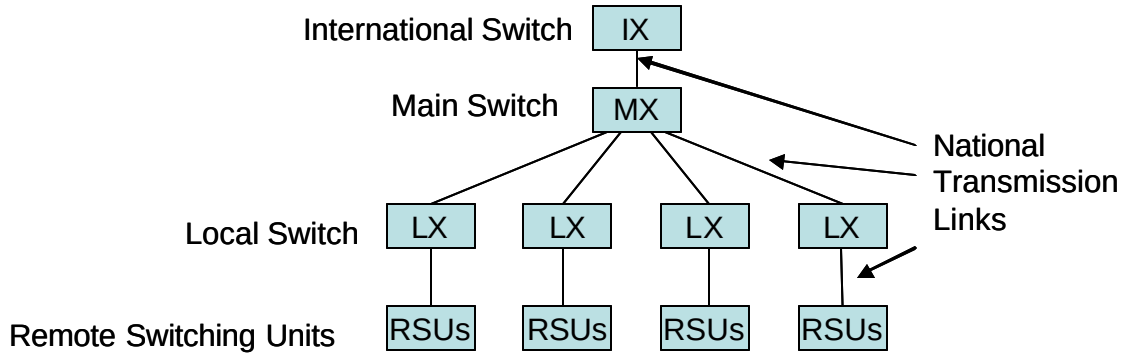


Figure 2 Core Network Architecture - Existing Network

7. The access network is based on copper multi-pair cables, both aerial and underground.

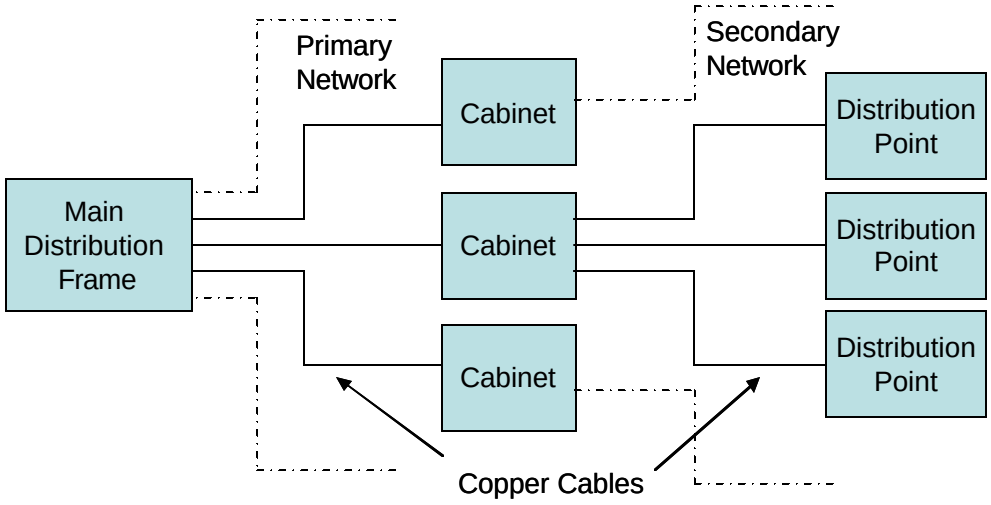


Figure 2 Access Network Architecture

8. The bottom-up model is constructed using the technology that an efficient operator would employ today. This means that there are some fundamental differences in the modelled approach when compared with the existing network in Cayman. The key differences are:

- Next generation switching equipment is employed to provide a multi-service platform based in IP technology.
- Transmission is based on an optical Ethernet.

9. The implication of this in terms of equipment are that:

- existing PSTN remotes are replaced with voice/broadband-enabled IP concentrators supporting the existing range of services. These are referred to as multiservice access nodes (MSANs);
- existing hosts are replaced with media gateways (MSEs); and,
- the core transmission network uses the same optical routes, but carrying Ethernet protocol.

10. The structure of the modelled core network is shown in the diagram below.

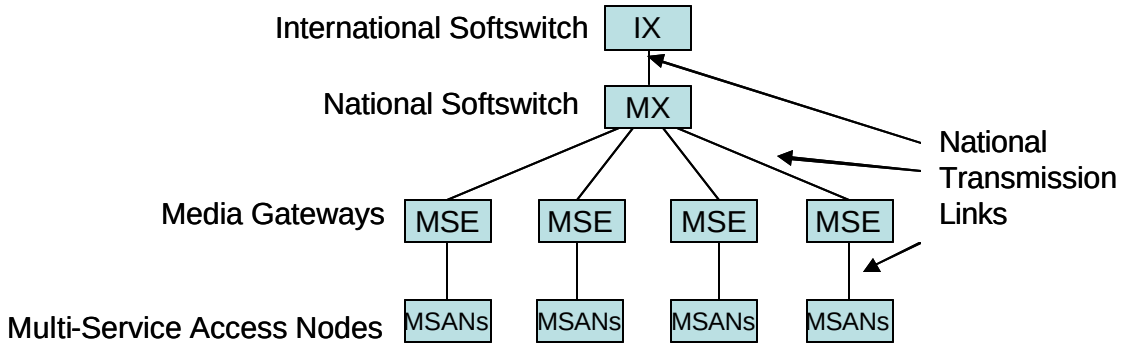


Figure 3 Core Network Architecture - Modelled Network

11. Although the IP technology is radically different to the traditional circuit switches, C&W Cayman plans indicate that the topological structure of the network in Cayman is likely to remain as it is today, with changes only in the type of equipment deployed at each node. As a result we have taken the same approach to modelling the fixed network – which is also consistent with the scorched-node assumption that underpins the costing methodology.

12. There is therefore an equivalence between network components of the existing network, and network components in the modelled IP network as shown in the table below:

Existing Component	**NGN Component**
Access network cable and duct	No change
Core network fibre and duct	No change
Remote concentrator units	MSAN (multi-service access node)
Local Switch	MSE (media gateway)
Main Switch	IP Softswitch

Description of Network Components

13. This section provides a description of the network components modelled.

Fixed Model - Access Network

14. The access network is based around a copper cable infrastructure and contains the following components:

- Copper multi-pair cables – these are used in a variety of sizes ranging from 6-pairs to 2400 pairs. Some of the cable is underground, either in ducts or directly buried, and some is aerial, mounted on poles.

- Joints – which provide the connections between the cables – they come in varying sizes according to the cable size.
- Manholes – these are use to provide access to cables joints for installation and maintenance purposes.
- Poles – these may be dedicated to the telecoms network, or may be shared with other utilities such as electricity.
- Duct – this provides an underground conduit for the cable. Some duct may be shared between the access and core networks.
- Distribution Points (DPs), Dropwires and Network Interface Devices – these provide the final link to the customer premises.

Fixed Model - Core Transmission

15. The core transmission network is based around optical fibre cables which may be either underground in ducts or aerial, supported on poles. The following components are used:

- Fibre Cables – these are provided in sizes ranging from 12 to 48 pairs.
- Fibre Joints – these provide the connections between separate lengths of fibre cable, and vary according to the size of cable jointed.
- Ducts, poles and manholes – these are shared with the access network.

16. We would emphasize the following with respect to transmission equipment. In the traditional network, optical multiplexers are deployed to convert digital outputs from the switches to optical signals suitable for transmission over the fibre network. However, for the LRIC network design using NGN technology, it will not be necessary to have separate transmission equipment – the IP switching units can be provided with Gigabit Ethernet interfaces which connect directly to the optical cables. Therefore there is no distinct transmission equipment provided.

Fixed Model - Switching

17. Multi Service Access Node (MSAN) – this equipment connects to the copper access network, and provides the functionality for provision of voice and ISDN calls, as well as ADSL and other xDSL data. All services are thus provided by the same unit, giving considerable cost savings compared with a traditional network where separate units are required to deliver voice and data.

18. Media Gateway (MSE) – this equipment collects and routes voice and data (carried as IP) from several MSANs.

19. Softswitch – this equipment is able to route calls between MSEs, and provides the link between the IP infrastructure of the Cayman national network and outside

networks. Separate softswitches are provided for national and international switching.

Network dimensioning rules and assumptions

20. This section describes the rules and assumptions that underpin the dimensioning of the fixed and mobile networks.

Fixed Network - Access

21. For the access network, the cost driver is subscriber lines. By applying the scorched node assumption, we assume that all existing nodes in the access network will remain regardless of the driver volume. At the minimum point, when the driver volume is zero, we assume that there is a capability to provide a line to every customer via normal provisioning procedures. This implies the following at the minimum point:

- At least two pairs are provided to connect each distribution point.
- At least two pairs are provided to connect each cabinet (jumpering at the cabinet can then allow connection to the relevant DP).
- The ratio of aerial to underground cable is kept constant, as it is assumed that the geographical mix of customers does not change with changing volume.
- The total numbers of DPs and cabinets remains the same (scorched node assumption)

22. At the maximum point (i.e., where the volume driver is at the current levels of demand in the Cayman network), we assume that:

- The current lengths and sizes (i.e. pairs) of cable are appropriate to service the demand, including appropriate allowances for spare capacity.
- The current numbers of cabinets and poles are appropriate to service the demand.

23. In order to calculate the quantities of cables and joints to provide for particular levels of demand, the model interpolates between the minimum and maximum points, using the following method:

- Km length for each cable type remains the same (scorched node assumption)
- The size of each cable (ie number of pairs) is scaled according to the following formula: *Cable size = maximum point cable size * volume / max_volume*
- This size is then rounded up to the nearest standard cable size

Volume at Maximum	146,860	Volume Driver	50,000

Aerial Direct Feed	Pairs provided at maximum	km	Scaled pairs	Rounded pairs	Pair km at max point	Pair km at current volume
	6	6	2	6	34	34
	12	21	4	6	256	128
	18	36	6	12	656	437
	25	98	9	12	2,461	1181
	30	7	10	12	207	83
	37	15	13	18	571	278
	50	82	17	18	4,097	1475
	75	20	26	30	1,523	609
	100	90	34	37	8,974	3320
	150	34	51	75	5,055	2528
	200	129	68	75	25,790	9671
	300	83	102	150	24,915	12457
	400	44	136	150	17,787	6670

Figure 4 Access Dimensions Extract

24. The model extract above (from the "access dimensions" sheet) gives an example illustrating how this works:

- In this example, the volume is set to 50,000 lines, compared with a maximum of 146,860 lines
- The first column shows the different sizes of cable at the maximum point
- The second column shows the km of each type
- The "scaled pairs" shows the new size of cable required when the volume is reduced to 50,000 lines
- The "rounded pairs" column shows the requirements using standard cable sizes
- The "pair km at maximum point" shows the pairs multiplied by km at the maximum point
- The "Pair km at current volume" shows the pairs multiplied by km at the volume of 50,000 lines.

25. So at the volume of 50,000 we have the same overall km of cable installed (as we still have to provide the same coverage to the cabinets and DPs), but the number of pairs in each cable length is reduced to service the reduced demand.

26. The same approach is used to dimension cables of the E-side and D-side, both for aerial and underground.

27. For cable joints, C&W data on the average separation of joints in a cable run is used to estimate the required number of joints of each type.

The formula used is:
Number of joints = cable km / average separation

28. For manholes and poles, the quantities are assumed to remain constant as they will be needed to provide coverage, regardless of the volume demand.

Fixed Network - Transmission

29. For the core transmission network, the quantities of fibre cable and associated joints are assumed to remain constant, as all the cable will be needed to provide connectivity regardless of the traffic demand.

30. The dimensions are therefore built up from C&W data, which breaks down the cables by type (i.e. number of pairs and underground/overhead) and gives the km length of each type.

Fixed Network - Switching

31. The switching equipment is dimensioned according to formulas provided by C&W experts in NGN technology.

Fixed Network - MSAN Dimensions

32. For the MSANs, the starting point is a list of all current C&W Cayman RSUs, and the installed lines capacity.

33. The dimensioned demand column is calculated by scaling the current installed lines for each RSU by the lines volume driver using the following formula:

    *Dimensioned demand = total lines * volume driver / total lines max point*
    The MSAN cost for each node is then calculated in the total cost per MSAN column via the following formula:
    *Cost = dimensioned demand * (1+voice/dsl provisioning ratio) / MSAN fill ratio * MSAN cost per port*

34. Although most of the MSAN costs comprise the costs of the access line interface, there remain some costs which relate to handling traffic. The above dimensioning formula does not allow for this distinction, so it is next necessary to calculate the split between traffic-related and line related costs.

35. This is done in the "MSAN analysis" sheet. Here, using data provided by our vendor to C&W relating to the replacement of certain RSUs by MSAN equipment, it is possible to derive the relationship between line-driven costs and the remaining fixed cost.

36. The resulting ratio of fixed costs as a % of total is then used the split the MSAN costs in the MSAN dimensions sheet into fixed (traffic related) and variable (line related) costs.

Fixed Network - MSE Dimensions

37. The media gateways are located at the existing local switch sites in the C&W Cayman Islands' network. Each MSE node consists of the following components:

- MSE base unit
- MSE access unit (each of which supports 4 MSANs)

38. The quantity of MSE base units is determined by the number of nodes, which is 2 in the Cayman network.

39. The quantity of MSE access units is determined according to the following formula:

*Quantity = 2 * number of access sites * planning factor / 4 + number of core sites*

40. These quantities represent a minimum configuration, yet are capable of supporting the entire voice and data requirements for a market the size of Cayman. As such, the equipment costs for the MSEs are fixed and do not vary with volume.

Fixed Network - Softswitch Dimensions

41. A single softswitch is capable of providing switching traffic both internally within the NGN network and to 3rd party networks.

42. The dimensions of the softswitch are determined by considering the number of lines served by the switch, as this gives an indication of the traffic it is required to handle.

43. The formula used to dimension the switch is:

Switch dimensions = lines + trunks
where *trunks = lines * line/trunk ratio*

44. The line/trunk ratio is a planning factor of 10% has been provided by C&W network planners and is used in the model.

45. Although lines are used to provide the dimensions of the switch, as this is how the pricing is structured, the volume driver concerned is traffic minutes. As traffic minutes vary, the dimensions of the switch will vary because the number of trunks needed varies. According to the given pricing structure, this relationship is linear. So complete dimensioning formula for the softswitches uses a minutes volume driver as follows:

Switch dimensions = lines + trunks * (minutes demand for softswitch) / softswitch capacity

46. As a final stage, the softswitch is split into minute- and call-driven components using benchmark information.

47. It should be noted that for a switch of the size needed in Cayman, the softswitch costs do not vary with respect to the calling rates, only minutes, so the call-driven costs are fixed.

3. Model Structure & Operation

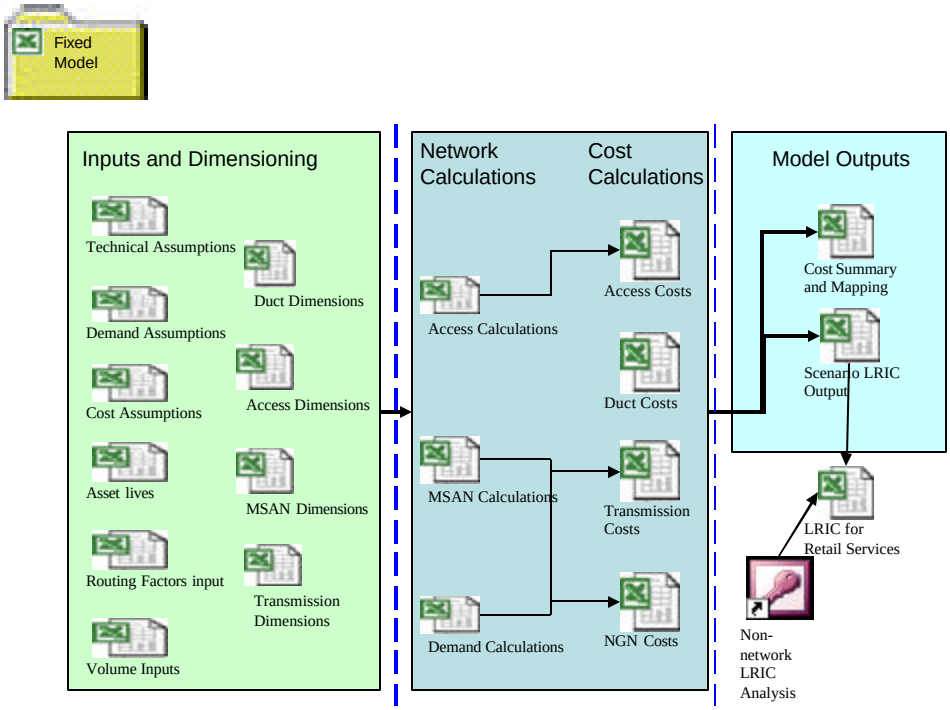
48. This section describes the various worksheets in the MS Excel Bottom-up model, and provides an overview as to operating procedures.

Fixed Model Structure

49. The fixed model is divided into the following modules:

- Model Inputs
- Network Dimensioning
- Network Calculations
- Cost Calculations
- Model Outputs

These modules are made up of a number of worksheets. The figure below outlines the structure of these modules and their composite sheets.



Model Inputs

50. This module contains the data required to run the model. It is divided into the following six sheets: Technical Assumptions, Demand Assumptions, Cost

Assumptions, Asset Lives, Routing Factors and Volume Inputs. We produce an unpopulated version of each sheet here or in the relevant Appendix. The list of all model inputs is given in Appendix XV.

- *Technical assumptions* – this contains the engineering assumptions that are used to dimension the network.

Technical Assumptions

Standard Parameters

Conversion factor for minutes to erlangs	
# of 64kbps channels in a 2 Mbps link	

NGN Assumptions

Planning ratio	
MSAN Fill Ratio	
ADSL average bandwidth per line Mbit/s	
ADSL Service Contention Ratio	
MSE ratio of call-sensitive/duration-sensitive	
Number of Core NGN Sites	
Max capacity for Softswitch - minutes	
Line/Trunk Ratio	

- *Cost assumptions* – this contains the unit cost assumptions used for the duct, access, transmission and NGN parts of the network. Please refer to Appendices I-III.

- *Demand assumptions* – this contains the assumptions regarding traffic, used to dimension the network.

Demand Assumptions

% of traffic in busy hours	
# of busy hours	
Transmission capacity allowance	
Provisioning Allowance	
Annual growth rate for lines	
Avg non conversation holding time for successful calls (minutes per call)	
Ratio of total/successful calls	

- *Asset lives* – this contains the asset lives used in the model to calculate the annualised costs.

Asset Lives

Fixed Network	years
NGN Equipment	
Duct	
Fibre Cable	
Fibre Joints	
Poles	
Management Systems	
Manholes	
Copper Cable	
Copper Joints	
DPs, Dropwire, NID	

- *Volume inputs* – these are the sources for the volumes by service. It also includes leased lines, frame relay and direct internet connection – it is used to calculate the bandwidth required for these services. See Appendix IV.

- *Routing Factors input* – this is the source for the routing factors for all the services. See Appendix V.

Network Structure

51. This module contains the data which defines the structure of the network – it is divided into the following four worksheets:

- *Access Dimensions* – this contains information on the quantity of various types of cable, and other information such as the spacing of joints and the number of manholes and poles. See Appendix VI.

- *Transmission Dimensions* – this contains information on the quantity of different types of optical cable. See Appendix VII.

- *Duct Dimensions* – this has information on the quantity of different categories of duct. See Appendix VIII.

- *MSAN Dimensions* – this contains information on the concentrator sites, and the number of lines installed at each site. See Appendix IX.

Network Calculations

52. This module contains the algorithms used to calculate the quantities of network equipment required to meet the service demand. It comprises the following three worksheets:

- *Demand Calculations* – this takes the volume inputs by service and scales up to allow for such thing as future growth. It then uses the routing factors to calculate the demand placed on each network element. This demand is then expressed both as an annual measure and a busy-hour measure. See Appendix X.

- *Access Calculations* – this contains the calculations of the access network required to meet the demand. See Appendix XI.

- *MSAN Calculations* – this calculates the MSAN lines needed to meet the demand. See Appendix XII.

53. Note that transmission and duct quantities are effectively dimensioned to meet demand in their respective Dimension sheets.

Cost Calculations

54. This module contains the calculations of total costs for the main network components. It comprises the following sheets:

- *Access costs* – this uses the calculated dimensions of the access network, along with the unit prices, to calculate the total access network costs split by the various components. See Appendix XIII.

- *Duct costs* – this uses the duct dimensions to calculate total costs for the ducting. See Appendix XIV.

- *Transmission costs* – this uses the transmission dimensions to calculate total costs for the core transmission network. See Appendix XV.

- *NGN costs* – this calculates the costs of the NGN components, based on the dimensions, the traffic demand and the unit costs. See Appendix XVI.

Please note that it is in these Costs sheets that any mark-up for indirect capex is added. See Section 4 of the Background Document.

Model Outputs

55. The *Cost Summary and Mapping* sheet is the main output for the model. It summarises the costs for the network components, and provides splits where needed (e.g., to split duct between access and core, and to split the core transmission between voice, data and internet). See Appendix XIV.

56. *Scenario LRIC outputs* provide bottom-up LRIC results in tabular form. A sample of the model outputs are presented in the case study.

4. CASE STUDY

Introduction

57. The preceding section of this document dealt with the structure and functioning of the model. In this section, screen-shot extracts will be given to show how actual numbers flow through the model.

58. In order to calculate the LRIC of each service, the model performs a series of iterations that simulates the following:

    1) Initially the model calculates the total costs of each network element for a given set of input cost assumptions, input technical assumptions and original input demand volumes.
    2) Removes the service volumes of each service one at a time
    3) Upon removal of each service volume, it recalculates new total costs of each network element for the given set of input cost assumptions, input technical assumptions and the reduced input demand volumes.
    4) It subtracts the new total cost from the original total costs to produce the pure LRIC associated with each service.
    5) It identifies the increment specific fixed costs (ISFCs) and network-wide common costs (FCCs) and marks up the pure LRIC to produce , D-LRIC and full LRIC for each service
    6) The output after each iteration is posted to the 'BU Output' sheet.

59. The following case study provide calculation steps, intermediate outputs and final outputs to demonstrate how the model determines the LRIC for the Residential Access service. Building on the LRIC calculation, a summary table of the Distributed LRIC and Full LRIC is presented to the end of each case study. Each study concludes by demonstrating the calculations involved in deriving the unit cost, using the summarised LRIC, DLRIC and Full LRIC values.

60. In order to make the presentation of results clearer, we have chosen to simplify that reporting somewhat. The simplifications are that

    a. we look at the direct capital costs NRC and depreciation elements of the LRIC and leave out network opex and indirect capex derived from expense factors

    b. we explicitly trace through the impact on two network elements--line-sensitive MSAN and the DP/dropwire component of the access network).

However, the impacts on all network elements appear at the end of the case study.

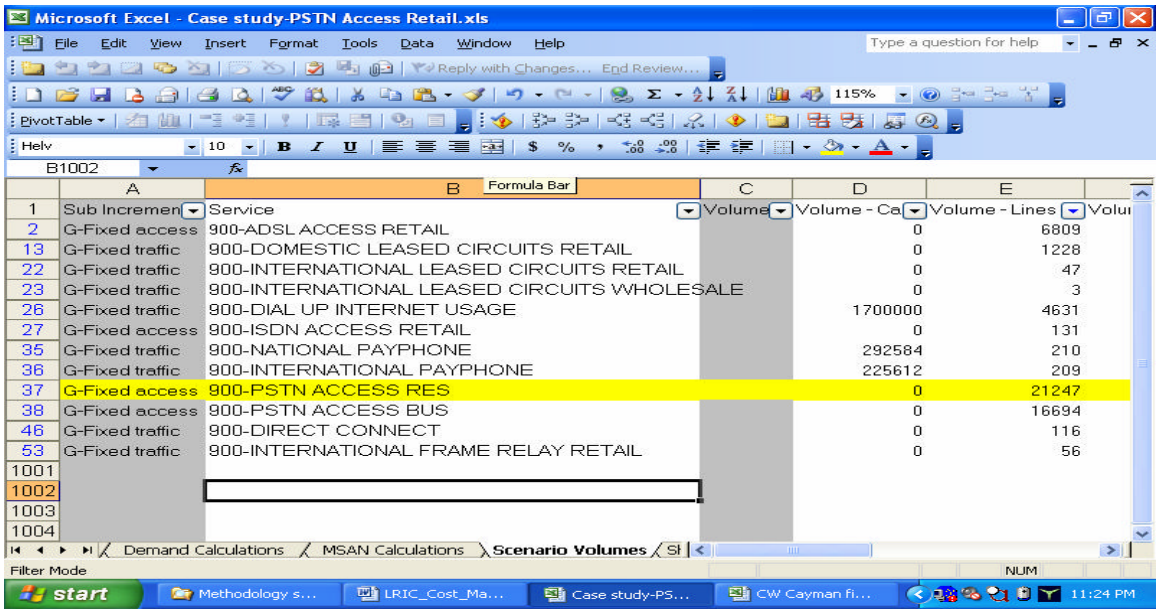
c. We produce the DLRIC and full LRIC only in summary fashion as drilling down would require case studies of additional services.

61. Again, we have made these simplifications to facilitate presentation. Upon request we will be happy to broaden the reporting of this case study.

62. As indicated elsewhere, costs and volume numbers presented in this case study are "dummies" and may not be representative of what C&W Cayman or other operators face.

The Starting Point

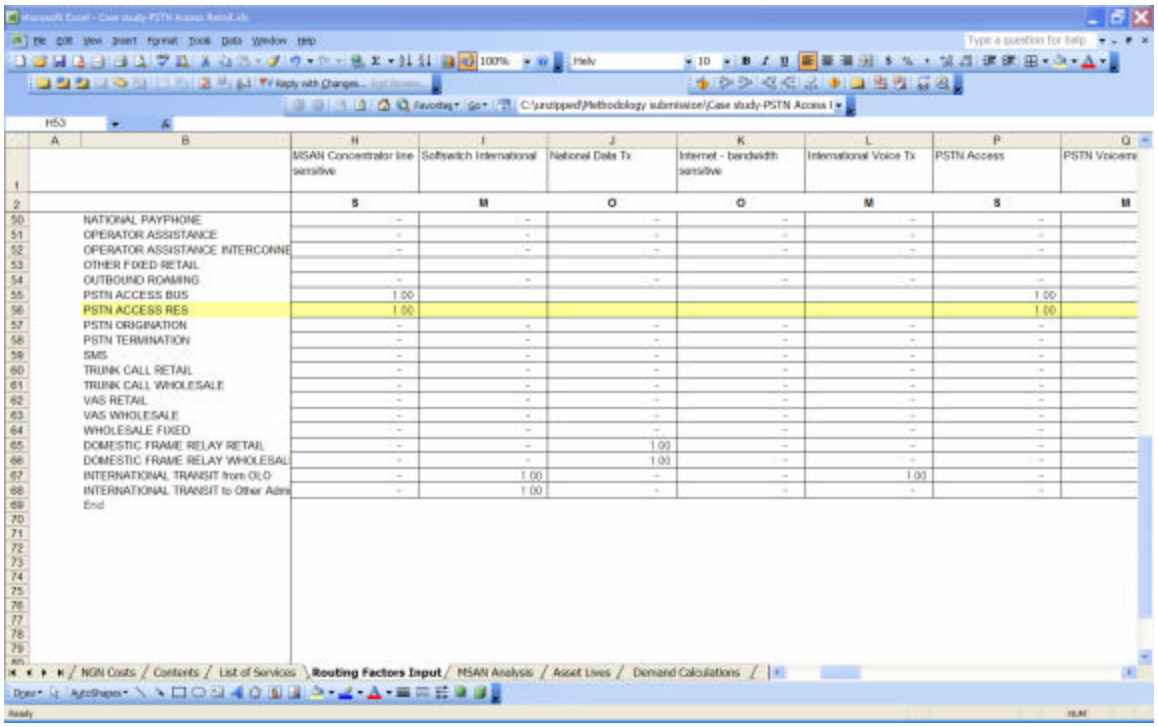
63. For this case study we have assumed that the number of residential lines served by the fixed network operator totals 21,247. We also assume that there are 16,694 business lines, for a total of 37,941 access lines. See extract sheet from Demand Assumptions.



	A	B	C	D	E
1	Sub Incremen	Service	Volume	Volume - Ce	Volume - Lines
2	G-Fixed access	900-ADSL ACCESS RETAIL		0	6809
13	G-Fixed traffic	900-DOMESTIC LEASED CIRCUITS RETAIL		0	1228
22	G-Fixed traffic	900-INTERNATIONAL LEASED CIRCUITS RETAIL		0	47
23	G-Fixed traffic	900-INTERNATIONAL LEASED CIRCUITS WHOLESALE		0	3
26	G-Fixed traffic	900-DIAL UP INTERNET USAGE		1700000	4631
27	G-Fixed access	900-ISDN ACCESS RETAIL		0	131
35	G-Fixed traffic	900-NATIONAL PAYPHONE		292584	210
36	G-Fixed traffic	900-INTERNATIONAL PAYPHONE		225612	209
37	G-Fixed access	900-PSTN ACCESS RES		0	21247
38	G-Fixed access	900-PSTN ACCESS BUS		0	16694
46	G-Fixed traffic	900-DIRECT CONNECT		0	116
53	G-Fixed traffic	900-INTERNATIONAL FRAME RELAY RETAIL		0	56
1001					
1002					
1003					
1004					

64. By examining the routing factor sheet, we appreciate what the components of the LRIC for residential access will be. The routing factor table tells us how many times each network component is used by each service. Those routing factors tell

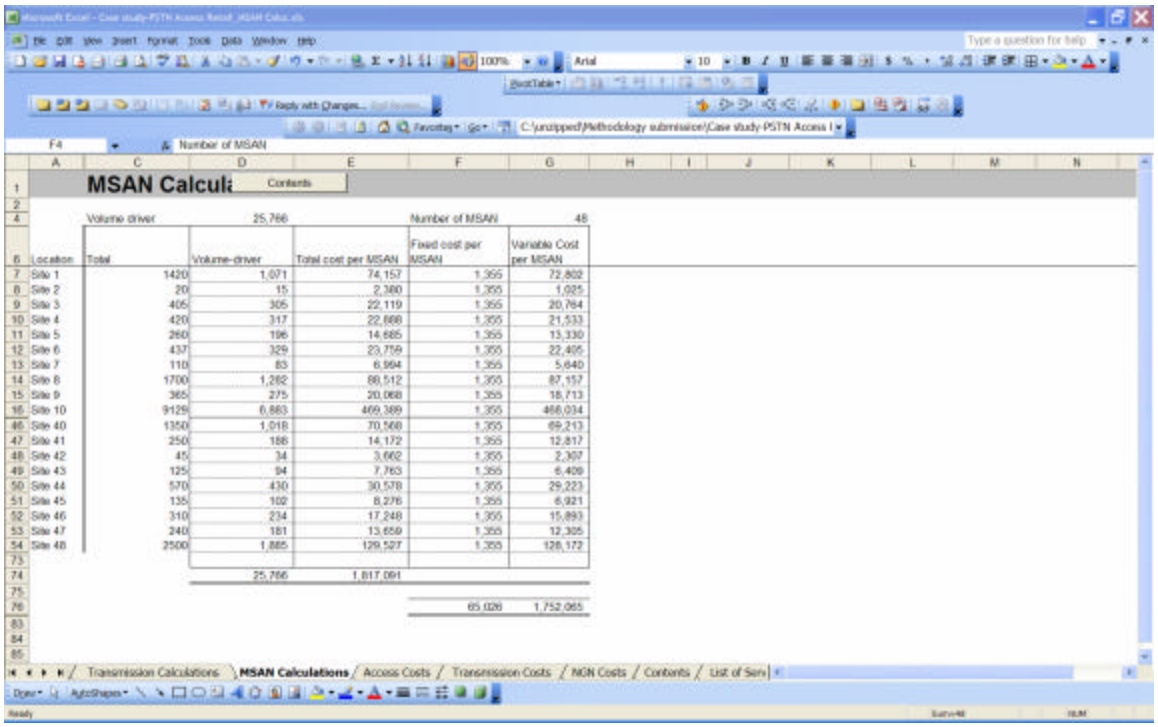
us that the network element effected will be the line-sensitive components of the MSAN and various components of the access network. See the extract below.



	MSAN Concentrator line sensitive	Softswitch International	National Data Tx	Internet - bandwidth sensitive	International Voice Tx	PSTN Access	PSTN Voicema
	S	M	O	O	M	S	M
NATIONAL PAYPHONE	-	-	-	-	-	-	
OPERATOR ASSISTANCE	-	-	-	-	-	-	
OPERATOR ASSISTANCE INTERCONNE	-	-	-	-	-	-	
OTHER FIXED RETAIL							
OUTBOUND ROAMING	-	-	-	-	-	-	
PSTN ACCESS BUS	1.00					1.00	
PSTN ACCESS RES	1.00					1.00	
PSTN ORIGINATION	-	-	-	-	-	-	
PSTN TERMINATION	-	-	-	-	-	-	
SMS	-	-	-	-	-	-	
TRUNK CALL RETAIL	-	-	-	-	-	-	
TRUNK CALL WHOLESALE	-	-	-	-	-	-	
VAS RETAIL	-	-	-	-	-	-	
VAS WHOLESALE	-	-	-	-	-	-	
WHOLESALE FIXED	-	-	-	-	-	-	
DOMESTIC FRAME RELAY RETAIL	-	-	1.00	-	-	-	
DOMESTIC FRAME RELAY WHOLESAL	-	-	1.00	-	-	-	
INTERNATIONAL TRANSIT from OLO	-	1.00	-	-	1.00	-	
INTERNATIONAL TRANSIT to Other Adm	-	1.00	-	-	-	-	
End							

NGN Costs / Contents / List of Services / **Routing Factors Input** / MSAN Analysis / Asset Lives / Demand Calculations /

65. For the MSAN calculations, the starting point is a list of all locations C&W Cayman RSUs and the installed lines capacity. The "MSAN Calculations" sheet gives the locations and the associated costs of each MSAN. An extract is shown below.



66. The volume driver column is calculated by scaling the current installed lines for each RSU by the lines volume driver using the formula:

*Dimensioned demand = total lines * volume driver / total lines max point*

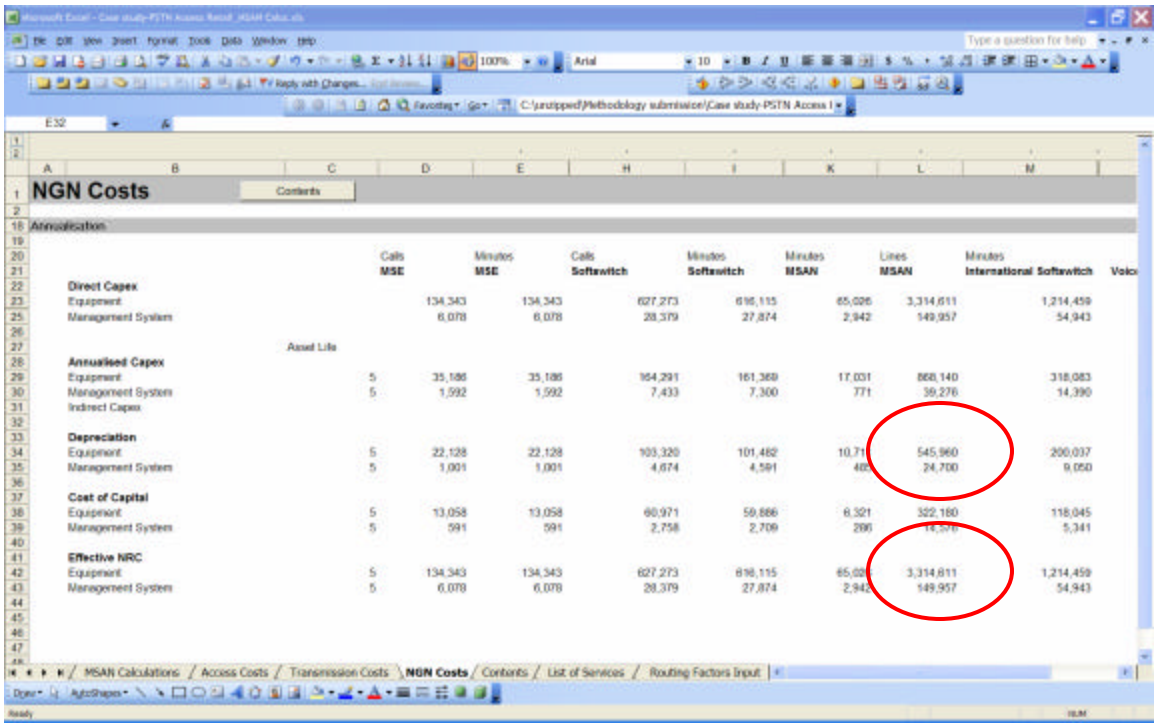
67. The MSAN cost for each node is then calculated in the total cost per MSAN column via the following formula:

*Cost = dimensioned demand * (1+voice/dsl provisioning ratio) / MSAN fill ratio * MSAN cost per port*

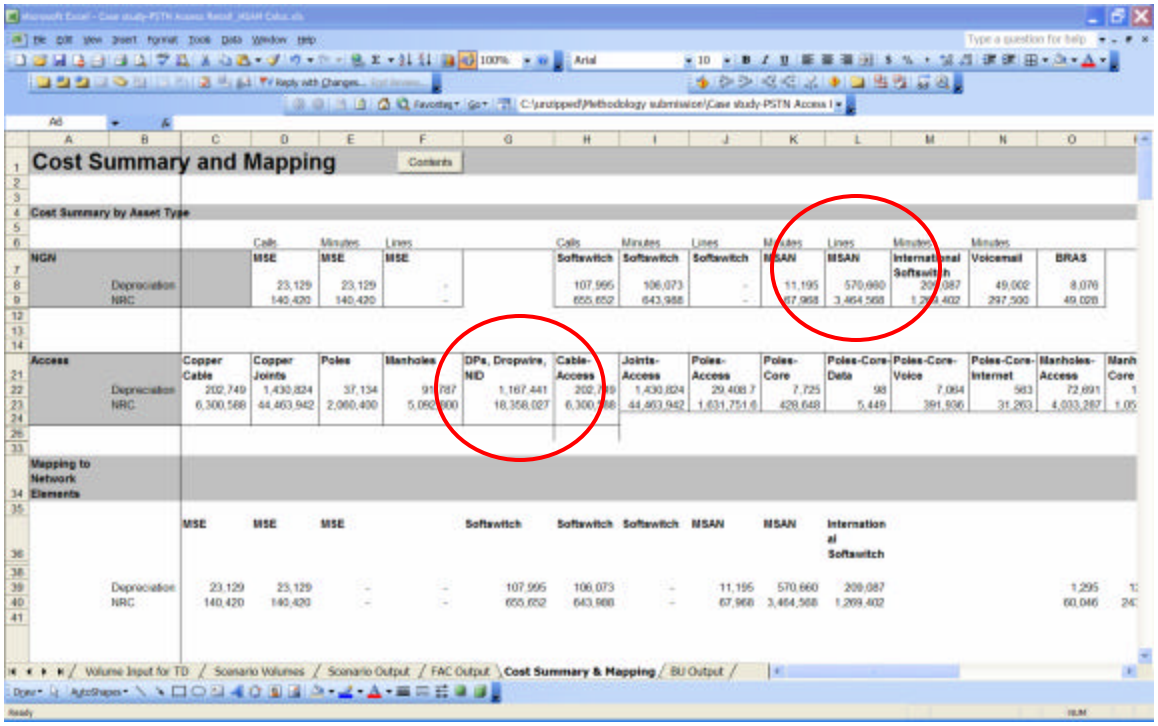
68. With respect to the fixed vs. variable cost, we note that, although most of the MSAN costs vary by the number of access lines , there remain some costs which are fixed. The break-down between fixed and variable comes from the "MSAN analysis" sheet. We have assumed that the proportion of MSAN fixed costs are 2.8% of the total. The variable line related costs, in this example, is $3,314,461.00.

69. This figure appears in the "NGN Costs" sheet, which in turn is used to derive NRC and depreciation by network element. We note that, in addition to the relevant equipment costs, a "management system" component ($149,957) enters the line-sensitive.MSAN costs.

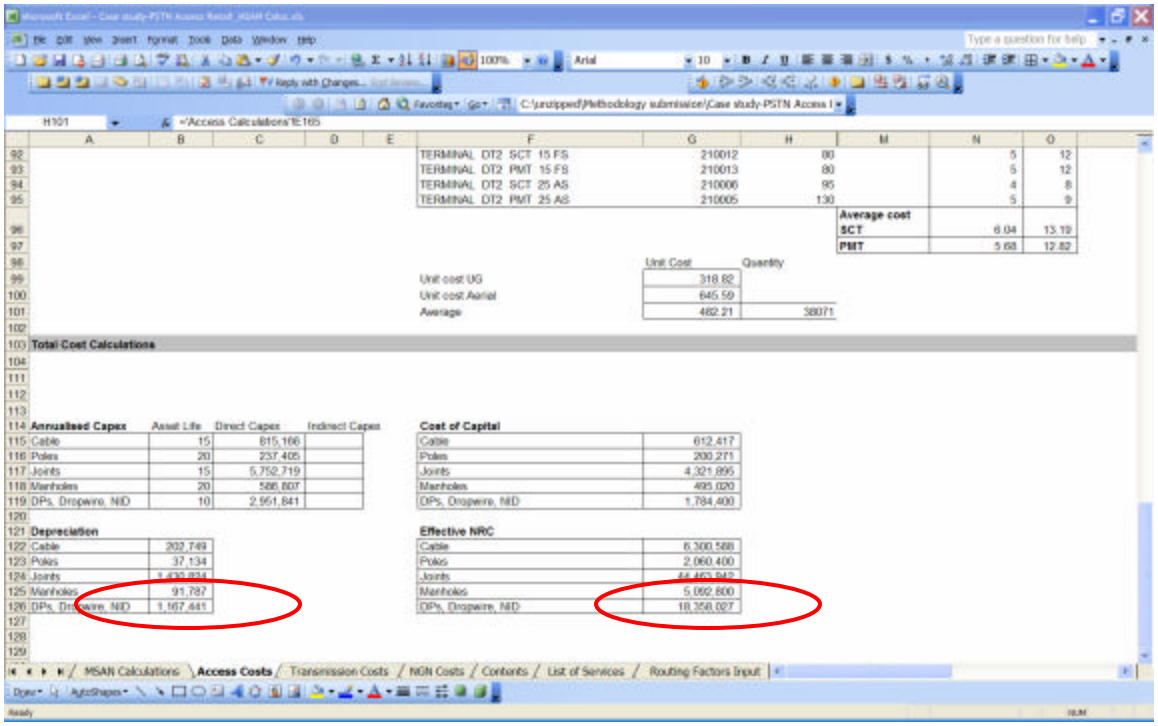
70. Please note that, for the purposes of this case study we have assumed a WACC of 9.7%.



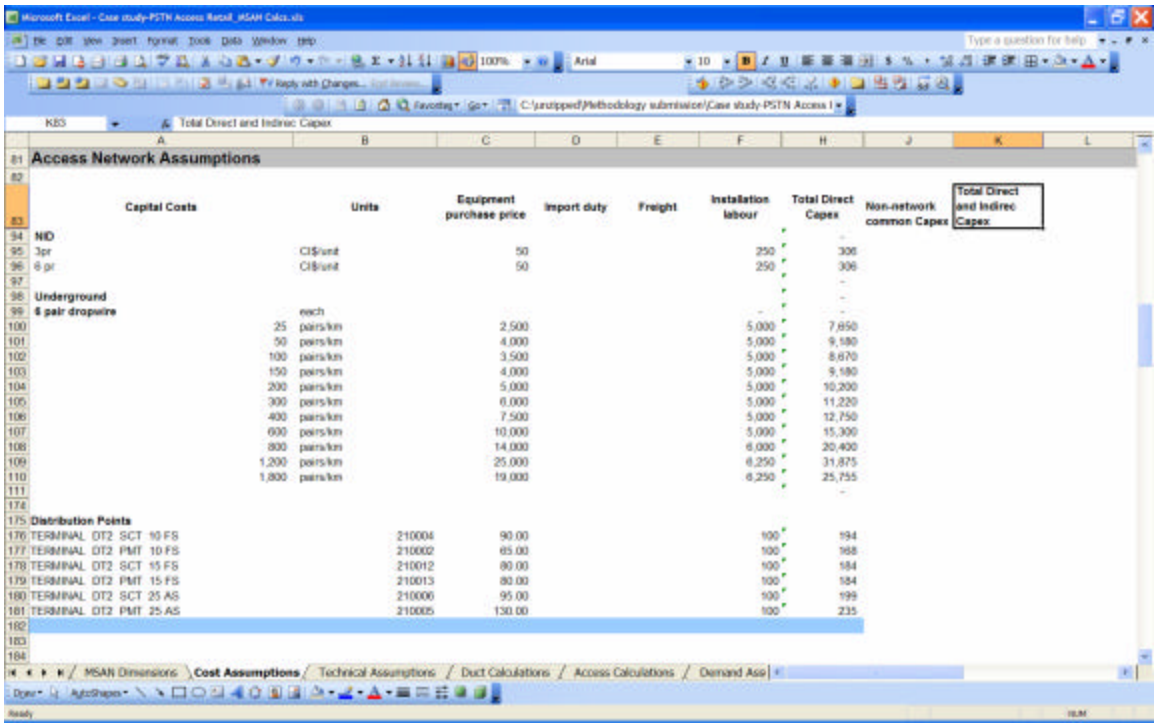
71. The resulting depreciation and NRC are carried over to the "Cost Summary and Mapping" Sheet.



72. Similarly, we can trace the impact on the DP/dropwires/NIDs. Working backwards this time, we see in the Cost Summary & Mapping sheet above, that the depreciation and NRC associated with DP/dropwires is $1,167,441 and $18,358,027 respectively. These figures come from the "Access Cost" sheet. See the Extract below.



73. The Access Costs figures, in turn, originated from the "Cost Assumption" sheet.



Access Network Assumptions

Capital Costs	Units	Equipment purchase price	Import duty	Freight	Installation labour	Total Direct Capex	Non-network common Capex	Total Direct and Indirec Capex
NID						-		
3pr	CI$/unit	50			250	300		
6 pr	CI$/unit	50			250	300		
						-		
Underground						-		
6 pair dropwire	each				-	-		
	25 pairs/km	2,500			5,000	7,650		
	50 pairs/km	4,000			5,000	9,180		
	100 pairs/km	3,500			5,000	8,670		
	150 pairs/km	4,000			5,000	9,180		
	200 pairs/km	5,000			5,000	10,200		
	300 pairs/km	6,000			5,000	11,220		
	400 pairs/km	7,500			5,000	12,750		
	600 pairs/km	10,000			5,000	15,300		
	800 pairs/km	14,000			6,000	20,400		
	1,200 pairs/km	25,000			6,250	31,875		
	1,800 pairs/km	19,000			6,250	25,755		
						-		
Distribution Points								
TERMINAL DT2 SCT 10 FS	210004	90.00			100	194		
TERMINAL DT2 PMT 10 FS	210002	65.00			100	168		
TERMINAL DT2 SCT 15 FS	210012	80.00			100	184		
TERMINAL DT2 PMT 15 FS	210013	80.00			100	184		
TERMINAL DT2 SCT 25 AS	210006	95.00			100	199		
TERMINAL DT2 PMT 25 AS	210005	130.00			100	235		

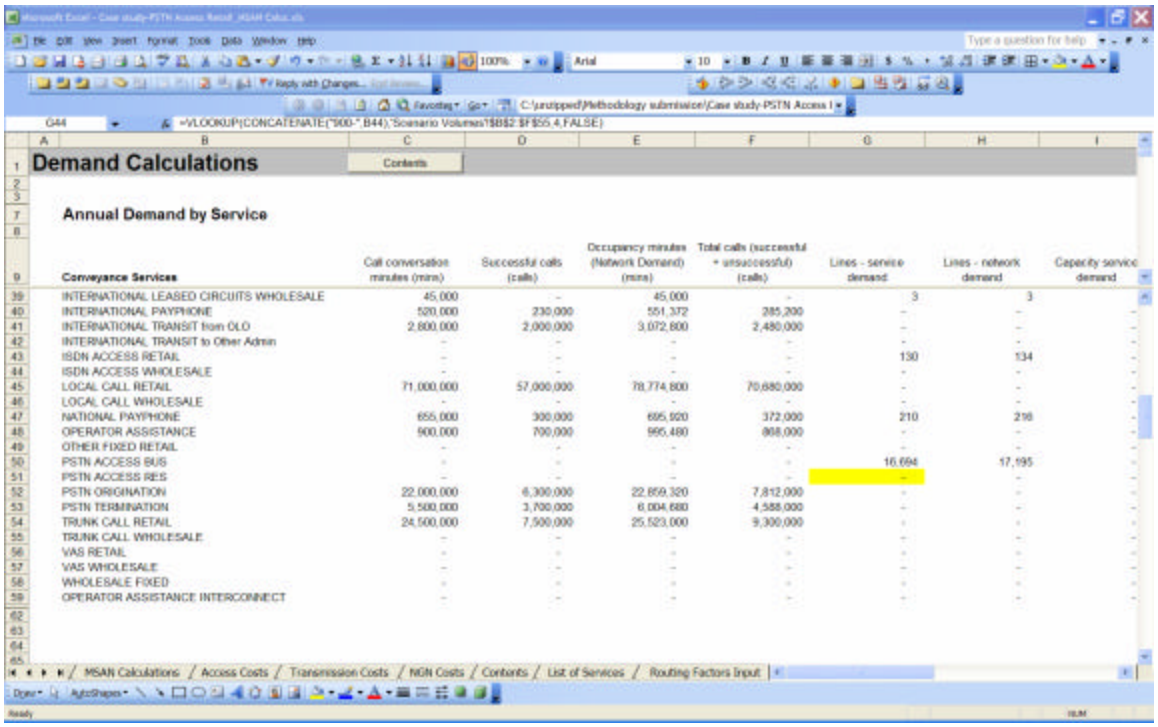
MSAN Dimensions | Cost Assumptions | Technical Assumptions | Duct Calculations | Access Calculations | Demand Ass

Calculating BU LRIC

74. The following steps describe the calculation process involved in computing the LRIC for the Residential Access service. We will follow the two network elements identified above--the line sensitive component of the MSAN (or concentrator) line sensitive component and DPs/dropwires--and observe changes in those elements after the Residential Access service is eliminated. Other network elements are impacted by a change in the residential access line volumes as well, but to ease the presentation we will just track the MSAN and DP/dropwire/NID costs. However, we show the calculation of the comprehensive set of impacts at the end of the case study.

75. In calculating the incremental cost of residential access line, we first set the volume of the service to zero using the "Scenario Volume" sheet.

76. The reduction in the access line volume carries through to the Demand Calculation sheet to the various network elements. See the extract below.

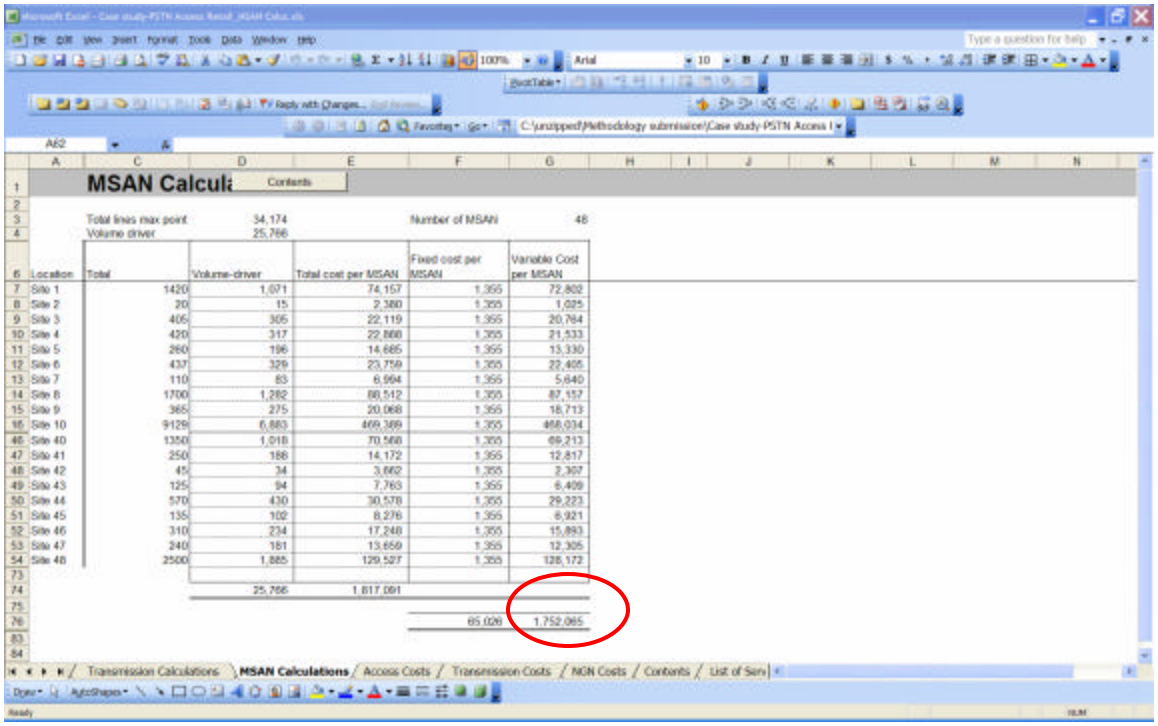


Demand Calculations

Annual Demand by Service

Conveyance Services	Call conversation minutes (mins)	Successful calls (calls)	Occupancy minutes (Network Demand) (mins)	Total calls (successful + unsuccessful) (calls)	Lines - service demand	Lines - network demand	Capacity service demand
INTERNATIONAL LEASED CIRCUITS WHOLESALE	45,000	-	45,000	-	3	3	-
INTERNATIONAL PAYPHONE	520,000	230,000	551,372	285,200	-	-	-
INTERNATIONAL TRANSIT from OLO	2,800,000	2,000,000	3,072,800	2,480,000	-	-	-
INTERNATIONAL TRANSIT to Other Admin	-	-	-	-	-	-	-
ISDN ACCESS RETAIL	-	-	-	-	130	134	-
ISDN ACCESS WHOLESALE	-	-	-	-	-	-	-
LOCAL CALL RETAIL	71,000,000	57,000,000	78,774,800	70,680,000	-	-	-
LOCAL CALL WHOLESALE	-	-	-	-	-	-	-
NATIONAL PAYPHONE	655,000	300,000	695,920	372,000	210	216	-
OPERATOR ASSISTANCE	900,000	700,000	995,480	868,000	-	-	-
OTHER FIXED RETAIL	-	-	-	-	-	-	-
PSTN ACCESS BUS	-	-	-	-	16,694	17,195	-
PSTN ACCESS RES	-	-	-	-	-	-	-
PSTN ORIGINATION	22,000,000	6,300,000	22,859,320	7,812,000	-	-	-
PSTN TERMINATION	5,500,000	3,700,000	6,004,680	4,588,000	-	-	-
TRUNK CALL RETAIL	24,500,000	7,500,000	25,523,000	9,300,000	-	-	-
TRUNK CALL WHOLESALE	-	-	-	-	-	-	-
VAS RETAIL	-	-	-	-	-	-	-
VAS WHOLESALE	-	-	-	-	-	-	-
WHOLESALE FIXED	-	-	-	-	-	-	-
OPERATOR ASSISTANCE INTERCONNECT	-	-	-	-	-	-	-

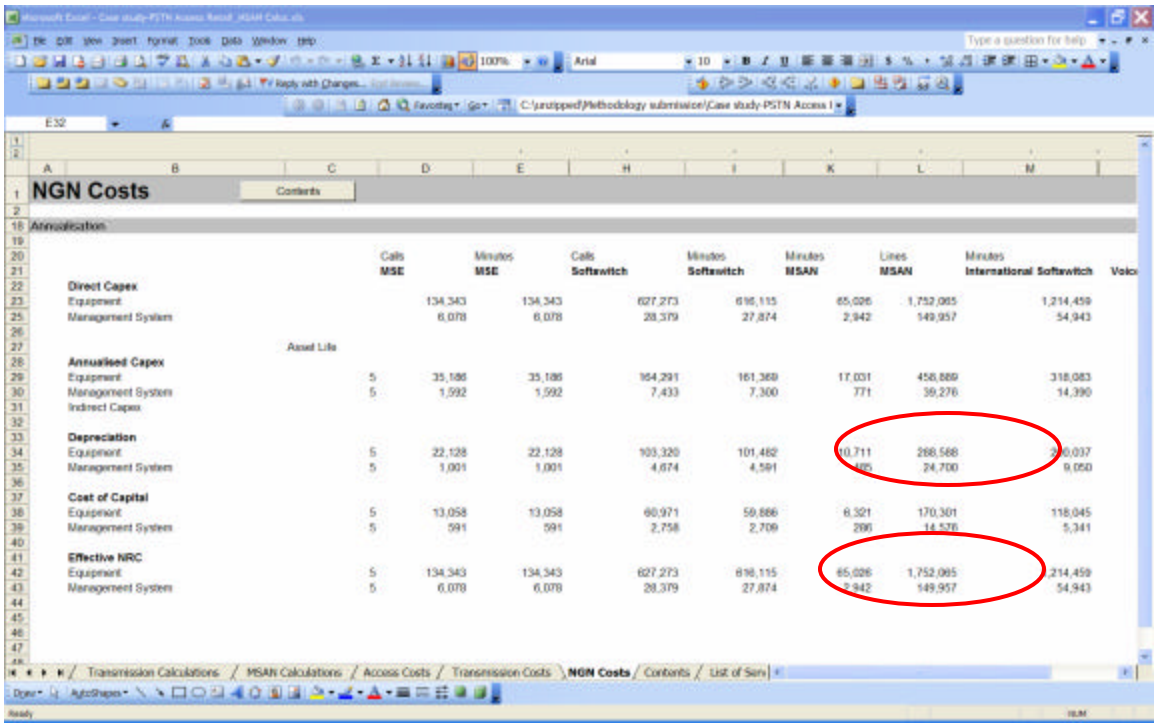
77. This drop in 21,247 PSTN Access residential lines lowers the variable MSAN element cost to $1,752,065.



MSAN Calcul

Total lines max point 34,174
Volume driver 25,766
Number of MSAN 48

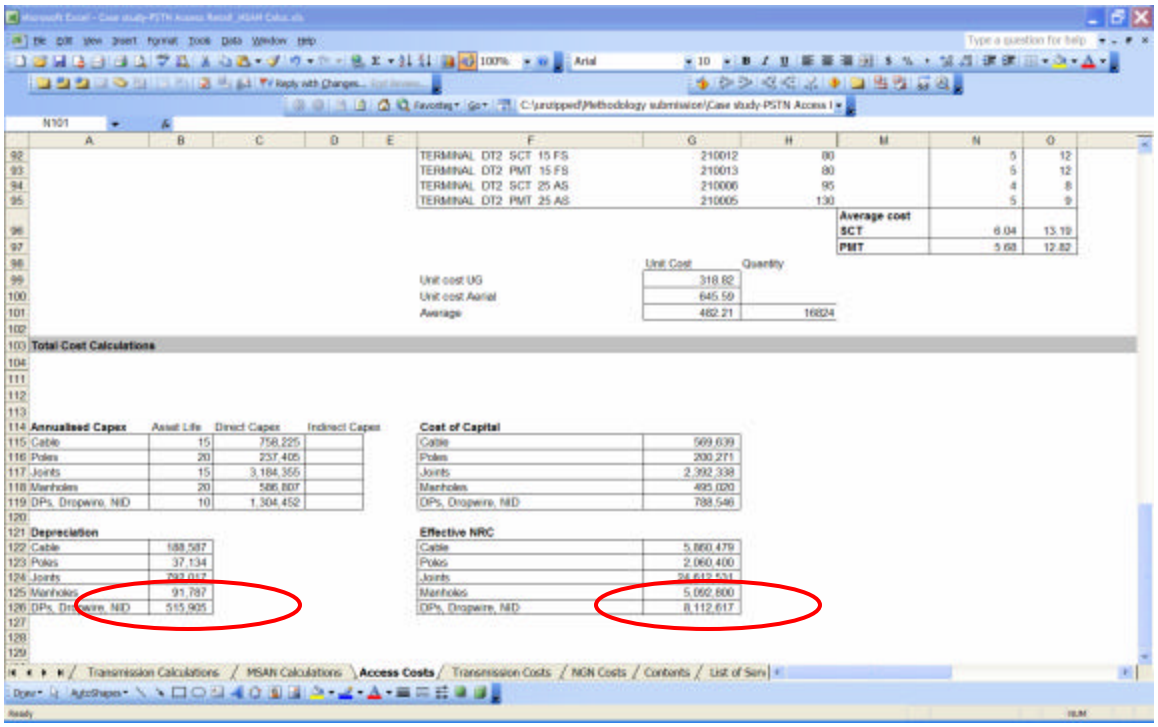
Location	Total	Volume-driver	Total cost per MSAN	Fixed cost per MSAN	Variable Cost per MSAN
Site 1	1420	1,071	74,157	1,355	72,802
Site 2	20	15	2,380	1,355	1,025
Site 3	405	305	22,119	1,355	20,764
Site 4	420	317	22,888	1,355	21,533
Site 5	260	196	14,685	1,355	13,330
Site 6	437	329	23,759	1,355	22,405
Site 7	110	83	6,994	1,355	5,640
Site 8	1700	1,282	88,512	1,355	87,157
Site 9	365	275	20,068	1,355	18,713
Site 10	9129	6,883	469,389	1,355	468,034
Site 40	1350	1,018	70,568	1,355	69,213
Site 41	250	188	14,172	1,355	12,817
Site 42	45	34	3,662	1,355	2,307
Site 43	125	94	7,763	1,355	6,409
Site 44	570	430	30,578	1,355	29,223
Site 45	135	102	8,276	1,355	6,921
Site 46	310	234	17,248	1,355	15,893
Site 47	240	181	13,659	1,355	12,305
Site 48	2500	1,885	129,527	1,355	128,172
		25,766	1,817,091		
				65,026	1,752,065



78. The depreciation and NRC fall to $288,588+24,700= $313,288 and $1,752,065+$149,957= $1,902,022, respectively, as is seen in the NGN Cost extract. The differences between the Net Replacement Cost and depreciation before and after zero-ing out the residential access service volume are the components of the Long Run Incremental Cost NRC and depreciation LRICs. For the Residential access are $257,372 and $1,562,546

MSAN-line sensitive	Before	After	LRIC
Depreciation	570,660	313,288	257,372
NRC	3464568	1902022	1,562,546

79. Similarly, the DP/dropwire/NID elements' depreciation and NRC fall to $515,905 and 8,112,617 respectively.



80. To give a flavour of the other impacts, in the table below we present both the NRC results from the all the elements of the Access network (whether they are impacted or not).

	Original NRC	Reduced NRC
Access ducting	27,355,646	27,355,646
DPs, Dropwires	18,358,027	8,112,617
Access Cable	6,300,588	5,860,479
Access joints	44,463,942	24,612,531
Access poles	1,631,752	1,631,752
Access manholes	4,033,287	4,033,287
TOTAL	102,143,241	71,606,311

NRC LRIC of PSTN Access Residential Service, PSTN Access network element	= $102,143,241 - $71,606,311
	$ 30,536,931

81. Pulling all these elements together, we get the total bottom-up pure LRIC for the access service.

Summary BU pure LRIC, DLRIC and Full LRIC results for PSTN Access Residential service

WACC	9.72%
Volume - lines	21,247

A	B	C	D	E	F
Network Element	**LRIC value – NRC**	**LRIC value - Depreciation**	**Cost of Capital = B x WACC**	**Total Economic Cost = C+D**	**Unit Cost = E / Volumes**
400-PSTN Access	$30,536,930.80	$ 1,304,505.32	$2,968,189.67	$ 4,272,694.99	
400-MSAN line sensitive	$1,562,546.87	$257,372.08	$151,879.56	$409,251.63	
TOTAL PURE LRIC	$32,099,477.67	$1,561,877.39	$ 3,120,069.23	$4,681,946.62	**$220.358**

82. The final step is to take account for Increment Specific Fixed Costs (ISFCs) and network-wide common cost (FCCs). The addition of the ISFCs to the BU pure LRIC produces the BU Distributed LRIC.

83. As described at the start of this case study, in pulling the pure LRIC for each service, the model determines the IFSCs and FCC of the entire network. We extract from the BU output sheet to illustrate the results of zero-ing out all the access services services. The IFSC is distributed between the access services on a equi-proportional basis. In this case, the pure LRIC of residential access service as a percentage of the total pure LRICs accounts for 56% and 55% for NRC and depreciation respectively. Thus, 56% and 55%of the IFSC NRC and depreciation respectively are allocated to the residential access service. See the tables below.

Scenario Output *before* and *after* removal of all access related service volumes

Entity	NRC Before	NRC After	Depreciation Before	Depreciation Before
400-PSTN Local Switch - call sensitive	140,420	140,420	23,129	23,129
400-PSTN Local Switch - duration sensitive	140,420	140,420	23,129	23,129
400-PSTN Main Switch - call sensitive	655,652	655,652	107,995	107,995
400-PSTN Main Switch - duration sensitive	643,988	643,988	106,073	106,073
400-Concentrator traffic sensitive	67,968	67,968	11,195	11,195
400-Concentrator line sensitive	3,464,568	-	570,660	-
400-Softswitch equipment	1,269,402	1,269,402	209,087	209,087
400-Packet Switching	-	-	-	-
400-National Data Tx	60,046	60,046	1,295	1,295
400-Internet - bandwidth sensitive	243,993	194,965	12,813	4,737
400-International Voice Tx	-	-	-	-
400-International Data Tx	-	-	-	-
400-National Voice Tx	4,318,869	4,318,869	93,177	93,177
400-VAS platforms	-	-	-	-
400-PSTN Access	102,143,241	33,020,684	3,396,140	595,125
400-PSTN Voicemail	297,500	297,500	49,002	49,002
400-Ix billing platform	-	-	-	-
400-DQ Operator services equipment	-	-	-	-
End				
	113,446,069	40,809,915	4,603,696	1,223,946

"Sum of the Differences" to Arrive and DLRIC

1	Difference: (Before Reduction of all Access related Volumes minus After Reduction of all Access related Volumes) -	72,636,154	3,379,750
2	Total BU LRIC from BU Output Sheet for Access Related Services	56,683,012	2,840,015
3	Therefore: Actual DLRIC Markup, 1 – 2	15,953,141	539,735
5	PSTN Access Res BU LRIC (from Total BU LRIC table below, see Summary table at the end)	32,099,478	1,561,877
6	PSTN Access Res BU LRIC as %age of of Total Access Related BU LRIC	56%	55%
8	**DLRIC Amount Allocated to PSTN Access related is therefore as shown in the table below (BU Joint Cost):6 x 3**	**8,918,053**	**298,122**

84. A similar exercise is conducted to identify and allocated the network-wide FCCs.

85. The summary that follows captures the BU-DLRIC and BU-full LRIC values for PSTN Access Residential and calculates the unit cost for both values.

BU Distributed LRIC (DLRIC) for PSTN Access Residential = LRIC + Joint Cost

A	B	C	D	E	F
Cost Type	**BU DLRIC – NRC**	**BU DLRIC - Depreciation**	**Cost of Capital = B x WACC**	**Total Economic Cost = C+D**	**Unit Cost = E / Volumes**
BU LRIC	$32,099,477.67	$1,561,877.39	$ 3,120,069.23	$ 4,681,946.62	
BU Joint Cost	$ 8,918,053.05	$298,122	$866,834.76	$ 164,956.84	
TOTAL DLRIC	$41,017,530.72	$1,859,999.48	$ 3,986,903.99	$ 5,846,903.47	**$275.19**

BU Full LRIC for PSTN Access Residential Service = LRIC + Joint Cost + Common Cost

A	B	C	D	E	F
Cost Type	**BU Full LRIC – NRC**	**BU Full LRIC - Depreciation**	**Cost of Capital = B x WACC**	**Total Economic Cost = C+D**	**Unit Cost = E / Volumes**
DLRIC	$41,017,530.72	$1,859,999.48	$ 3,986,903.99	$ 5,846,903.47	
BU Common Cost	$18,616,066.29	$335,513.81	$1,809,481.64	$ 2,144,995.45	
TOTAL Full LRIC	$59,633,597.01	$ 2,195,513.29	$ 5,796,385.63	$7,991,898.92	**$376.14**

Appendices

Appendix I. Cost Assumptions (Duct)

Duct Unit Costs

		Equipment purchase price	Import duty	Freight	Installation labour	Total Direct Capex	Non-network-common capex	Total Direct and Indirect Capex	Network Opex as % of Direct Capex	Non-network Common Opex as % of Network Opex
Exclusive duct (ie, single bore)										
Duct - footway - unsurfaced	CI$/km									
Duct - footway - concrete in situ	CI$/km									
Duct - carriageway (asphalt)	CI$/km									
Jointing box - footway - unsurfaced	CI$									
Jointing box - footway - concrete in situ	CI$									
Jointing box - carriageway (asphalt)	CI$									
Jointing box - (for Splice every 1000m)	CI$									
Shared duct (i.e, 2-bore)										
Duct - footway - unsurfaced	CI$/km									
Duct - footway - concrete in situ	CI$/km									
Duct - carriageway (asphalt)	CI$/km									
Jointing box - footway - unsurfaced	CI$									
Jointing box - footway - concrete in situ	CI$									
Jointing box - carriageway (asphalt)	CI$									
add'l Jointing box cost - (for Splice every 1000m)	CI$									
Shared duct (i.e, 4-bore)										
Duct - footway - unsurfaced	CI$/km									
Duct - footway - concrete in situ	CI$/km									
Duct - carriageway (asphalt)	CI$/km									
Jointing box - footway - unsurfaced	CI$									
Jointing box - footway - concrete in situ	CI$									
Jointing box - carriageway (asphalt)	CI$									
add'l Jointing box cost - (for Splice every 1000m)	CI$									
Shared duct (i.e, 6-bore)										
Duct - footway - unsurfaced	CI$/km									
Duct - footway - concrete in situ	CI$/km									
Duct - carriageway (asphalt)	CI$/km									
Jointing box - footway - unsurfaced	CI$									
Jointing box - footway - concrete in situ	CI$									
Jointing box - carriageway (asphalt)	CI$									
add'l Jointing box cost - (for Splice every 1000m)	CI$									
Shared duct (i.e, 12-bore) see note 2										
Duct - footway - unsurfaced	CI$/km									
Duct - footway - concrete in situ	CI$/km									
Duct - carriageway (asphalt)	CI$/km									
Jointing box - footway - unsurfaced	CI$									
Jointing box - footway - concrete in situ	CI$									
Jointing box - carriageway (asphalt)	CI$									
add'l Jointing box cost - (for Splice every 1000m)	CI$									
Sub Duct										
sub-duct per km see note 3	CI$/km									

Appendix II. Cost Assumptions—Access Network

Access Network

Capital Costs	Units	Equipment purchase price	Import duty	Freight	Installation labour	Total Direct Capex	Non-network-common capex	Total Direct and Indirect Capex	Network Opex as % of Direct Capex	Non-network Common Opex as % of Network Opex
Copper (e.g. 100 pair, 500 pair, dropwire etc)										
Aerial										
1	each									
6	each									
25	pairs/km									
50	pairs/km									
100	pairs/km									
200	pairs/km									
300	pairs/km									
NID										
3pr	CI$/unit									
6 pr	CI$/unit									
Underground										
6 pair dropwire	each									
25	pairs/km									
50	pairs/km									
100	pairs/km									
150	pairs/km									
200	pairs/km									
300	pairs/km									
400	pairs/km									
600	pairs/km									
800	pairs/km									
1,200	pairs/km									
1,800	pairs/km									
Other Information										
Splicing cost per cable splice - underground (1800 pair full splice)	CI$									
Splicing cost per cable splice - underground (1200 pair full splice)	CI$									
Splicing cost per cable splice - underground (900 pair full splice)	CI$									
Splicing cost per cable splice - underground (600 pair full splice)	CI$									
Splicing cost per cable splice - underground (400 pair full splice)	CI$									
Cable (24-Fibre) laying cost including sub-duct- underground see note 9	CI$/km									
Cable (48-Fibre) laying cost including sub-duct- underground see note 9	CI$/km									
Cable laying cost light cabling-including rodding see note 1	CI$/km									
Average separation of jointing boxes	km									
Average separation of fibre splices - underground	km									
Cabinets/Copper Cross connect etc										
Cabinets	CI$									
1800 pair Cross connect see note 10	CI$									
1200 pair Cross connect	CI$									
600 pair Cross connect	CI$									
Poles										
Pole owned	CI$/pole									
Total Pole rental per month	CI$/month									

Islandwide Media mix		
Duct - footway - unsurfaced	%	
Duct - footway - concrete in situ	%	
Duct - carriageway (asphalt)	%	

Media Mix (Entrant specific)		
Duct - footway - unsurfaced	%	
Duct - footway - concrete in situ	%	
Duct - carriageway (asphalt)	%	

Manholes

Costs for installed Asphalt/Concrete manhole	CI$									
Install a JUC12/JRC12 Manhole	Each									
Install a MRT7 Manhole	Each									
Install a MRT8 Manhole	Each									
Install a JRC14/JUC14 Manhole	Each									
Install a JUF4/JUF6/JUC6 Manhole	Each									
Distribution Points										
TERMINAL DT2 SCT 10 FS										
TERMINAL DT2 PMT 10 FS										
TERMINAL DT2 SCT 15 FS										
TERMINAL DT2 PMT 15 FS										
TERMINAL DT2 SCT 25 AS										
TERMINAL DT2 PMT 25 AS										

Appendix III. Cost Assumptions Transmission and Switching

Transmission Direct Capex Assumptions

	Units	Capital costs					
		Equipment purchase price	Import duty	Freight	Installation labour	Non-network-common capital Cost	Total
Cable							
8 fibre optical cable	CI$/km						
12 fibre optical cable	CI$/km						
24 fibre aerial optical cable	CI$/km						
24 fibre ug optical cable	CI$/km						
48 fibre ug optical cable	CI$/km						
Optical fiber joint							
8 fibre optical cable	CI$/fiber joint						
12 fibre optical cable	CI$/fiber joint						
24 fibre aerial optical cable	CI$/fiber joint						
24 fibre ug optical cable	CI$/fiber joint						
48 fibre ug optical cable	CI$/fiber joint						
Cable (24-Fibre) laying cost including sub-duct- underground see note 9	CI$/km						
Cable (48-Fibre) laying cost including sub-duct- underground see note 9	CI$/km						

NGN Direct Capex Assumptions

		Capex	Non-network-common capital Cost	Total	Network Opex as % of Direct Capex	Non-network Common Opex as % of Network Opex
MSAN	Per Port					
MSE Node - Base	Per Node					
MSE Node - 4 Port Access	Per 4 Port					
Softswitch Per Port	Per Line/Trunk					
Voice Migration Per Port	Per Line/Trunk					
Voice Migration Planning	Per Line/Trunk					
BRAS	Per DSL User					
Network Management hardware	Per system					
Network Management software	Per system					
MSAN nw interface card	Per card					
Voicemail Platform	Per platform					

Appendix IV. Volumes

Service	Volume - Lines	Volume - Calls	Volume - Minutes	Volume - 2M
ADSL ACCESS RETAIL				
ADSL ACCESS WHOLESALE				
ADSL BANDWIDTH RETAIL				
ADSL BANDWIDTH WHOLESALE				
ATM				
FIXED CALL TO C&W MOBILE				
FIXED CALL TO OTHER MOBILE				
CARDS				
DATA				
DOMESTIC DQ RETAIL				
DOMESTIC DQ WHOLESALE				
DOMESTIC LEASED CIRCUITS RETAIL				
DOMESTIC LEASED CIRCUITS WHOLESALE				
DOMESTIC TRANSIT				
EMERGENCY SERVICES RETAIL				
EMERGENCY SERVICES WHOLESALE				
FIXED INTERNATIONAL INCOMING				
FIXED INTERNATIONAL OUTGOING				
INTERNATIONAL DQ RETAIL				
INTERNATIONAL DQ WHOLESALE				
INTERNATIONAL LEASED CIRCUITS RETAIL				
INTERNATIONAL LEASED CIRCUITS WHOLESALE				
INTERNATIONAL TRANSIT from OLO				
INTERNATIONAL TRANSIT to Other Admin				
DIAL UP INTERNET USAGE				
ISDN ACCESS RETAIL				
ISDN ACCESS WHOLESALE				
LOCAL CALL RETAIL				
LOCAL CALL WHOLESALE				
TRUNK CALL RETAIL				
TRUNK CALL WHOLESALE				
OPERATOR ASSISTANCE				
OTHER FIXED RETAIL				
NATIONAL PAYPHONE				
INTERNATIONAL PAYPHONE				
PSTN ACCESS RES				
PSTN ACCESS BUS				
PSTN ORIGINATION				
PSTN TERMINATION				
FIXED VOICEMAIL RETAIL				
FIXED VOICEMAIL WHOLESALE				
DATA OTHER RETAIL				
DATA OTHER WHOLESALE				
DIRECT CONNECT				
DOMESTIC FRAME RELAY RETAIL				
DOMESTIC FRAME RELAY WHOLESALE				
OTHER FIXED RETAIL				
VAS RETAIL				
VAS WHOLESALE				
WHOLESALE FIXED				
INTERNATIONAL FRAME RELAY RETAIL				
INTERNATIONAL FRAME RELAY WHOLESALE				
OPERATOR ASSISTANCE INTERCONNECT				

LEASED LINES	
Retail Domestic LL Capacity (2M)	
Retail Domestic LL No Lines	
Wholesale Domestic LL Capacity (2M)	
Wholesale Domestic LL No Lines	
Retail IPLC Capacity (2M)	
Retail IPLC No Lines	
Wholesale IPLC Capacity (2M)	
Wholesale IPLC No Lines	

Appendix V. Routing Factors

	MSE - call sensitive	MSE - duration sensitive	MSE - line sensitive	Softswitch - call sensitive	Softswitch - duration sensitive	MSAN Concentrator traffic sensitive	MSAN Concentrator line sensitive	Softswitch International	National Data Tx	Internet - bandwidth sensitive	International Voice Tx	International Data Tx	National Voice Tx	VAS platforms	PSTN Access	PSTN Voicemail	National submarine Tx	Prepaid PSTN Calling Card Equipment	Ix billing platform	DQ Operator services equipment
	C	M	S	C	M	M	S	M	O	O	M	O	M	M	S	M	M	M	O	M
ADSL ACCESS RETAIL							1.00													
ADSL ACCESS WHOLESALE							1.00													
ADSL BANDWIDTH RETAIL		1.00			1.00	1.00				1.00		1.00								
ADSL BANDWIDTH WHOLESALE				1.00	1.00	1.00				1.00		1.00								
ATM																				
CARDS	1.00	1.00	-	0.35	0.30	2.00	-	0.50	-	-	0.50	-	1.80	-	-	-	-	-	-	-
CPE																				
DATA OTHER RETAIL	-	-	-	-	-	-							-	-	-	-	-	-	-	-
DATA OTHER WHOLESALE																				
DIAL UP INTERNET USAGE	1.00	1.00	-	1.00	1.00	1.00	-	-	-	1.00	-	-	1.58	-	-	-	-	-	-	-
DIRECT CONNECT	-	-	-	-	-	-	-	-	-	1.00	-	-	-	-	-	-	-	-	-	-
DOMESTIC DQ RETAIL	1.00	1.00	-	1.00	1.00	1.00	-	-	-	-	-	-	1.58	-	-	-	-	-	-	1.00
DOMESTIC DQ WHOLESALE	-	-	-	1.00	1.00	-	-	-	-	-	-	-	1.58	-	-	-	-	-	1.00	1.00
DOMESTIC LEASED CIRCUITS RETAIL		1.00			1.00	1.00			1.00						2.00					
DOMESTIC LEASED CIRCUITS WHOLESALE		1.00			1.00	1.00			1.00						2.00					
DOMESTIC TRANSIT	-	-	-	1.00	1.00	-	-	-	-	-	-	-	1.00	-	-	-	-	-	1.00	-
EMERGENCY SERVICES RETAIL	1.00	1.00	-	1.00	1.00	2.00	-	-	-	-	-	-	1.58	-	-	-	-	-	-	1.00
EMERGENCY SERVICES WHOLESALE	1.00	1.00	-	1.00	1.00	1.00	-	-	-	-	-	-	1.00	-	-	-	-	-	1.00	1.00
FIXED CALL TO C&W MOBILE	1.00	1.00	-	1.00	1.00	1.00	-	-	-	-	-	-	1.58	-	-	-	-	-	1.00	-
FIXED CALL TO OTHER MOBILE	1.00	1.00	-	1.00	1.00	1.00	-	-	-	-	-	-	1.58	-	-	-	-	-	1.00	-
FIXED INTERNATIONAL INCOMING	1.00	1.00	-	1.00	1.00	1.00	-	1.00	-	-	1.00	-	1.00	-	-	-	-	-	1.00	-
FIXED INTERNATIONAL OUTGOING	1.00	1.00	-	1.00	1.00	1.00	-	1.00	-	-	1.00	-	1.00	-	-	-	-	-	-	-
FIXED VOICEMAIL RETAIL	1.00	1.00	-	1.00	1.00	1.00	-	-	-	-	-	-	1.58	-	-	1.00	-	-	-	-
FIXED VOICEMAIL WHOLESALE						-	-	-	-	-	-	-		-	-		-	-	-	-
INBOUND ROAMING	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
INTERNATIONAL DQ RETAIL	1.00	1.00	-	1.00	1.00	1.00	-	1.00	-	-	1.00	-	1.54	-	-	-	-	-	-	1.00
INTERNATIONAL DQ WHOLESALE				1.00	1.00	-	-	1.00	-	-	1.00	-	-	-	-	-	-	-	1.00	1.00
INTERNATIONAL FRAME RELAY RETAIL																				
INTERNATIONAL FRAME RELAY WHOLESALE																				
IPLC RETAIL												1.00								
IPLC WHOLESALE												1.00								
INTERNATIONAL PAYPHONE	1.00	1.00	-	1.00	1.00	1.00	-	1.00	-	-	1.00	-	0.33	-	-	-	-	-	-	-
ISDN ACCESS RETAIL							1.00								1.00					
ISDN ACCESS WHOLESALE							1.00								1.00					
LOCAL CALL RETAIL	1.00	1.00	-	-	-	2.00	-	-	-	-	-	-	1.00	-	-	-	-	-	-	-
LOCAL CALL WHOLESALE																				
NATIONAL PAYPHONE	1.00	1.00	-	0.35	0.30	2.00	-	-	-	-	-	-	2.30	-	-	-	-	-	-	-
OPERATOR ASSISTANCE	1.00	1.00	-	1.00	1.00	1.00	-	-	-	-	-	-	1.58	-	-	-	-	-	-	1.00
OPERATOR ASSISTANCE INTERCONNECT							-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTHER FIXED RETAIL																				
OUTBOUND ROAMING	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PSTN ACCESS BUS																				
PSTN ACCESS RES							1.00								1.00					
PSTN ORIGINATION	1.00	1.00	-	1.00	1.00	1.00	-	-	-	-	-	-	1.58	-	-	-	-	-	1.00	-
PSTN TERMINATION	1.00	1.00	-	1.00	1.00	1.00	-	-	-	-	-	-	1.58	-	-	-	-	-	1.00	-
SMS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TRUNK CALL RETAIL	2.00	2.00	-	1.00	1.00	2.00	-	-	-	-	-	-	2.30	-	-	-	-	-	-	-
TRUNK CALL WHOLESALE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VAS RETAIL	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00	-	-	-	-	-	-
VAS WHOLESALE	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00	-	-	-	-	-	-
WHOLESALE FIXED	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DOMESTIC FRAME RELAY RETAIL	-	-	-	-	-	-	-	-	1.00	-	-	-	-	-	-	-	-	-	-	-
DOMESTIC FRAME RELAY WHOLESALE	-	-	-	-	-	-	-	-	1.00	-	-	-	-	-	-	-	-	-	-	-
INTERNATIONAL TRANSIT from OLO	-	-	-	1.00	1.00	-	-	1.00	-	-	1.00	-	-	-	-	-	-	-	1.00	-
INTERNATIONAL TRANSIT to Other Admin	-	-	-	-	-	-	-	1.00	-	-	-	-	-	-	-	-	-	-	1.00	-

Appendix VI. Access Dimensions

Access Network Dimensions

Copper pair cable by type	Units	Volume
Aerial Direct Feed		
5	km	
6	km	
7	km	
10	km	
12	km	
20	km	
25	km	
30	km	
50	km	
100	km	
150	km	
200	km	
300	km	
Aerial D-side		
5	km	
6	km	
7	km	
10	km	
12	km	
20	km	
25	km	
30	km	
50	km	
100	km	
150	km	
200	km	
300	km	
Aerial E-side		
50	km	
12	km	
18	km	
25	km	
30	km	
37	km	
50	km	
75	km	
100	km	
150	km	
200	km	
300	km	
400	km	
NID		
3pr		
6 pr		
Average length of copper pair from subscriber to MDF	km	
Number of ONUs	unit	
Pair gain systems		
AML - Added Main Line	unit	
MPLX - Miniples	unit	
PG - Pair Gain	unit	
Other Information		
Avg separation of jointing boxes	km	
Avg separation of fibre splices - underground	km	
Avg underground length of trans. between concentrator and DP	km	
Avg aerial length of transmission between X connect cabinet and furthest DP	km	
Avg UG length of transmission between Exchange and X connect cabinet	km	
Cabinets/Copper Cross connection points		
Cross connect	units	
1200 pair	units	
1800 pair	units	
2700 pair	units	
Poles		
Pole owned	pole	
Pole rented	pole	

	Units	Volume
Underground Direct Feed		
2	km	
5	km	
6	km	
7	km	
10	km	
12	km	
15	km	
20	km	
25	km	
30	km	
50	km	
100	km	
150	km	
200	km	
300	km	
400	km	
500	km	
600	km	
Underground D-side		
2	km	
5	km	
6	km	
7	km	
10	km	
12	km	
15	km	
20	km	
25	km	
30	km	
50	km	
100	km	
150	km	
200	km	
300	km	
400	km	
Underground E-side		
12	km	
25	km	
100	km	
150	km	
300	km	
400	km	
500	km	
600	km	
800	km	
900	km	
1,200	km	
1,600	km	
1,800	km	
2,000	km	

Manholes (list by type e.g. concrete, steel)
All concrete chambers

Install a JUC12/JRC12 Manhole	
Install a MRT7 Manhole	
Install a MRT8 Manhole	
Install a JRC14/JUC14 Manhole	
Install a JUF4/JUF6/JUC6 Manhole	

Appendix VII. Transmission Dimensions

Transmission Dimensions

ARIEL_UG	LENGTH/ meters	RUN	SECTION	FIBRE_	Primary exchange/ remote	Primary exchange/ remote	Secondary exhange/remote ID	Secondary exhange/remote ID
Aerial								
Aerial								
Aerial								
Aerial								

UG								
UG								
UG								
UG								

Appendix VIII. Duct Dimensions

Duct Network - Input Data

Exclusive duct (ie, single bore)	Duct	km	
	Amount of duct sharing - core access(i.e. % of ducts, single bore)	%	
Shared duct (i.e, 2-bore)	Duct	km	
	Amount of duct sharing - core access(i.e. % of ducts, 2- bore)	%	
Shared duct (i.e, 4-bore)	Duct	km	
	Amount of duct sharing - core access(i.e. % of ducts, 4- bore)	%	
Shared duct (i.e, 3-bore)	Duct	km	
	Amount of duct sharing - core access(i.e. % of ducts, 4- bore)	%	
Shared duct (i.e, 5-bore)	Duct	km	
	Amount of duct sharing - core access(i.e. % of ducts, 4- bore)	%	
Shared duct (i.e, 6-bore)	Duct	km	
	Amount of duct sharing - core access(i.e. % of ducts, 4- bore)	%	
Shared duct (i.e, 7-bore)	Duct	km	
	Amount of duct sharing - core access(i.e. % of ducts, 4- bore)	%	
Shared duct (i.e, 8-bore)	Duct	km	
	Amount of duct sharing - core access(i.e. % of ducts, 4- bore)	%	
Shared duct (i.e, 9-bore)	Duct	km	
	Amount of duct sharing - core access(i.e. % of ducts, 4- bore)	%	
Shared duct (i.e, 10-bore)	Duct	km	
	Amount of duct sharing - core access(i.e. % of ducts, 4- bore)	%	
Shared duct (i.e, 12-bore)	Duct	km	
	Amount of duct sharing - core access(i.e. % of ducts, 4- bore)	%	
Shared duct (i.e, 13-bore)	Duct	km	
	Amount of duct sharing - core access(i.e. % of ducts, 4- bore)	%	
Shared duct (i.e, 20-bore)	Duct	km	
	Amount of duct sharing - core access(i.e. % of ducts, 4- bore)	%	
Shared duct (i.e, 21-bore)	Duct	km	
	Amount of duct sharing - core access(i.e. % of ducts, 4- bore)	%	
Shared duct (i.e, 24-bore)	Duct	km	
	Amount of duct sharing - core access(i.e. % of ducts, 4- bore)	%	
Shared duct (i.e, 48-bore)	Duct	km	
	Amount of duct sharing - core access(i.e. % of ducts, 4- bore)	%	
Sub Duct	sub-duct per km	km	

Appendix IX. MSAN Locations and Installed Lines

MSAN Dimensions (Existing Concentrator Locations)

Host Exchange	Remote	Installed Lines
	Fort Street	
	GT Andy's Auto	
	GT Ansbacher House	
	GT British American	
	GT Barclays Bank	
	GT C.I.B.C	
	GT Cayman National	
	GT Capital Place	
	GT Elizabethan Square	
	GT Fairbanks Road	
	GT Hyatt	
	GT Lions Centre	
	GT Glass House	
	GT Newport Ave	
	GT Swiss Bank 0	
	GT Swiss Bank 1	
	GT Scotia Bank	
	George Town 0	
	GT Templeton Pine Lake	
	GT U.B.S	
	GT Ugland House 0	
	GT Ugland House 1	
	North Sound	
	Seven Mile Beach 0	
	Safe Haven	
	South Sound	
	SMB Crystal Harbour	
	Tower Building	
	West Bay 0 & 1	
	WB North West Point	
	WB Crystal Valley	
	Bodden Town	
	Crows Nest	
	Cayman Brac Bluff	
	EE Queens High Way	
	East End	
	Frank Sound	
	Cayman Kai	
	North Side	
	Spotts North Sound Estates	
	Spott Bay	
	Spotts Patrick Island	
	Spotts Prospect Park	
	Spotts 0	
	Spotts 1	
	Stake Bay	
	Cross Roads	
	One Technology Sqare	

Appendix X. Demand Calculations

Demand Calculations

Annual Demand by Service

Conveyance Services	Call conversation minutes (mins)	Successful calls (calls)	Occupancy minutes (Network Demand) (mins)	Total calls (successful + unsuccessful) (calls)	Lines - service demand	Lines - network demand	Capacity service demand	Capacity network demand
ADSL ACCESS RETAIL								
ADSL ACCESS WHOLESALE								
ADSL BANDWIDTH RETAIL								
ADSL BANDWIDTH WHOLESALE								
ATM								
FIXED CALL TO C&W MOBILE								
FIXED CALL TO OTHER MOBILE								
CARDS								
CPE								
DATA OTHER RETAIL								
DATA OTHER WHOLESALE								
DIAL UP INTERNET USAGE								
DIRECT CONNECT								
DOMESTIC DQ RETAIL								
DOMESTIC DQ WHOLESALE								
DOMESTIC LEASED CIRCUITS RETAIL								
DOMESTIC LEASED CIRCUITS WHOLESALE								
DOMESTIC TRANSIT								
EMERGENCY SERVICES RETAIL								
EMERGENCY SERVICES WHOLESALE								
FIXED INTERNATIONAL INCOMING								
FIXED INTERNATIONAL OUTGOING								
FIXED VOICEMAIL RETAIL								
FIXED VOICEMAIL WHOLESALE								
DOMESTIC FRAME RELAY RETAIL								
DOMESTIC FRAME RELAY WHOLESALE								
INTERNATIONAL DQ RETAIL								
INTERNATIONAL DQ WHOLESALE								
INTERNATIONAL LEASED CIRCUITS RETAIL								
INTERNATIONAL LEASED CIRCUITS WHOLESALE								
INTERNATIONAL PAYPHONE								
INTERNATIONAL TRANSIT from OLO								
INTERNATIONAL TRANSIT to Other Admin								
ISDN ACCESS RETAIL								
ISDN ACCESS WHOLESALE								
LOCAL CALL RETAIL								
LOCAL CALL WHOLESALE								
NATIONAL PAYPHONE								
OPERATOR ASSISTANCE								
OTHER FIXED RETAIL								
PSTN ACCESS BUS								
PSTN ACCESS RES								
PSTN ORIGINATION								
PSTN TERMINATION								
TRUNK CALL RETAIL								
TRUNK CALL WHOLESALE								
VAS RETAIL								
VAS WHOLESALE								
WHOLESALE FIXED								
OPERATOR ASSISTANCE INTERCONNECT								
INTERNATIONAL FRAME RELAY RETAIL								
INTERNATIONAL FRAME RELAY WHOLESALE								

Demand Measures by Network Element

	MSE - call sensitive	MSE - duration sensitive	Softswitch - call sensitive	Softswitch - duration sensitive	MSAN Concentrator traffic sensitive	MSAN Concentrator line sensitive	Softswitch International	National Data Tx	Internet - bandwidth sensitive	International Voice Tx	International Data Tx	National Voice Tx	VAS platforms	PSTN Access	PSTN Voicemail	Ix billing platform	DQ Operator services equipme
Annual Measures																	
Actual Demand																	
Network Demand																	
Dimensioned Demand																	
Busy Hour Measures																	
Actual Demand																	
Network Demand																	
Dimensioned Demand																	
Demand Outputs - Variable																	
Demand Outputs - Maximum Point																	

Appendix XI. Access Calculations

Access Network Calculations

Dimension Calculations

Aerial Direct Feed

Pairs provided	km	Scaled pairs	Round pairs	pair km max	pair km vol driven
6					
12					
18					
25					
30					
37					
50					
75					
100					
150					
200					
300					
400					

Aerial D-side

Pairs provided	km	Scaled pairs	Round pairs	pair km max	pair km vol driven
6					
12					
18					
25					
30					
37					
50					
75					
100					
150					
200					
300					
400					

Aerial E-side

Pairs provided	km	Scaled pairs	Round pairs	pair km max	pair km vol driven
6					
12					
18					
25					
30					
37					
50					
75					
100					
150					
200					
300					
400					

Underground Direct Feed

Pairs provided	km	Scaled pairs	Round pairs	pair km max	pair km vol driven
2					
5					
6					
7					
10					
12					
15					
20					
25					
30					
50					
100					
150					
200					
300					
400					
500					
600					

Underground D-side

Pairs provided	km	Scaled pairs	Round pairs	pair km max	pair km vol driven
2					
5					
6					
7					
10					
12					
15					
20					
25					
30					
50					
100					
150					
200					
300					
400					

Underground E-side

Pairs provided	km	Scaled pairs	Round pairs	pair km max	pair km vol driven
12					
25					
100					
150					
300					
400					
500					
600					
800					
900					
1,200					
1,600					
1,800					
2,000					

Quantity Summary

Aerial

	km Direct	E Side	D Side	Total	Joints
6	-	-	-	-	-
12	-	-	-	-	-
18	-	-	-	-	-
25	-	-	-	-	-
30	-	-	-	-	-
37	-	-	-	-	-
50	-	-	-	-	-
75	-	-	-	-	-
100	-	-	-	-	-
150	-	-	-	-	-
200	-	-	-	-	-
300	-	-	-	-	-
400	-	-	-	-	-

UG

	km Direct	E Side	D Side	Total	Joints
6	-	-	-	-	-
12	-	-	-	-	-
18	-	-	-	-	-
25	-	-	-	-	-
37	-	-	-	-	-
50	-	-	-	-	-
100	-	-	-	-	-
150	-	-	-	-	-
200	-	-	-	-	-
300	-	-	-	-	-
400	-	-	-	-	-
600	-	-	-	-	-
800	-	-	-	-	-
900	-	-	-	-	-
1,200	-	-	-	-	-
1,500	-	-	-	-	-
1,800	-	-	-	-	-
2,400	-	-	-	-	-

Appendix XII. MSAN Calculations

MSAN Calculations

Estimation of Fixed (not line sensitive) MSAN costs

Selected MSAN	*Total Lines*	*Cost*
MG9K SSO		
MG9K GAA		
MG9K GLC		
MG9K FST		
MG9K KAI		
MG9K NSR		
MG9K ESE		
MG9K BOT		
MG9K FKS		
MG9K Safehaven		
MG9K NOS		
MG9K WEB		
MG9K SMB		
MG9K SPS		
Total		

Cost-line Slope		
Intercept		
Fixed cost as % of total		(Intercept over Total Cost)

Fixed and Variable MSAN costs

Location	Volume-driver (line capacity)	Total cost per MSAN (Capacity/Fill Ratio/Per MSAN Port Cost)	Fixed cost per MSAN (from above)	Variable Cost per MSAN (Total less fixed)
Bodden Town				
Cayman Brac Bluff				
Cayman Kai				
Cross Roads				
Crows Nest				
East End				
EE Queens High Way				
Fort Street				
Frank Sound				
George Town 0				
GT Andy's Auto				
GT Ansbacher House				
GT Barclays Bank				
GT British American				
GT C.I.B.C				
GT Capital Place				
GT Cayman National				
GT Elizabethan Square				
GT Fairbanks Road				
GT Glass House				
GT Hyatt				
GT Lions Centre				
GT Newport Ave				
GT Scotia Bank				
GT Swiss Bank 0				
GT Swiss Bank 1				
GT Templeton Pine Lake				
GT U.B.S				
GT Ugland House 0				
GT Ugland House 1				
North Side				
North Sound				
One Technology Sqare				
Safe Haven				
Seven Mile Beach 0				
SMB Crystal Harbour				
South Sound				
Spott Bay				
Spotts 0				
Spotts 1				
Spotts North Sound Estates				
Spotts Patrick Island				
Spotts Prospect Park				
Stake Bay				
Tower Building				
WB North West Point				
WB Crystal Valley				
West Bay 0 & 1				

Appendix XIII. Access Costs

Access Network Costs

Cable Costs

Underground		Unit Cost (from Cost Assumptions)	Quantity -km (from Access Calculations)	Cost
	6			
	12			
	18			
	25			
	37			
	50			
	100			
	150			
	200			
	300			
	400			
	600			
	800			
	900			
	1,200			
	1,500			
	1,800			
	2,400			

Aerial		Unit Cost (from Cost Assumptions)	Quantity -km (from Access Calculations)	Cost
	6			
	12			
	18			
	25			
	30			
	37			
	50			
	75			
	100			
	150			
	200			
	300			
	400			

Total Installed Cable Cost	

Joints		Unit Cost (from Cost Assumptions)	Quantity UG - km (from Access Calculations)	Quantity Aerial -km (from Access Calculations)	Total quantity	Total Cost
	6					
	12					
	18					
	25					
	30					
	37					
	50					
	75					
	100					
	150					
	150					
	200					
	300					
	400					
	600					
	800					
	900					
	1,200					
	1,500					
	1,800					
	2,400					

Manholes

Type	Unit Cost (from Cost Assumptions)	Quantity (from Access Calculations)	Cost
Install a JUC12/JRC12 Manhole			
Install a MRT7 Manhole			
Install a MRT8 Manhole			
Install a JRC14/JUC14 Manhole			
Install a JUP4/JUP6/JUC6 Manhole			

Poles

	Unit Cost (from Cost Assumptions)	Quantity (from Access Calculations)	Total Cost
Pole owned			
Pole rented			

DPs, Dropwire, NID

			Units	Cost per pair	Total inc installation per pair
Distribution Points					
TERMINAL DT2 SCT 10 FS					
TERMINAL DT2 PMT 10 FS					
TERMINAL DT2 SCT 15 FS					
TERMINAL DT2 PMT 15 FS					
TERMINAL DT2 SCT 25 AS					
TERMINAL DT2 PMT 25 AS					
			Average cost SCT		
			Average cost PMT		

	Unit Cost	Quantity	Total
Unit cost UG			
Unit cost Aerial			
Average			

Depreciation Calculations

Direct Capex

Cable	-
Poles	-
Joints	-
Manholes	-
DPs, Dropwire, NID	-

Annualised Capex	Asset Life	Direct Capex	Indirect Capex
Cable			
Poles			
Joints			
Manholes			
DPs, Dropwire, NID			

Cost of Capital	
Cable	
Poles	
Joints	
Manholes	
DPs, Dropwire, NID	

Depreciation	
Cable	
Poles	
Joints	
Manholes	
DPs, Dropwire, NID	

Effective NBC	
Cable	
Poles	
Joints	
Manholes	
DPs, Dropwire, NID	

Appendix XIV. Duct Costs

Duct Costs

	Volumes	Unit Price	Total cost
Exclusive duct (ie, single bore)			
Shared duct (i.e, 2-bore)			
Shared duct (i.e, 4-bore)			
Shared duct (i.e, 3-bore)			
Shared duct (i.e, 5-bore)			
Shared duct (i.e, 6-bore)			
Shared duct (i.e, 7-bore)			
Shared duct (i.e, 8-bore)			
Shared duct (i.e, 9-bore)			
Shared duct (i.e, 10-bore)			
Shared duct (i.e, 12-bore)			
Shared duct (i.e, 13-bore)			
Shared duct (i.e, 20-bore)			
Shared duct (i.e, 21-bore)			
Shared duct (i.e, 24-bore)			
Shared duct (i.e, 48-bore)			
Sub Duct			

Annualised Capex

	Asset Life	Direct Capex	Indirect Capex

Depreciation	
Cost of Capital	
Effective NRC	

Appendix XV. Transmission Costs

Transmission Network Costs

Summary of Dimensions

		6		8		12		24		48		
		Aerial	UG	Aerial	UG	Aerial	UG	Aerial	UG	Aerial	UG	
Joint separation	km											
Number of Joints	#											

Unit costs

	6		8		12		24		48		Total
	Aerial	UG	Aerial	UG	Aerial	UG	Aerial	UG	Aerial	UG	
Fibre											
Joint											

Costs

	6		8		12		24		48		Total
	Aerial	UG	Aerial	UG	Aerial	UG	Aerial	UG	Aerial	UG	
Fibre											
Joints											
Total Costs											

Annualisation

Annualised Capex

	Asset Life	Direct Capex	Indirect Capex
Fibre			
Joints			

Cost of Capital

Fibre	
Joints	

Depreciation

Fibre	
Joints	

Effective NRC

Fibre	
Joints	

Appendix XVI. NGN Costs

NGN Costs

Annualisation (from Cost Assumptions and Technical Assumptions)

		Calls	Minutes	Lines	Calls	Minutes	Lines	Minutes	Lines	Minutes		
		MSE	**MSE**	**MSE**	**Softswitch**	**Softswitch**	**Softswitch**	**MSAN**	**MSAN**	**International Softswitch**	**Voicemail Platform**	**BRAS**
Direct Capex												
Equipment												
Management System												
	Asset Life											
Annualised Capex												
Equipment												
Management System												
Indirect Capex												
Depreciation												
Equipment												
Management System												
Cost of Capital												
Equipment												
Management System												
Effective NRC												
Equipment												
Management System												

Appendix XVII. Cost Summary

Cost Summary and Mapping

Cost Summary by Asset Type

NGN (from NGN Costs)	MSE (Calls)	MSE (Minutes)	MSE (Lines)	Softswitch (Calls)	Softswitch (Minutes)	Softswitch (Lines)	MSAN (Minutes)	MSAN (Lines)	International Softswitch (Minutes)	Voicemail (Minutes)	BRAS
Depreciation											
NRC											

Fibre Transmission	Fibre and Joints (from Transmission Costs)	Fibre and Joints-Data (Allocation via Demand Calculations)	Fibre and Joints-Voice (Allocation via Demand Calculations)	Fibre and Joints-Internet (Allocation via Demand Calculations)
Depreciation				
NRC				

Access (from Access Costs)	Copper Cable	Copper Joints	Poles	Manholes	DPs, Dropwire, NID	Cable-Access	Joints-Access	Poles-Access	Poles-Core	Poles-Core-Data	Poles-Core-Voice	Poles-Core-Internet	Manholes-Access	Manholes-Core	Manholes-Core-Data	Manholes-Core-Voice	Manholes Core-Internet
Depreciation																	
NRC																	

Duct	Duct (from Duct Calculations)	Duct-Access (Allocation via Access Dim. And Trans. Cost)	Duct-Core (Allocation via Access Dim. And Trans. Cost)	Duct-Core-Data (Allocation via Demand Calculations)	Duct-Core-Voice (Allocation via Demand Calculations)	Duct-Core-Internet (Allocation via Demand Calculations)
Depreciation						
NRC						

Mapping to Network Elements

	MSE-call senstive	MSE-duration sensitive	MSE-line sensitive	Softswitch-call sensitive	Softswitch-duration sensitive	Softswitch-line sensitive	MSAN-traffic sensitive	MSAN-line sensitive	International Softswitch	Packet Switching	National Data Tx	Internet -bandwidth sensitive	International Voice Tx	International Data Tx	National Voice Tx	Advanced IN equipment	Dedicated Calling Card platform	VAS platforms	PSTN Access	PSTN Voicemail	National submarine Tx	Prepaid Calling Card Equipment	Ix billing platform	DQ Operator services equipment
Depreciation																								
NRC																								

Appendix XVIII. List of Inputs

Cost Assumption Inputs:-

- **General Assumptions:**
  - Exchange rates
  - WACC
  - Planning cost as % of Capex

- **Duct Costs:**
  - Exclusive duct (ie, single bore)
  - Shared duct
  - Sub Duct

- **Access Network Costs:**
  - Copper (e.g. 100 pair, 500 pair, dropwire etc)
    - Aerial
    - NID
    - Underground
    - Other Information
    - Cabinets/Copper Cross connect
    - Poles
    - Islandwide Media mix
    - Media Mix (Entrant specific)
    - Manholes (list by type e.g. concrete, steel)
    - Costs for Asphalt/Concrete version
    - Distribution Points

- **Transmission Direct Capex Cost:**
  - Cable
  - Optical fiber joint

- **NGN Direct Capex Cost:**
  - MSAN, Per Port
  - MSE Node - Base, Per Node
  - MSE Node - 4 Port Access, Per 4 Port
  - Softswitch Per Port, Per Line/Trunk
  - Voice Migration Per Port, Per Line/Trunk
  - Voice Migration Planning, Per Line/Trunk
  - BRAS, Per DSL User
  - Network Management hardware, Per system
  - Network Management software, Per system
  - MSAN network interface card, Per card
  - Voicemail Platform, Per platform

Technical Assumptions:-

- **Engineering Assumptions:**
  - Conversion factor for minutes to erlangs
  - # of 64kbps channels in a 2 Mbps link
  - NGN Assumptions
    - Planning ratio
    - MSAN Fill Ratio
    - ADSL average bandwidth per line Mbit/s
    - ADSL Service Contention Ratio
    - MSE ratio of call-sensitive/duration-sensitive
    - Number of Core NGN Sites
    - Max capacity for Softswitch – minutes
    - Line/Trunk Ratio

Demand Assumptions:-

- **Traffic Data:**
  - % of traffic in busy hours
  - # of busy hours
  - Transmission capacity allowance
  - Provisioning Allowance
  - Annual growth rate for lines
  - Avg non conversation holding time for successful calls (minutes per call)
  - Ratio of total/successful calls

Asset Lives:-

- NGN Equipment
- Duct
- Fibre Cable
- Fibre Joints
- Poles
- Management Systems
- Manholes
- Copper Cable
- Copper Joints
- DPs, Dropwire, NID

Routing Factors

Volume Inputs by # Calls, # Lines, Minutes, 2M, Other for:-

- ADSL ACCESS RETAIL
- ADSL ACCESS WHOLESALE
- ATM
- FIXED CALL TO C&W MOBILE
- FIXED CALL TO OTHER MOBILE
- CARDS
- CPE
- DATA OTHER RETAIL
- DATA OTHER WHOLESALE
- DIAL UP INTERNET USAGE
- DIRECT CONNECT
- DOMESTIC DQ RETAIL
- DOMESTIC DQ WHOLESALE
- DOMESTIC LEASED CIRCUITS RETAIL
- DOMESTIC LEASED CIRCUITS WHOLESALE
- DOMESTIC TRANSIT
- EMERGENCY SERVICES RETAIL
- EMERGENCY SERVICES WHOLESALE
- FIXED INTERNATIONAL INCOMING
- FIXED INTERNATIONAL OUTGOING
- FIXED VOICEMAIL RETAIL
- FIXED VOICEMAIL WHOLESALE
- DOMESTIC FRAME RELAY RETAIL
- DOMESTIC FRAME RELAY WHOLESALE
- INTERNATIONAL DQ RETAIL
- INTERNATIONAL DQ WHOLESALE
- INTERNATIONAL LEASED CIRCUITS RETAIL
- INTERNATIONAL LEASED CIRCUITS WHOLESALE
- INTERNATIONAL PAYPHONE
- INTERNATIONAL TRANSIT from OLO
- INTERNATIONAL TRANSIT to Other Admin
- ISDN ACCESS RETAIL
- ISDN ACCESS WHOLESALE
- LOCAL CALL RETAIL
- LOCAL CALL WHOLESALE
- NATIONAL PAYPHONE
- OPERATOR ASSISTANCE
- OTHER FIXED RETAIL
- PSTN ACCESS BUS
- PSTN ACCESS RES
- PSTN ORIGINATION

- PSTN TERMINATION
- TRUNK CALL RETAIL
- TRUNK CALL WHOLESALE
- VAS RETAIL
- VAS WHOLESALE
- WHOLESALE FIXED
- OPERATOR ASSISTANCE INTERCONNECT
- INTERNATIONAL FRAME RELAY RETAIL
- INTERNATIONAL FRAME RELAY WHOLESALE
- ADSL BANDWIDTH RETAIL
- ADSL BANDWIDTH WHOLESALE

Network Structure Dimension Inputs:-

- **Duct dimensions:**
  - Exclusive duct (ie, single bore) lengths
  - Shared duct distance lengths
  - sub-duct lengths

- **Access Dimensions:**
  - Copper pair cable by type and length (e.g. 100 pair, 500 pair, dropwire etc)
    - Aerial Direct Feed
    - Aerial D-side
    - Aerial E-side
    - NID
    - Underground Direct Feed
    - Underground D-side
    - Underground E-side
  - Other Information
    - Average separation of jointing boxes by length
    - Average separation of fibre splices – underground by length
    - Average underground length of transmission between concentrator and distribution point
    - Average aerial length of transmission between cross connect cabinet and furthest distribution point
    - Average UG length of transmission between Exchange and the cross connect cabinet
  - Cabinets/Copper Cross connection points, units
  - Poles, units
  - Manholes (list by type e.g. concrete, steel)
  - DP's, units

- **MSAN Dimensions:**
  - Existing Concentrator Locations

- Number of subscribers

- **Transmission Dimensions:**
  - Transmission type – aerial/underground
  - Lengths
  - Run
  - Sections
  - Fibre

- **Data Volume Inputs:**
  - Retail Domestic LL Capacity (2M)
  - Retail Domestic LL No Lines
  - Wholesale Domestic LL Capacity (2M)
  - Wholesale Domestic LL No Lines
  - Retail IPLC Capacity (2M)
  - Retail IPLC No Lines
  - Wholesale IPLC Capacity (2M)
  - Wholesale IPLC No Lines