



BERMUDA
**REGULATORY
AUTHORITY**

**ECA Section 78
Transitional Spectrum Investigation**

**Draft Final Decision
and Order**

Draft Final Decision and Order

Matter: SC-1222-2013

Date: 15 October 2014

Response Date: 29 October 2014

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1 INTRODUCTION

1.1 Purpose and Next Steps

1. The purpose of this Draft Final Decision and Order is to provide the results of the Regulatory Authority's ("RA" or "Authority") Electronic Communications Act 2011 ("ECA") Section 78 Transitional Spectrum Investigation and inform affected spectrum licensees and other interested parties which of the spectrum assignments the Regulatory Authority will renew, revise, or decline for renewal when the existing Transitional Spectrum Licenses expire on 29 October 2014.
2. Given the confidential nature of the data addressed in this proceeding the Regulatory Authority determined that it was prudent to provide spectrum licensees with company specific versions of the Regulatory Authority's Draft SEUSA Analysis and Draft Final Decisions. This document provides a non-confidential version of the Regulatory Authority's Section 78 Transitional Spectrum Investigation so that licensees and interested parties can provide comments on the Regulatory Authority's analysis and decisions.
3. As such, the Regulatory Authority invites comments on this Draft Final Decision and Order from members of the public, operators of electronic communications networks and providers of electronic communications services, and other interested parties. Written comments should be submitted before 5:00 PM (Bermuda time) on 29 October 2014.
4. Responses to this Draft Final Decision and Order should be filed electronically in MS Word or Adobe Acrobat format. Parties filing comments should go to the Regulatory Authority's website, www.rab.bm, follow the link to the Decisions and Orders page, and click the "Click here to submit a response" icon which appears at the top of the page. All comments should be clearly marked "Response to Draft Final Decision and Order Matter: SC-1222-2013 Comments on ECA Section 78 Transitional Spectrum Investigation" and should otherwise comply with Rules 18 and 30 of the Authority's Interim Administrative Rules, which are posted on the Regulatory Authority's website.
5. The Regulatory Authority intends to make responses to this Draft Final Decision and Order available on its website. If a commenting party's response contains any information that is confidential in nature, a clearly marked "Non-Confidential Version," redacted to delete the confidential information, should be provided together with a complete version that is clearly marked as the "Confidential Version." Redactions should be strictly limited to "confidential information," meaning a trade secret, information whose commercial value would be diminished or destroyed by public disclosure, information whose disclosure would have an adverse effect on the commercial interests of the commenting party, or information that is legally subject to confidential treatment. The "Confidential Version" should highlight the information that has been redacted. Any person claiming confidentiality in respect of the information submitted must provide a full justification for the claim. Requests for confidentiality will be treated in the manner provided for in Rule 30 of the Regulatory Authority's Interim Administrative Rules.
6. The Chief Technical Officer is the principal point of contact at the Regulatory Authority for interested persons during this consultation. He may be contacted by email at mwells@rab.bm or by mail at:

Michael Wells
Chief Technical Officer
Regulatory Authority
3rd Floor Cumberland House
1 Victoria Street Hamilton, HM11
Bermuda

7. In this document, except insofar as the context otherwise requires, words or expressions shall have the meaning assigned to them by the Regulatory Authority Act 2011 (“RAA”), the ECA, and the Interpretation Act 1951.

1.2 Legislative Background

1.2.1 Transitional Provisions

8. ECA Section 73(2)(c) provides for the award of 18-month transitional spectrum licences to ICOL holders reflecting their respective spectrum assignments (if any) at the time of the ECA’s commencement (28 January 2013). These transitional Spectrum Licences were duly awarded to eligible ICOL holders by the Authority on 29 April 2013.
9. ECA Section 78 requires that during the 18-month transitional period:

The Authority shall conduct an investigation of the spectrum assignments reflected in the spectrum licences granted to ICOL holders pursuant to section 73(2)(c) and any other COL holders pursuant to section 76 for the purpose of determining whether the frequencies assigned are being utilized efficiently, and the Authority may, upon expiry of the 18 month term—

(a) decline to renew the spectrum licence; or

(b) modify the spectrum licence to authorize the use of a reduced amount of spectrum,

if the licence holder fails to demonstrate a reasonable need for some or all of the spectrum assigned to it, and the Authority concludes that such measures are necessary to ensure the efficient use of spectrum.

1.2.2 Spectrum Management

10. ECA Section 36 (1) requires that the Regulatory Authority:
... shall implement the general policies and regulations made by the Minister in respect of radio frequencies comprising the electromagnetic spectrum which are, or are available to be, used to transmit or receive electronic communications.
11. ECA Section 37 describes the “objectives of spectrum management” and requires that:

(1) In performing their functions under this Part, the Minister and the Authority shall ensure that radio spectrum is managed in a manner that—

- (a) is objective, transparent and non-discriminatory;*
- (b) is economically and technically efficient;*
- (c) facilitates the introduction and evolution of new technologies and innovative electronic communications services;*
- (d) gives due recognition to the level of investment in existing equipment configured for specific frequencies and the cost of migrating to other frequencies;*
- (e) preserves or promotes effective and sustainable competition in the provision of electronic communications services subject to this Act;*
- (f) is compatible with the Convention; and*
- (g) meets the radiocommunications needs of Government Departments and agencies.*

(2) Where any of these objectives appear to be in conflict, the Minister shall, after conferring with the Authority, prioritise the objectives or otherwise resolve the conflict in a way that, in the Minister's opinion, best serves the public interest.

1.3 Government Spectrum Policy

12. The Minister of Education and Economic Development (“MEED”), Dr. the Hon. E Grant Gibbons, JP, MP, as the Minister responsible for Telecommunications (“Minister”), is required by Section 35 of the Electronic Communications Act 2011 to make general policies and, as necessary, regulations for the electronic communications sector with respect to:
 - (a) the management and allocation of spectrum; and
 - (b) the procedure to be followed by the Regulatory Authority in assigning spectrum.
13. On 22 September 2014 the Minister published a Policy Statement¹ (hereafter: “Statement”) to provide the spectrum management policies for the Regulatory Authority to implement going forward with respect to spectrum allocations, spectrum assignments, and spectrum related fees.²
14. The Minister's Statement addressed five fundamental spectrum management issues by:

1

http://www.gov.bm/portal/server.pt/disclaimer.html/skin/ggambo62...n_hi_userid=2/gateway/PTARGS_0_2_6079_330_1813_43/http%3B/ptpublisher.gov.bm%3B7087/publishedcontent/publish/min_telecom_and_e_commerce/telecommunications/dept_telcom_press_releases/spectrum_policy_statement_0.pdf

² The effective date of the policies contained in the Minister's Statement is 22 September 2014.

- (a) Defining High Demand Spectrum (“HDS”) bands.³ The purpose of defining HDS frequencies is to focus the Regulatory Authority’s attention and resources on the set of frequencies where the potential for demand to exceed supply and the need to ensure efficient spectrum assignments are the greatest so that these frequencies may be subjected to more stringent spectrum management procedures with respect to assignments and fees.
- (b) Establishing, for HDS frequencies, a Bermuda frequency allocation table (“FAT”) and a Bermuda band plan (“BBP”) based on the frequency allocations and band plans adopted by the FCC.⁴
- (c) Establishing a hybrid first-come-first-served (“FCFS”)-Comparative Selection assignment process for all HDS frequencies.⁵
- (d) Establishing a spectrum cap on all HDS assignments such that no firm, or affiliates (as defined in the ECA or RAA), be permitted to hold more than 50% of any HDS band, subject to the limited exceptions described by the Minister. The Minister stated that this cap shall be applied, on a forward looking basis, any time there is an application for a new spectrum assignment, a renewal of an existing spectrum assignment, and/or when a merger or other consolidation is proposed amongst spectrum licensees.⁶
- (e) Establishing an administered incentive pricing (AIP) scheme with the goal of incentivising efficient use of spectrum for all HDS bands.⁷

1.4 Transitional Spectrum Licenses

- 15. The transitional Spectrum Licenses issued to ICOL holders contain a number of clauses relevant to this Investigation.
- 16. Clause 3.2 describes the “*Scope Of Licence*” which provides that:

This Licence does not grant the Licensee any ownership rights in the Assigned Frequencies, and no such rights shall be created or implied by virtue of the Licensee’s use of the Assigned Frequencies.

- 17. Clause 4 describes the “*Grant And Duration Of The Licence*” which provides that the license:

... is valid and effective from the date hereof and shall remain in effect, provided that the Associated ICOL is valid and effective, until the earlier of:

(a) 29 October 2014;

(b) the date on which the Licensee surrenders this Licence;
or

³ MEED Policy Statement, Section 3.1.

⁴ MEED Policy Statement, Section 3.2.

⁵ MEED Policy Statement, Section 3.3.

⁶ MEED Policy Statement, Section 3.3.1.3.

⁷ MEED Policy Statement, Section 3.4.

(c) *the date on which this Licence is revoked pursuant to Section 93(5) of the RAA.*

18. Clause 5.1 addresses “*Renewal*” which provides that:

This Licence may be renewed, at the discretion of the Authority, for a term not to exceed ten years, provided that the duration of the renewed Licence shall not exceed that of the Associated ICOL.

19. Clause 6 addresses “*Modification*” which provides that:

... the licence, including its Schedules, may be modified by the Authority:

...

(f) *following the conclusion of a spectrum investigation pursuant to Section 78 of the ECA or following an adjudication pursuant to Section 41 of the ECA.*

20. Clause 7 addresses “*Obligations Under The Licence*” which provides:

...

7.3 The Licensee shall assist the Authority in the coordination and management of Radio Spectrum and shall make efficient use of the Assigned Frequencies for the Authorized Use. The Licensee shall notify the Authority promptly if the Licensee no longer requires the use of any or all of the Assigned Frequencies.

7.4 The Licensee shall cooperate fully with the Authority in identifying whether and to what extent the Assigned Frequencies are being used efficiently and whether the Licensee has a reasonable need for all or a portion of the Assigned Frequencies in accordance with Section 78 of the ECA, including as follows:

(a) *The Licensee shall promptly provide any information requested by the Authority concerning the Licensee’s actual or proposed use of the Assigned Frequencies and other Radio Spectrum resources.*

(b) *The Licensee shall submit to the Authority, no later than six months following the effective date of this Licence, a report approved by the Licensee’s Board of the Directors containing a detailed analysis of spectrum usage by the Licensee, in the format prescribed by the Authority, in relation to services that were provided using the Assigned Frequencies for the Authorized Uses as at the date of the commencement of Part 12 of the ECA.*

(c) *The Licensee shall comply fully with any timetables established by the Authority for the release of any of the Assigned Frequencies if required by the Authority, provided that the timetable for release shall commence no sooner than 29 October 2014.*

21. Clause 9 addresses “*Compliance*” which provides that:

Failure to comply with the terms of this Licence shall constitute a violation of the conditions of this Licence and the Associated ICOL, and violations shall be dealt with in accordance with the procedures set forth in the RAA and ECA.

22. Clause 10 addresses “*Enforcement And Revocation*” which provides that:

The Authority may initiate enforcement proceedings pursuant to Section 93 of the RAA if there is reason to believe that the Licensee has contravened the conditions of this Licence or the Applicable Regulatory Framework, including failure to pay any fees prescribed for use of the Assigned Frequencies in full on a timely basis.

23. Clause 11 addresses “*Assignment*” which provides that:

The Licensee shall not transfer, assign, Sub-Licence or lease, in whole or in part, this Licence or the spectrum usage rights granted herein to any third party, including any Affiliate, without the prior written authorization of the Authority acting with the written consent of the Minister. For purposes of this condition, “assignment” shall be deemed to include a change of Control of the Licensee.

1.5 Scope of Investigation

24. The RA is required by ECA Section 78 to conduct an investigation of the spectrum assignments granted to ICOL holders for the purpose of determining whether the assigned frequencies are being utilized efficiently. The ECA places the burden of proof on the licensee to demonstrate a reasonable need for the spectrum it has been assigned. If the licence holder fails to demonstrate a reasonable need for some or all of the spectrum it has been assigned the Regulatory Authority may decline to renew the spectrum licence, or modify the spectrum licence to authorize the use of a reduced amount of spectrum, if the RA concludes that such measures are necessary to ensure the efficient use of spectrum.
25. RAA Section 16(d) states that “In performing its duties under this Act, the Authority shall act in a reasonable, proportionate and consistent manner”. ECA Section 2 defines the term proportionate as “no more than reasonably necessary to achieve a given regulatory objective, taking into account the relative cost of compliance and the ultimate benefit to consumers.”
26. Given these guidelines the Regulatory Authority determined that it was reasonable to limit the scope of this investigation to “high value” spectrum assignments, where the potential for demand to exceed supply and the need to ensure efficient spectrum assignments are greatest. Consistent with this approach the Regulatory Authority limited this investigation to the spectrum associated with Wireless Cable Spectrum Licences, Commercial Mobile Radio Service Spectrum Licences, and Fixed Wireless Access Spectrum Licences. Excluded from the scope of this investigation were the spectrum assignments associated with Other Mobile Radio Service Spectrum Licences and Point-to-Point Microwave Spectrum Licences.
27. Since the start of this proceeding the Minister defined HDS bands so that these specific frequencies could be subjected to more stringent spectrum management

procedures with respect to assignments and fees. The Minister found this approach to be reasonable, proportionate, and consistent with the requirement of ECA Section 37(1)(a) to ensure that radio spectrum is managed in a manner that is objective, transparent and non-discriminatory.

28. To be consistent with the Minister's stated policy the Regulatory Authority has further limited the scope of this investigation to the HDS bands as defined by the Minister. The HDS bands represent the frequencies where the potential for demand to exceed supply and the need to ensure efficient spectrum assignments are the greatest. As such, the Regulatory Authority concludes that it is not necessary at this time to decline to renew or modify spectrum licences for non-HDS assignments to ensure the efficient use of spectrum.

1.6 Procedural History

29. On 7 October 2013 the Regulatory Authority issued a Notice and Information Request ("Notice") which required ICOL holders with associated Spectrum Licences for Wireless Cable Spectrum, Commercial Mobile Radio Service Spectrum, and/or a Fixed Wireless Access Spectrum to submit, by 29 October 2013:

a report approved by the Licensee's Board of the Directors containing a detailed analysis of spectrum usage by the Licensee, in the format prescribed by the Authority, in relation to services that were provided using the Assigned Frequencies for the Authorized Uses as at the date of the commencement of Part 12 of the ECA.

30. These submissions are referred to as Spectrum Efficiency and Usage Self-Assessments ("SEUSAs").

1.6.1 Bermuda Digital Broadband ("BDB")

31. BDB did not provide a SEUSA;
32. On 14 April 2014 the Regulatory Authority provided BDB its Confidential Draft SEUSA Analysis⁸ which included:
 - (a) the Regulatory Authority's internal analysis of BDB's spectrum efficiency; and
 - (b) the BDB spectrum assignments which had been identified for recovery by the Regulatory Authority.
33. On 9 May 2014 Bermuda Digital Communications Ltd. ("BDC") responded to the Confidential Draft SEUSA Analysis on behalf of BDB.⁹
34. On 8 July 2014 the Regulatory Authority provided BDB its Confidential Draft Final Decision ("DFD").

1.6.2 Bermuda Digital Communications ("BDC")

35. On 29 October 2013 BDC provided its SEUSA;

⁸ ECA Section 78 Transitional Spectrum Investigation - BDB Confidential Draft SEUSA Analysis; Notice Matter: SC-1222/2013; dated 14 April 2014.

⁹ This response was included in Bermuda Digital Communications response of the same date. At page 13 of this document BDC describes BDB as "...a subsidiary of BDC."

36. On 11 November 2013 provided “third party evidence” in support of their SEUSA;¹⁰
37. On 14 April 2014 the Regulatory Authority provided BDC its Confidential Draft SEUSA Analysis¹¹ which included:
 - (a) the Regulatory Authority’s internal analysis of BDC’s spectrum efficiency; and
 - (b) the BDC spectrum assignments which had been identified for recovery by the Regulatory Authority.
38. On 9 May 2014 BDC provided its response to the Confidential Draft SEUSA Analysis.
39. On 29 May 2014 BDC met with representatives of the Regulatory Authority in a “one-on-one” meeting to discuss spectrum that had been identified for recovery.¹²
40. On 4 June 2014 the Regulatory Authority issued follow-up questions to BDC.
41. On 13 June 2014 BDC provided its response to the follow-up questions.
42. On 1 July 2014 the Regulatory Authority provided BDC its Confidential Draft Final Decision (“DFD”).

1.6.3 Telecommunications (Bermuda & West Indies) Limited (“Digicel”)

43. On 29 October 2013 Digicel provided its SEUSA;
44. On 14 April 2014 the Regulatory Authority provided Digicel its Confidential Draft SEUSA Analysis¹³ which included:
 - (a) the Regulatory Authority’s internal analysis of Digicel’s spectrum efficiency; and
 - (b) the Digicel spectrum assignments which had been identified for recovery by the Regulatory Authority.
45. On 13 May 2014 Digicel provided its response to the Confidential Draft SEUSA Analysis.
46. On 22 May 2014 Digicel met with representatives of the Regulatory Authority in a “one-on-one” meeting to discuss spectrum that had been identified for recovery.¹⁴
47. On 8 July 2014 the Regulatory Authority provided Digicel its Confidential Draft Final Decision (“DFD”).
48. On 17 July 2014 Digicel provided comments on its DFD.

1.6.4 Digital Mobile Television Limited (“DMTV”)

49. On 18 September 2014 provided its SEUSA.

¹⁰ Global Spectrum Benchmarking Study Whitepaper prepared by Altman Vilandrie & Company for Bermuda Digital Communications, Ltd.; dated 8 November 2013.

¹¹ ECA Section 78 Transitional Spectrum Investigation - BDC Confidential Draft SEUSA Analysis; Notice Matter: SC-1222/2013; dated 14 April 2014.

¹² Representatives of BDC and the Regulatory Authority also participated via conference call.

¹³ ECA Section 78 Transitional Spectrum Investigation - Digicel Confidential Draft SEUSA Analysis; Notice Matter: SC-1222/2013; dated 14 April 2014.

¹⁴ Representatives of Digicel and the Regulatory Authority also participated via conference call.

1.6.5 Logic

50. On 29 October 2013 Logic provided its SEUSA;
51. On 14 April 2014 the Regulatory Authority provided Logic its Confidential Draft SEUSA Analysis¹⁵ which included:
 - (a) the Regulatory Authority's internal analysis of Logic's spectrum efficiency; and
 - (b) the Logic spectrum assignments which had been identified for recovery by the Regulatory Authority.
52. On 9 May 2014 Logic provided its response to the Confidential Draft SEUSA Analysis.
53. On 21 May 2014 Logic met with representatives of the Regulatory Authority in a "one-on-one" meeting to discuss spectrum that had been identified for recovery.
54. On 8 July 2014 the Regulatory Authority provided Logic its Confidential Draft Final Decision ("DFD").

1.6.6 Quantum

55. On 29 October 2013 Quantum provided its SEUSA;
56. On 14 April 2014 the Regulatory Authority provided Quantum its Confidential Draft SEUSA Analysis¹⁶ which included:
 - (a) the Regulatory Authority's internal analysis of Quantum's spectrum efficiency; and
 - (b) the Quantum spectrum assignments which had been identified for recovery by the Regulatory Authority.
57. On 21 May 2014 Quantum met with representatives of the Regulatory Authority in a "one-on-one" meeting to discuss spectrum that had been identified for recovery.¹⁷
58. On 8 July 2014 the Regulatory Authority provided Quantum its Confidential Draft Final Decision ("DFD").

1.6.7 World On Wireless ("WOW")

59. On 25 October 2013 WOW provided its SEUSA.

2 INVESTIGATION PROCEDURE

60. The information contained in the SEUSAs and subsequent communications with licensees was considered by the Regulatory Authority together with evidence received from interested third parties and data collected independently by the Authority, in conformity with ECA Section 78. The results of the Regulatory Authority's analysis are provided in this Draft Final Decision and Order.

¹⁵ ECA Section 78 Transitional Spectrum Investigation - Logic Confidential Draft SEUSA Analysis; Notice Matter: SC-1222/2013; dated 14 April 2014.

¹⁶ ECA Section 78 Transitional Spectrum Investigation - Quantum Confidential Draft SEUSA Analysis; Notice Matter: SC-1222/2013; dated 14 April 2014.

¹⁷ Representatives of the Regulatory Authority also participated via conference call.

3 SUESA ANALYSIS

61. The information and analysis in this section is based primarily on the SUESA's filed by each licensee.

3.1 Measuring Efficiency

62. Spectrum efficiency is said to occur when the maximum amount of information (i.e. output) is transmitted within a given amount of spectrum (i.e. input), or equivalently, when the least amount of spectrum is used to transmit a given amount of information.

63. The amount of information carried is measured as the capacity of the network. The capacity of a network is generally determined by multiplying together:

(a) the amount of spectrum used;

(b) the number of sites used; and

(c) the spectrum efficiency of technology deployed.

64. With regard to sites, it is noted that the ability of operators in Bermuda to increase the number of sites they use is somewhat constrained by the availability of suitable sites and by planning restrictions. There would therefore be an expectation that in order to deliver the required capacity, more spectrum may be required than in a situation where the addition of sites was less restricted than it is in Bermuda. The lack of easy availability of sites is particularly acute for fixed wireless access where line-of-sight to the subscriber is important. Site availability constraints are less problematic with lower frequency spectrum, particularly sub-1GHz frequencies. That said, Digicel described site planning issues in terms of delays and stated that it is not a genuine limitation on Digicel's network.

65. With regard to technology, the move to a more efficient technology will be driven partly by the need to support growing traffic, but also by the availability of network infrastructure and, in particular, user equipment which can take advantage of the newer technology, as well as how to deal with traffic on the older network whilst the spectrum is re-farmed to introduce the new technology.

66. To compare the efficiency of the networks in Bermuda with those of other countries, the Regulatory Authority benchmarked the local networks against figures for similar nations. It is important to use similar nations as the population and topography of Bermuda make comparisons to countries that are larger or land-locked less valid. In this respect we have compared the following.

Criteria	Discussion
Number of subscribers per sector ¹⁸	The number of subscribers per sector is a strong comparator of the efficiency of the design of the network insofar as a higher value indicates more reliance on spectrum than on infrastructure to deliver a service.
Number of sectors per square km	The number of sectors per square km per MHz is a good comparison of whether operators are relying on spectrum to deliver capacity, or are using infrastructure; in this respect the higher the value, the less reliance is being made on spectrum assets.
Number of subscribers per MHz	The number of subscribers per MHz also considers whether infrastructure or spectrum is being used to deliver services, the higher the value, the more use of infrastructure.

Figure 1: Spectrum efficiency criteria that have been used to assess cellular networks

67. Finding reasonable benchmarks against which to compare values is complicated by the unique nature of Bermuda, being a small island nation. Suitable data has been gathered from Jersey and Guernsey which are reasonable facsimiles for Bermuda. It was also worth comparing values between the different operators in Bermuda to provide relative benchmarks.
68. What is also important, in the context of Bermuda, is whether the networks are:
 - (a) designed in a way which makes effective use of the spectrum they have available to them (i.e. that they are not wasteful in their use of spectrum); and
 - (b) correctly dimensioned to deal with the traffic they see (i.e. there is neither significant unused capacity, nor are sites too heavily loaded which would reduce service quality).
69. These two factors can be assessed by comparing the way in which frequencies are used between cells, and the utilisation of the cells during the busy hours. In an efficient network, we would expect to see that:
 - (a) the frequencies used are evenly distributed across all the sites, showing good planning and sensible re-use of frequencies;
 - (b) the sites themselves are evenly distributed based on the population distribution;
 - (c) the traffic in the busy hour is in the range 50% to 90% (below this indicates that the networks have excess capacity, and above this suggests they are overloaded).¹⁹

¹⁸ In a mobile, or cellular network, an individual cell tower has 3 directional antennas that each cover one-third (120 degrees) of the circumference around the cell tower. Each third, or 120 degrees of the circumference, is called a sector.

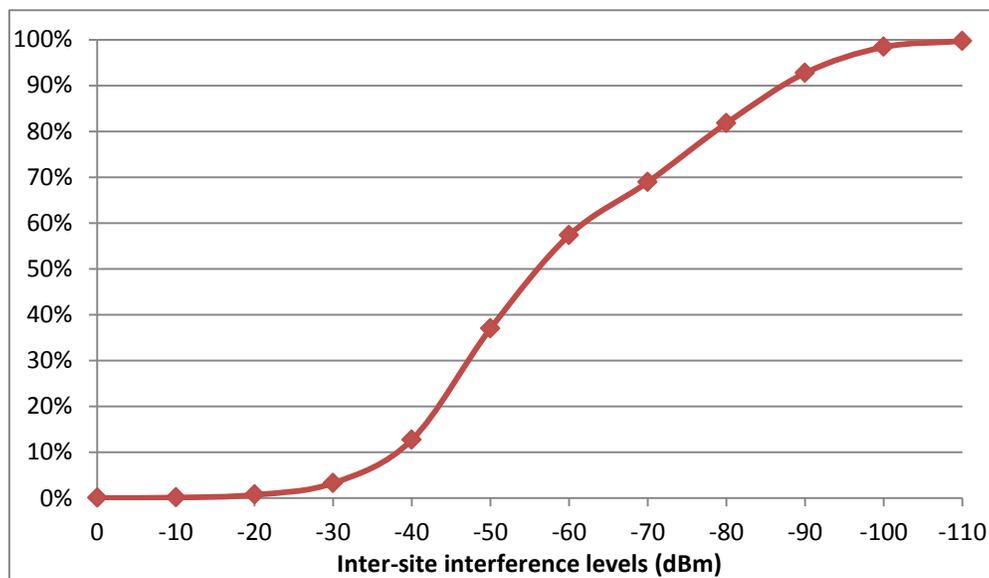
¹⁹ Overuse is a form of inefficiency insofar as it indicates that the network is poorly designed to cope with the offered traffic.

70. As the measurement of spectrum efficiency can be undertaken in many ways, rather than provide specific values (which are generally meaningless insofar as spectrum efficiency is not an exact science when it comes to real-life deployments) the Regulatory Authority categorised the results of its analysis into 5 categories:
- (a) Poor (the spectrum is hardly used)
 - (b) Low (the spectrum is not used efficiently)
 - (c) Medium (the spectrum is used reasonably efficiently, but there is scope for improvement)
 - (d) Good (the spectrum is being well used, with relatively some scope for improvement)
 - (e) Excellent (the spectrum is being fully and completely utilised)

3.2 Summary of Confidential Analysis

3.2.1 Distance Between Cell Sites

71. The Regulatory Authority conducted an analysis of the distance between the sites used by the commercial mobile radio licensees to determine the extent to which frequency (or code for cdma and UMTS) re-use between sites is possible. In many cases the height of the sites above the surrounding terrain, together with the height of the antennas above ground used means that there is less scope for frequency re-use than might be expected on a typical mobile network.²⁰ We note that the majority of the sites deployed in Bermuda are macro sites (e.g. tall towers), whereas it is common to expect a good proportion of micro sites (e.g. antennas mounted on buildings or street furniture), especially in more densely populated areas.
72. The chart below shows the distribution of inter-site interference levels (e.g. the levels of interference from one site which would be present at another site) for all of the cellular sites in Bermuda.



²⁰ In the one-on-one meeting Digicel noted that lower tower heights were a concern in Bermuda.

Figure 2: Distribution of inter-site interference levels for Bermuda

73. Based on this distribution, we estimate that the number of sites which exhibit mutual interference is in excess of 50%. This is not an exact estimate as the interference potential is based upon that caused to users rather than between sites, but it does illustrate that there may be less scope for frequency re-use in Bermuda than might be the case in certain other circumstances.

3.2.2 Comparative Benchmarking

74. The GSM and UMTS networks of BDC were benchmarked against networks in Jersey and Guernsey.

75. BDC has deployed fewer sectors per sq km than the networks in Jersey and Guernsey. This suggested that to be as efficient as the networks in Jersey and Guernsey, both networks could have approximately 40% more sites, or be able to deliver the same service with approximately 40% less spectrum. This is supported by the number of subscribers per MHz which is lower for BDC than the average values for Jersey and Guernsey. The number of subscribers per sector is higher in Bermuda than Jersey and Guernsey further suggesting that there is insufficient infrastructure and a reliance on spectrum to deliver capacity. We note that in the one-on-one meetings with BDC it acknowledged that adding spectrum is a cost-effective method to increase capacity relative to adding infrastructure.

76. For the GSM networks, the Regulatory Authority therefore estimated that BDC could provide the same service using approximately 20-40% less spectrum when compared to the operators in Jersey and Guernsey.

77. For the UMTS networks, the same reliance on spectrum instead of infrastructure is shown both in the number of sectors per sq km and the number of subscribers per MHz. The number of subscribers per sector is also again high.

78. For the UMTS networks, we concluded that BDC could provide the same service using approximately 33% less spectrum when compared to the benchmark calculated for operators in Jersey or Guernsey.

79. We note that the availability of sites in Bermuda is limited due to local planning constraints. If this factor is taken into account, the levels of spectrum efficiency demonstrated may be adequate.

3.2.3 Summary of Findings

3.2.3.1 Bermuda Digital Communications

80. On the more general measures, we find the following:

Technology	Frequencies evenly distributed	Sites suitably distributed	Traffic loading in the busy hour	Overall efficiency	Notes
GSM	No	Yes	Good	Good	
cdma1x	Yes	No	Good	Low	Few sites

UMTS	Yes	Yes	Good	Medium	
Wimax	Yes	Yes	Low	Medium	

Figure 3: Summary of spectrum efficiency findings for BDC

3.2.3.2 Digicel

81. On the more general measures, we find the following:

Technology	Frequencies evenly distributed	Sites suitably distributed	Traffic loading in the busy hour	Overall efficiency	Notes
GSM	Yes	Yes	Low	Medium	
UMTS	Yes	Yes	Medium	Medium	

Figure 4: Summary of spectrum efficiency findings for Digicel

3.2.3.3 Logic Communications

82. On the more general measures, we find the following:

Technology	Frequencies evenly distributed	Sites suitably distributed	Traffic loading in the busy hour	Overall efficiency	Notes
WiMax	No	Yes	High	Low	

Figure 5: Summary of spectrum efficiency findings for Logic Communication

3.2.4 Spectrum Use

3.2.4.1 Commercial Mobile Radio Service

3.2.4.1.1 Bermuda Digital Communications

83. Within the PCS C block (1900 MHz band), BDC provided data on the carrier frequencies they used. With the exception of a small gap in their assignment virtually all the frequencies are in use. In general, it would be normal to see a relatively even distribution of carriers across the whole of the band if spectrum is being used efficiently; however there is a clear disparity between the usage at the bottom of the assignment and those at the top. There is no obvious cause for this disparity based on the data provided, however it could be due to the distribution of channels used for control, and those used for traffic or may be down to the legacy arrangement of frequencies following the merger with M3. In any instance, there is clearly scope for BDC to introduce further cells within this allocation by improving the re-use of the frequencies at the lower end of the band without additional spectrum.

84. The site locations are generally well spread across the islands, with a cluster of sites in Hamilton. This distribution is as would be expected of a reasonably efficient operator.

85. Though it is likely that the sites for UMTS in Cellular Block B (850 MHz band) provide near universal coverage due to the better long-range propagation at 850 compared with 1900 MHz, there is clearly scope to roll-out UMTS to additional cell sites in this band, as well as at 1900 MHz.
86. BDC provided data on the extent to which its networks were utilised during the busy hour of the day. These figures are within the range that we would expect to see for an efficient network.
87. Given the restrictions on the installation of new cell-sites, the evidence provided by BDC shows, in general, that their network has been reasonably efficiently designed with the possible exception that the distribution of carriers (i.e. individual radio frequencies) for its GSM network is somewhat uneven, meaning that there may be scope for introducing more carriers at some sites. Additionally, the UMTS network is reaching the point where it is near saturation, suggesting that additional sites (or carriers) are needed.
88. We note that, in total, 10.5 MHz of BDC's spectrum in the 850 MHz band is currently unused. Due to BDC's arrangement of the various blocks in use in the 850 MHz band it is not straightforward to migrate services to clear a full block. However, it is expected that the cdma 1x network will be phased out over time as it is an older technology. As such, it would become possible to migrate BDC's services out of the A and A' Blocks. Doing so would still leave sufficient carriers to continue 1x voice and 1x EVDO service to those customers who continue to use cdma services until completely phased out. It is not expected that the reduction in capacity due to closure of carriers would lead to additional congestion as the number of users is expected slowly decrease as newer phones adopt UMTS (and later LTE) technologies replace aging cdma devices.
89. The length of time required for such the migration will depend upon the age of the equipment. Given the relatively small number of sites used for the cdma network, it seems feasible that, even if new filters or other equipment were necessary, a re-engineering of this type should not take longer than 90 days. However, there will be limitations on the speed by which carriers can be closed due to the need to provide a service to existing customers. While the network re-engineering may be relatively quick the Regulatory Authority recognizes that in the near term (during the re-engineering and while the network has relatively heavy use) a reduction in carriers could cause a temporary degradation to service levels.

3.2.4.1.2 Digicel

90. For their GSM network, Digicel provided data on the usage of their carriers. Due to the use of frequency hopping, and the need to make assumptions about frequency re-use, it is more difficult to determine whether frequency usage is evenly distributed. Overall there is little to suggest that the distribution of frequencies is inefficient, however frequency re-use is lower than observed amongst other operators in Bermuda.
91. The site locations are generally well spread across Bermuda, with a cluster of sites in Hamilton. This distribution is as would be expected of a reasonably efficient operator.
92. Digicel provided data for their GSM network from which we were able to calculate the level of utilisation of their network based on the traffic in the busy hour divided by

the available traffic capacity using a 2% quality of service (QoS). They also provided data on the utilisation of channel elements (CE) on their UMTS network from which we can calculate usage by considering the number of CE available at each site (which we have assumed to be 256).

93. This level of utilisation of the GSM network is relatively low. It would suggest that the Digicel network is dimensioned to provide capacity in excess of that which is necessary for its current level of subscribers. The lower frequency re-use identified above would support this theory. Overall, it appears that Digicel’s use of its GSM spectrum is relatively inefficient compared to the amount of traffic which it needs to deliver. Therefore, it appears to be feasible for Digicel to re-design its network to operate in less spectrum and, for example, empty the D Block of traffic.
94. For their UMTS network, we find it to be well dimensioned for the levels of traffic with utilisation as would be appropriate for the busy hour. Overall we find this network to have a medium spectrum efficiency.

3.2.4.2 Fixed Wireless Access

3.2.4.2.1 Bermuda Digital Communications

95. The table below shows the spectrum assigned to Bermuda Digital Communications (BDC) together with their usage of that spectrum according to their response.

Frequency (MHz)	Usage
3300 – 3400	Pre-WiMax based fixed-wireless service

Figure 6: BDC frequency assignments and usage

96. BDC provide data concerning the frequency use at their WiMax sites but do not specify the channel bandwidth. Assuming a 10 MHz channel bandwidth, we find that there is a reasonable distribution of frequencies and should inter-site interference be taken into account, we would be likely to determine why certain frequencies are re-used less than others (e.g. because the frequencies in question are used from the highest towers and thus most susceptible to interference).
97. The average level of utilisation is relatively low with the exception of a small number of sites which show heavier loads.
98. The distribution of frequencies and sites suggests a reasonably efficiently designed network. The low utilisation, except at specific hotspots suggests the network is designed with excess capacity, however this could quickly be used if user traffic grows.
99. Overall we find the network to have a medium spectrum efficiency.

3.2.4.2.2 Logic Communications

100. The table below shows the spectrum assigned to Logic Communications together with their usage of that spectrum according to their response.

Frequency (MHz)	Usage
3400 -3600	WiMax based fixed-wireless service

Figure 7: Logic Communications frequency assignments and usage

101. Logic's network appears to have a reasonable distribution of frequency usage, however the amount of re-use of frequencies is relatively low.
102. Logic Communications provided data on the throughput of each of their cells. This data was provided graphically and hence it is difficult to read specific values.
103. The figures provided suggest that during the busy hour the networks are approaching their capacity. Given the low re-use of frequencies, there would appear to be plenty of scope to increase the capacity of the system, or to provide the same service in less spectrum. Potentially, 50 MHz of the band could be vacated with greater frequency re-use.
104. We regard the spectrum efficiency of the system to be low.

3.3 Spectrum Identified for Recovery

105. As a result of considering the efficiency with which the various operators are using their spectrum and thereby their justified need for that which they are using, the Regulatory Authority has identified a number of opportunities for operators to use the spectrum more efficiently, and therefore the potential for spectrum that is licensed and in-use to be vacated without significantly impacting the quality of service being provided.
106. In particular, we have identified that:
 - (a) BDB can relinquish its entire assignment (2500-2686 MHz) immediately as it is not in use.
 - (b) BDC could vacate (2x) 5 MHz of the 850 MHz band immediately as it is not in use. In the longer term, with some re-engineering of their cdma network BDC could return all of the A Blocks (e.g. A and A') of spectrum in the 850 MHz band.
 - (c) Digicel could re-engineered their GSM network to use less spectrum, potentially freeing 5 MHz in the 1900 MHz Band (e.g. the GSM D Block).
 - (d) Logic Communications could re-engineer their network to use less spectrum, potentially freeing 50 MHz of the 3400 to 3600 MHz band.
107. In general, to re-engineer modern wireless communications networks to use different frequencies, little is usually required other than to conduct a re-planning exercise and then implement a phased plan of loading the new frequencies into the appropriate base stations. This can take as little as a month, however a period of 90 days would be sufficient in most cases for this to take place.
108. In the case of older technology, it may be necessary to conduct some work at a site or even to replace filters in which case more time would be required. Whether or not the networks discussed above fall into the category of older technology needs to be discussed with the operators concerned.

4 DRAFT SUESA ANALYSIS COMMENTS AND DRAFT FINAL DECISIONS

4.1 General Issues

109. In their written comments and oral communications both BDC and Digicel expressed concerns about the calculations and comparisons used in the Regulatory Authority's SEUSA analysis which is discussed in Section 3. For example, BDC asserted that the Spectrum Efficiency Ratio is a good starting point for the Regulatory Authority's

analysis of spectrum efficiency but BDC urged the Regulatory Authority to also consider its additional recommendations and criteria when evaluating spectrum efficiency and considering whether recovery or re-engineering of spectrum is in the public interest.²¹

110. Additionally, Digicel noted that the assessment of spectrum efficiency at the technical level is not something it has seen regulators attempt in the other jurisdictions in which it operates, and as such, Digicel says it understands the challenge the Regulatory Authority faces in this proceeding. Digicel suggested that calculating the volume of Erlangs conveyed in a given area at a given time would provide an informative estimate of spectrum efficiency. However, Digicel also recognized that the information required for such a calculation is generally confidential to operators and thus not available to the Regulatory Authority for comparative purposes.
111. The Regulatory Authority agrees, in part, with the concerns expressed by BDC and Digicel regarding the calculations and comparisons used in its analysis. The Regulatory Authority understands that benchmarks and comparisons with other jurisdictions are rarely perfect tools. As noted in Section 3, finding reasonable benchmarks against which to compare values is complicated by the unique nature of Bermuda, being a small island nation. Bermuda's unique topography and market characteristics often make for challenging comparisons. However, the fact that the comparisons are challenging is insufficient reason for the Regulatory Authority to ignore this basic analytical tool or the results of any given comparison because the comparators are not purely "apples to apples" in all aspects. Instead, the Regulatory Authority must use its expertise to determine how best to use the available data and comparisons in its analysis and decisions.
112. Consistent with BDC's argument that the Spectrum Efficiency Ratio was 'a good starting point' the Regulatory Authority has relied upon the Spectrum Efficiency Ratio and the Jersey and Guernsey benchmarks as a starting point for the analysis of spectrum efficiency in Bermuda. The relative measures of BDC and Digicel against the operators in Jersey and Guernsey is informative, but not dispositive of determining how efficiently spectrum is being used in Bermuda. As such, we wish to make it clear that meeting or exceeding the benchmarks from Jersey and Guernsey does not, in itself, prove efficient spectrum usage in Bermuda just as not meeting the Jersey and Guernsey benchmarks does not by itself prove inefficiency. In sum, the Jersey and Guernsey data provide reasonable benchmarks for the Regulatory Authority to consider, but the Regulatory Authority must also rely on its general expertise as well given the complexity of assessing efficiency on technical terms.²²
113. Given the large number of parameters associated with wireless network architecture(s), the limitations on publicly available data, and the challenge of finding reasonable benchmarks the assessment of the efficiency of spectrum usage is necessarily both art and science. However, the vast majority of the spectrum which the Regulatory Authority has identified for recovery, or more accurately, non-renewal upon expiration of the existing transitional spectrum licenses, is currently not being used by the licensee. As such, by any and all reasonable measures the spectrum

²¹ BDC 9 May 2014 response to the Confidential Draft SEUSA Analysis, page 8.

²² This issue was recognized by Digicel in its comments noting that technical analysis of spectrum efficiency analysis is not common in other jurisdictions.

efficiency for these unused assignments if effectively zero. No adjustment to the calculations and comparisons used in the Regulatory Authority's SEUSA analysis could alter this simple fact.

114. For spectrum assignments that are at least in partial use, if we assume, *arguendo*, that BDC's and Digicel's arguments are accepted by the Regulatory Authority at face value, we find that doing so does not significantly alter the calculated values, and thus, the results of our initial analysis do not change.
115. We also do not find compelling the operators' arguments that future network growth and new technologies require firms to hold significant quantities of unused spectrum in commercially desirable HDS bands. We note that these fallow frequencies can cause market distortions, competitive imbalances,²³ and negative externalities,²⁴ and thus, are not in the public interest. The magnitude of the negative impact to the public interest is greatest where the assigned but unused frequencies exist in HDS bands, in commercially desirable bands below 1 GHz, and/or in large quantities. Thus, the public interest calls for the Regulatory Authority to require a higher level of efficiency for such frequencies and assignments.

4.2 Licensee Specific Issues

4.2.1 BDB

116. BDB has neither deployed a network nor introduced services. As a result the Regulatory Authority identified that BDB could relinquish its entire spectrum assignment (2500-2686 MHz) immediately as it is not in use.
117. BDC noted that the spectrum band currently assigned to its sister company, BDB, is allocated to wireless multichannel video services but may be relevant to BDC's future growth of wireless services if the spectrum band is reallocated for mobile use, appropriate technology is identified and new sites obtained, which is expected to take some extended period of time. BDC claims that some portion of the 2500 MHz Band may offer a future means of accommodating increased capacity needs.²⁵
118. Based on the information provided by BDB (and BDC) and subsequent communications, the evidence received from interested third parties, and data collected independently by the Regulatory Authority we have determined, in conformity with ECA Section 78(a), that BDB's spectrum license for 2500-2686 MHz shall not be renewed when its existing spectrum license expires on 29 October 2014.
119. BDB has failed to demonstrate a reasonable need for the spectrum currently assigned to it, and the Regulatory Authority concludes that recovery of this spectrum is necessary to ensure the efficient use of spectrum in Bermuda.
120. BDB has neither deployed a network nor introduce services. BDC's future plans for the spectrum in question are speculative, at best, and fail to demonstrate an existing need for this spectrum.

²³ For example, where a competing firm's access to the unused frequencies would likely result in increased competition.

²⁴ For example, where a competing firm's access to the unused frequencies could result in the need for fewer cell towers.

²⁵ BDC Draft SEUSA Analysis Response Matter SC-1222/2013; dated May 9, 2014; page 13.

121. We also note that the Minister has implemented a general spectrum cap of no more than 50% of any High Demand Spectrum (“HDS”) band, which includes the 2500 MHz Band. BDB’s current assignment is effectively 100% of this band and thus does not comply with the spectrum cap implemented by the Minister.
122. As with other licensees, BDB will be permitted to request/apply for other spectrum assignments as they are made available by the Regulatory Authority.

4.2.2 BDC

123. The Regulatory Authority’s analysis identified that BDC is currently not utilizing 10.5 MHz of spectrum in the 850 MHz band and that with reasonable changes to its network architecture BDC could free up the A and A’ blocks²⁶ of the 850 MHz band (hereafter “A blocks”) so that it may be reassigned to another licensee. BDC’s chief argument in support of retaining assignment of the A blocks is so that it can expand its service offerings to Bermuda by the end of 2014. BDC provided documentation from an equipment manufacturer and minutes from its Board meeting regarding the proposed investment.
124. As an initial matter the Regulatory Authority finds that BDC’s investment plans fail to demonstrate a reasonable need for the spectrum in question. The vendor documentation provided by BDC which purports to show ongoing communications regarding the proposed investment in equipment to provide expanded services in the 850 MHz band speaks to BDC’s intentions but does not support a claim of need. Furthermore, the documentation provided by BDC does not actually indicate which frequencies the equipment would operate in or even mention the 850 MHz band. Thus, the Regulatory Authority does not know the degree to which BDC’s efforts in this regard were actually relevant to the frequencies in question.
125. BDC’s arguments in support of a ‘reasonable need’ for the entire 850 MHz band in order to provide expanded services are also not compelling. BDC’s ability to provide expanded service does not depend upon the continued assignment of the A blocks. The Regulatory Authority’s research indicates that much, if not all, of the end user equipment required by BDC to support expanded services in the 850 MHz band also operates in multiple other bands including those already assigned to BDC (e.g. 1900 MHz band), those that are currently not assigned to any licensee (e.g. 2100 MHz band), and frequencies that the Regulatory Authority is currently in the process of reallocating for mobile use in Bermuda (e.g. 700 MHz band). Further, BDC’s own comments note that end user equipment supporting expanded services such as those BDC intends to deploy in the 850 MHz band are more limited than the equipment supporting such services in other bands such as 700 MHz and AWS [2100 MHz band].²⁷ Thus, BDC’s own arguments undercut its claim that it needs the frequencies in question.
126. BDC argues that a key consideration driving its planned 850 MHz expansion is maintaining some 2G elements because BDC is the only inbound CDMA roaming provider. BDC claims that it provides the only E911 life line service available to CDMA users in Bermuda and that life line service is a critical necessity in emergency situations which trumps spectral efficiency requirements.

²⁶ The A and A’ blocks represent 12.5 MHz of bandwidth.

²⁷ See: BDC Draft SEUSA Analysis Response; dated 9 May 2014 at page 8.

127. While we agree that access to E911 service is important we note that the Regulatory Authority provided BDC with a proposed migration plan that would allow BDC to maintain service for CDMA customers. The plan provided by the Regulatory Authority is consistent with BDC's own stated plans for its CDMA based network. We find that it is possible for BDC to maintain its proposed 2G elements without using the A Blocks.
128. Thus, based on the information contained in BDC's SEUSA and subsequent communications, the evidence received from interested third parties, and data collected independently by the Regulatory Authority we have determined, in conformity with ECA Section 78(b), that BDC's spectrum license for the A Blocks of spectrum in the 850 MHz band will not be renewed when its existing spectrum license expires on 29 October 2014.
129. BDC has failed to demonstrate a reasonable need for this spectrum currently assigned to it, and the Regulatory Authority concludes that recovery of this spectrum is necessary to ensure the efficient use of spectrum in Bermuda.
130. As with other licensees, BDC will be permitted to request/apply for other spectrum assignments as they are made available by the Regulatory Authority.

4.2.3 Digicel

131. As a result of considering the efficiency with which Digicel is currently using their spectrum assignments and thereby their justified need for that which they have been assigned, the Regulatory Authority identified that Digicel's GSM network could be re-engineered to use less spectrum, potentially freeing the D Block.
132. In response Digicel questioned the relevance and application of the efficiency benchmarks used by the Regulatory Authority. According to Digicel, when meaningful measures are used Digicel is in fact using the GSM and UMTS spectrum generally more, or much more efficiently, than in the comparator countries used by the Regulatory Authority.²⁸
133. Digicel also disputes the Regulatory Authority's utilization calculations. According to Digicel both its GSM utilization UMTS utilization figures are higher than the results calculated by the Regulatory Authority. Digicel claims both figures represent high or very high utilization.²⁹
134. Based on the information contained in Digicel's SEUSA and subsequent communications, the evidence received from interested third parties, and data collected independently by the Regulatory Authority we have determined, in conformity with ECA Section 78(b), that Digicel's spectrum license for the D Block of spectrum in the 1900 MHz band³⁰ will not be renewed when its existing spectrum license expires on 29 October 2014.
135. While Digicel disputes the relevance and application of the efficiency benchmarks used by the Regulatory Authority its response merely highlights general concerns

²⁸ See Digicel response to the Regulatory Authority document "Digicel Confidential Draft SEUSA Analysis"; dated 13 May 2014; page 3/11.

²⁹ See Digicel response to the Regulatory Authority document "Digicel Confidential Draft SEUSA Analysis"; dated 13 May 2014; page 4/11.

³⁰ Specifically, 1865-1870 MHz paired with 1945-1950 MHz.

with benchmarking, such as finding ideal “like with like” comparators, instead of demonstrating a need for the spectrum the Regulatory Authority identified for recovery.

136. The Regulatory Authority accepts Digicel’s utilization calculations and notes that they are based on inputs Digicel did not provide the Regulatory Authority when it originally conducted its analysis.³¹ However, the updated utilization figures do not demonstrate a reasonable need for Digicel to retain the D Block of spectrum in the 1900 MHz band or cause the Regulatory Authority to reject its original finding that this the recovery of spectrum is necessary to ensure the efficient use of spectrum in Bermuda.
137. Furthermore, as noted above in paragraph 14(d) that the Minister has implemented a spectrum for HDS bands, which includes the 1900 MHz Band. This standard shall be applied, on a forward looking basis any time there is an application for a new spectrum assignment, a renewal of an existing spectrum assignment, and/or when a merger or other consolidation is proposed amongst spectrum licensees. As such the Regulatory Authority, save for limited exceptions provided by the Minister’s Statement, is obligated to reduce Digicel’s assignment in the 1900 MHz band.
138. Digicel requested that if its 1900 MHz band assignment is reduced that the 5 MHz block of spectrum be taken from the end of its current assignment, and not the D block, which given the peculiarities of the 1900 MHz band plan, is located in the middle of Digicel’s assignment, between blocks A and B. Digicel argues that allowing it to maintain a contiguous assignment in the 1900 MHz band would be more spectrally efficient, reduce interference concerns, and make the extracted block more useful to another network operator. The Regulatory Authority is sympathetic to Digicel’s concerns but we are not inclined, at this time, to deviate from the band plan established by the Minister based on those already approved by the US Federal Communications Commission.
139. As with other licensees, Digicel will be permitted to request/apply for other spectrum assignments as they are made available by the Regulatory Authority.

4.2.4 DMTV

140. DMTV has been assigned two 6 MHz broadcasting channels (Channels 19 and 20; 500-512 MHz) in a non-HDS band which the company is using to provide free over the air broadcasts of ZBM (ABC) & ZFB (CBS) plus four other stations.³² A spectrum scan conducted by the Regulatory Authority indicates that the upper half of this assignment is in use while the lower half is not. Given the size of this assignment and its location in a non-HDS band the Regulatory Authority concludes at this time that recovery of this spectrum is not necessary to ensure the efficient use of spectrum in Bermuda.
141. Based on the information data collected independently by the Regulatory Authority we have determined, in conformity with ECA Section 78, that DMTV’s spectrum

³¹ Regulatory Authority was required to make certain assumptions regarding the configured capacity of the network and the proportion of resources reserved for data whereas Digicel used actual engineered values for its calculations.

³² See: <http://www.dmtv.bm/index.php/what-is-go-media>

license for 500-512 MHz spectrum shall be renewed when its existing spectrum license expires on 29 October 2014.

142. As with other licensees, DMTV will be permitted to request/apply for other spectrum assignments as they are made available by the Regulatory Authority.

4.2.5 Logic

143. As a result of considering the efficiency with which Logic is currently using their spectrum assignments and thereby their justified need for that which they have been assigned, the Regulatory Authority identified that:
- (a) Logic could re-engineer their network to use less spectrum, potentially freeing 50 MHz of the 3.4 to 3.6 GHz band. The Regulatory Authority tentatively concluded that Logic should return a contiguous 50 MHz of spectrum from its current assignment of 3.4 to 3.6 GHz.
144. In response Logic asserted that the spectrum around 3.460 GHz which the Regulatory Authority identified as not being used in Logic's network is not used by Logic's base stations but is utilized by some of its customers. Similarly, Logic notes that the other usage gaps identified by the Regulatory Authority are currently used by corporate customers from the City Hall base station.³³
145. Logic maintains that Bermuda's size and the irregularity of the topology require base stations to be located closer to each other than they would in a flat non-vegetative environment. According to Logic, the majority of its base stations are located within a radius of 2 kilometres or less and that all are transmitting at the minimum amount of power that can be utilized. Logic claims that even with this transmit power and the configuration of antennae the coverage of sectors still overlap in several cases. Thus, Logic argues that due to the topology and the close proximity of base stations Logic cannot increase the frequency reuse without significantly impacting performance. According to Logic, another factor that supports the need for lower frequency reuse is the positioning of Customer-premises equipment (CPE) in disperse locations. Due to non-line-of-site conditions some CPE are connected to base stations that do not service that geographical area. Logic claims this is due to noise floor being raised or cross-interference between base stations and CPE.³⁴
146. Logic claims that returning 25% of its current spectrum assignment would result in service degradation, loss of services in areas, and would require a minimum of 9 months to a year to complete.³⁵
147. Based on the information contained in Logic's SEUSA and subsequent communications, the evidence received from interested third parties, and data collected independently by the Regulatory Authority we have determined, in conformity with ECA Section 78, that Logic's spectrum license for the 3.4–3.6 GHz spectrum in the 3.5 GHz band shall be renewed when its existing spectrum license expires on 29 October 2014.

³³ See Logic response to the Regulatory Authority document "Logic Confidential Draft SEUSA Analysis"; dated 9 May 2014; page 3.

³⁴ See Logic response to the Regulatory Authority document "Logic Confidential Draft SEUSA Analysis"; dated 9 May 2014; pages 3-6.

³⁵ See Logic response to the Regulatory Authority document "Logic Confidential Draft SEUSA Analysis"; dated 9 May 2014; page 7.

148. Logic has demonstrated a reasonable need for the spectrum currently assigned to it given the stated limitations on frequency reuse in this frequency range. Moreover, the Regulatory Authority concludes at this time that recovery of this spectrum is not necessary to ensure the efficient use of spectrum in Bermuda. The Regulatory Authority finds that the recovery of this spectrum would disproportionately burden Logic without significantly increasing the efficiency of spectrum usage or spectrum assignment in Bermuda.
149. Furthermore, we also note that renewing Logic's current spectrum assignment is not contrary to the spectrum cap imposed by the Minister as the 200 MHz Logic is currently assigned is not more than 50% of the 3500 MHz Band.
150. As with other licensees, Logic will be permitted to request/apply for other spectrum assignments as they are made available by the Regulatory Authority.

4.2.6 Quantum

151. As a result of considering the efficiency with which operators are using the spectrum they have been assigned the Regulatory Authority determined that Quantum's provisional spectrum assignment³⁶ of the AWS A Block (1710-1720 MHz and 2110-2120 MHz) is not in use and its license should not be renewed.
152. Based on the information contained in Quantum's SEUSA and subsequent communications, the evidence received from interested third parties, and data collected independently by the Regulatory Authority we have determined, in conformity with ECA Section 78, that Quantum's provisional spectrum assignment of the AWS A Block (1710-1720 MHz and 2110-2120 MHz) will not be renewed when its provisional spectrum assignment expires on 31 October 2014.
153. Quantum has failed to demonstrate a reasonable need for this spectrum currently assigned to it, and the Regulatory Authority concludes that recovery of this spectrum is necessary to ensure the efficient use of spectrum in Bermuda.
154. We note that the terms of Quantum's approved spectrum request:
 - (a) provide that the spectrum "will only be granted on a provisional basis up to 31st October 2014." and
 - (b) "The period for which spectrum is granted may not necessarily be extended."³⁷
155. As with other licensees, Quantum will be permitted to request/apply for other spectrum assignments as they are made available by the Regulatory Authority.

4.2.7 WOW

156. The Regulatory Authority notes that WOW is currently involved in a proceeding (Matter: SC-1501-2014) in which WOW is voluntarily migrating out of the 700 MHz band to a smaller assignment in a non-HDS band. As such, the disposition of WOW's spectrum license(s) is not addressed in this proceeding.

³⁶ On 17 July 2013 Quantum accepted the Regulatory Authority's offer of a provisional assignment (dated 10 May 2013) but a formal spectrum license was never issued by the Regulatory Authority.

³⁷ See Letter from Regulatory Authority to Ms. Lin Gentemann, dated 10 May 2013; page 2/2.

5 GOING FORWARD

157. The Regulatory Authority has determined that the Spectrum Licensees for BDB and Quantum shall expire on 29 October 2014 and not be renewed.
158. The Regulatory Authority has determined that the Spectrum Licensees for BDC and Digicel will be modified, consistent with ECA Section 78 "...to authorize the use of a reduced amount of spectrum." As such, BDC and Digicel will have their new reduced assignment spectrum licenses issued on 30 October 2014 with a 10 year term ending on 29 October 2024.³⁸ For the BDC and Digicel spectrum blocks that are currently assigned but are not being renewed each party will be issued a temporary spectrum license with a 90 day term ending on 27 January 2015.
159. Our analysis indicates that 90 days is more than sufficient for each licensee to reengineer its network to accommodate the revised spectrum assignments. Should either licensee require more than 90 days to complete the transition said licensee must petition the Regulatory Authority in writing as soon as possible, but no later than 30 days from the date of the Final Decision and Order, to request an extension of its temporary migration spectrum license. The Regulatory Authority will confer with the affected party to determine if an extension will be granted and how long the extension will remain valid. The Regulatory Authority notes that barring exceptional circumstances, an extension shall not be granted, and that any extension which is granted shall be valid for no more than 90 days.³⁹

5.1 Other Matters of Interest

5.1.1 License Conditions

160. We remind spectrum licensees that the terms of their transitional Spectrum licenses:
 - (a) do not grant the licensee "... any ownership rights in the Assigned Frequencies, and no such rights shall be created or implied by virtue of the Licensee's use of the Assigned Frequencies."⁴⁰
 - (b) explicitly state that the license "may be renewed, **at the discretion of the Authority**, for a term not to exceed ten years, provided that the duration of the renewed Licence shall not exceed that of the Associated ICOL."⁴¹ (emphasis added)
 - (c) and require the licensee to "... comply fully with any timetables established by the Authority for the release of any of the Assigned Frequencies if required by the Authority, provided that the timetable for release shall commence no sooner than 29 October 2014."⁴²

³⁸ The revised "Schedule A" for BDC and Digicel are provided in APPENDIX A.

³⁹ Thus, the maximum term for the temporary spectrum license shall not exceed 180 days (27 April 2014).

⁴⁰ Spectrum License Section 3.2.

⁴¹ Spectrum License Section 5.1.

⁴² Spectrum License Section 7.4(c).

APPENDIX A

Bermuda Digital Communications Ltd.

REVISED

SCHEDULE A

ASSIGNMENT OF RADIO FREQUENCY SPECTRUM

The frequency bands listed in the Schedule below have been assigned for use by the Licensee in the provision of Commercial Mobile Radio Services.

Band	Frequency (MHz)		Block Size (MHz)	Frequency (MHz)		Block Size (MHz)
	Mobile to Base Station			Base Station to Mobile		
Cellular A+ A" Block	824.0	835.0	11	869.0	880.0	11
Cellular B Block	835.0	845.0	10	880.0	890.0	10
Cellular A' Block	845.0	846.5	1.5	890.0	891.5	1.5
Cellular B' Block	846.5	849.0	2.5	891.5	894.0	2.5
PCS E	1885.0	1890.0	5	1965.0	1970.0	5
PCS F	1890.0	1895.0	5	1970.0	1975.0	5
PCS C	1895.0	1910.0	15	1975.0	1990.0	15

Telecommunications (Bermuda & West Indies) Limited

REVISED

SCHEDULE A

ASSIGNMENT OF RADIO FREQUENCY SPECTRUM

The frequency bands listed in the Schedule below have been assigned for use by the Licensee in the provision of Commercial Mobile Radio Services.

Band	Frequency (MHz)		Block Size (MHz)	Frequency (MHz)		Block Size (MHz)
	Mobile to Base Station			Base Station to Mobile		
GSM A	1850.0	1865.0	15	1930.0	1945.0	15
GSM B	1870.0	1885.0	15	1950.0	1965.0	15
GSM D	1865.0	1870.0	5	1945.0	1950.0	5