

October 31, 2011

**VIA ELECTRONIC DELIVERY**

Marlene H. Dortch, Secretary  
Federal Communications Commission  
445 12th Street, SW  
Room TWA325  
Washington, DC 20554

**Re: Notice of *Ex Parte* Presentation  
WT Docket No. 11-18; RM-11592**

Dear Ms. Dortch:

On October 27, 2011, Vulcan Wireless LLC (“Vulcan”) representative Michele Farquhar met with Louis Peraertz, legal advisor to Commissioner Clyburn, supporting the need for a 700 MHz band interoperability condition on the AT&T-Qualcomm acquisition and related issues.

During the meeting, the parties discussed Vulcan’s concerns as a Lower 700 MHz A Block licensee and the circumstances that are dramatically impeding A Block broadband deployment, as described in Vulcan’s May 26 and July 27, 2011 *ex parte* presentations submitted in the above-referenced proceedings. Specifically, Ms. Farquhar discussed how the unique nature of the 700 MHz band and market consolidation have led to a skewed 3GPP process, which has resulted in fractured and disaggregated spectrum, a captive vendor community, isolated/orphaned spectrum holders, and harm to competition and consumers. She also explained that the AT&T-Qualcomm transaction would substantially threaten interoperability by magnifying AT&T’s market power in the Lower 700 MHz band, which could further delay equipment and devices for the A Block. She highlighted that most A Block licensees are small carriers or new entrants serving relatively small and rural areas that lack the market power, scope, and financial support necessary to influence the vendor community. As a result, Vulcan continues to urge the Commission to adopt a transaction-specific condition that would require any mobile device manufactured after June 2013 that is operating on paired Lower 700 MHz band spectrum to operate on all Lower 700 MHz band paired spectrum. Approving the transaction without this condition would lead to irreparable harm to A Block licensees as well as consumers.

In addition, Ms. Farquhar discussed the impact of the FCC’s delay in addressing Lower 700 MHz interoperability concerns. She reported that the current 700 MHz A Block difficulties have been increasingly cited in advance of similar spectrum auctions in Canada and other countries. She provided a copy of a Canadian analyst report from October 2 that highlights the interoperability and equipment availability problems that have devalued the A Block licenses in the U.S. (attached), and noted an article in the October 19, 2011 edition of TR Daily that quotes the director of the GSMA’s

regional office in Latin America regarding the difficulty of device interoperability between the U.S. 700 MHz sub-bands. Ms. Farquhar added that the Commission should address these interoperability concerns expeditiously so that they do not impair future U.S. spectrum auctions. Finally, she noted the negative impact on public safety stemming from the lack of interoperability in the 700 MHz band, as discussed in the letter from Governor Haley Barbour of Mississippi (dated September 20) filed in RM-11592.

Pursuant to Section 1.1206(b) of the Commission's rules, I am filing this notice electronically in the above-referenced docket. Please contact me directly with any questions.

Respectfully submitted,

*/s/ Michele C. Farquhar*

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# Communications - Telecommunications

October 2, 2011  
Research Comment  
Toronto, Ontario

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**Industry Rating: Outperform**

## Auction Structure Key to Impact on Industry – Focus on Prime Bands Aligned With AT&T and Verizon as Not All 700 MHz Spectrum Created Equal

### Highlights

- Industry Canada is expected to release its 700 MHz/2.5GHz spectrum auction rules by year-end. The question of whether and how some spectrum could be reserved for “new entrants” has been topical.
- While the superior propagation and in-building coverage characteristics of 700 MHz spectrum are well understood, we highlight that it is the sub-bands or “blocks” within the 700 MHz spectrum that are critical in determining the near- to mid-term availability of low-cost 4G LTE equipment and devices. With AT&T and Verizon currently driving the LTE ecosystem on only a subset of 700 MHz blocks (46 MHz), truly “prime” 700 MHz spectrum is even scarcer than the 58 MHz of paired spectrum blocks expected to be auctioned in Canada.
- After a detailed review of Industry Canada and FCC filings, we have developed some scenarios to help frame the issue for investors to better assess the proposed auction rules for Rogers (rated Outperform by Tim Casey), BCE (rated Market Perform) and TELUS (rated Outperform) when they are issued later this fall.
- **Positive Scenarios for Incumbents** include: (1) an open auction; (2) sub-prime lower A band reserved for new entrants; and (3) modified U.S. 700MHz Band Plan with open auction for three of four “prime” bands.
- **Negative Scenarios for Incumbents** include: (1) U.S. 700MHz Band Plan with one or more prime bands reserved for new entrants; (2) Modified U.S. 700MHz Band Plan with open auction for one/two of four prime bands; (3) Regional Telecom Carriers no longer considered new entrants with one band reserved for new entrants.
- We believe the most likely scenario is the modified U.S. 700 MHz band plan as it would allow a spectrum reserve and give all incumbents an opportunity to own national 700MHz spectrum, albeit a thin band. From a new entrant perspective, it could trigger consolidation, which could help ensure that one “greenfield” operator would emerge in the medium term, which could help stabilize pricing within the marketplace.
- Predicting the proceeds of an auction is often “unpredictable” particularly before the auction structure is announced. That said, prior auctions valuation metrics suggest a valuation in the \$3 billion range should be expected if the modified U.S. 700MHz band plan is adopted with one band reserved for new entrants. We have factored in \$750 million for 700MHz licenses at each of the incumbent carriers (ROBELUS) as place holders in our models in the interim before the rules are announced.

## 700 MHz “Beachfront” Property Well Understood but It Is the Sub-bands That Really Count

While the superior propagation and in-building coverage characteristics of 700 MHz spectrum are well understood by investors, we highlight that it is the sub-bands or “blocks” within the 700 MHz spectrum that are critical in determining the near- to mid-term availability of low-cost 4G LTE equipment and devices for Canadian carriers. With AT&T and Verizon currently driving the LTE ecosystem on only a subset of 700 MHz blocks (46 MHz), truly “prime” 700 MHz spectrum is even scarcer than the 58 MHz of paired spectrum blocks expected to be auctioned in Canada.

In the U.S., 700MHz spectrum was made available through multiple auctions held between 2002 and 2008. The largest 700 MHz auction (FCC Auction 73 in March 2008) raised \$19.2 billion for 52 MHz of spectrum (namely, Lower A, Lower B, Lower E, Upper C and Upper D blocks), with AT&T and Verizon collectively bidding \$16 billion for the bulk of the auctioned blocks. Verizon secured national Upper C block spectrum for a total capacity of 22 MHz (2 x 11 MHz), while AT&T secured 12 MHz (2 x 6 MHz) of Lower B block spectrum covering 175 million POPs, adding to its 12 MHz (2 x 6 MHz) of Lower C block spectrum covering 196 million POPs previously acquired from Aloha Partners for \$2.5 billion. Generally speaking, Verizon’s national uniform 700 MHz spectrum is considered strategically and operationally superior to AT&T’s, as AT&T will need to use two blocks of 700 MHz and AWS spectrum to provide national coverage, a much more complex network to engineer. The Upper D block auctioned as part of FCC Auction 73 saw no successful bids due to public safety conditions, and the Lower A block went to various smaller regional and rural carriers with the understanding that this block was potentially impaired by Channel 51 interference.

**Chart 1: U.S. 700 MHz Spectrum FCC Auction 73 Highlights**

FCC Auction 73 Winning Bidders	POPs (MM)	MHz * POPs	Bid Amount (\$000's)	Price / MHz-POP
<b>AT&amp;T *</b>				
Lower B Block	175,827	2,109,918	\$6,636,658	\$3.15
<b>Verizon</b>				
Lower A Block	147,921	1,775,056	\$2,569,509	\$1.45
Lower B Block	46,313	555,752	\$2,051,844	\$3.69
Upper C Block	280,795	6,177,489	\$4,741,807	\$0.77
<b>Total</b>	<b>475,029</b>	<b>8,508,298</b>	<b>\$9,363,160</b>	<b>\$1.10</b>
<b>CenturyLink</b>	17,652	211,818	\$148,964	\$0.70
<b>Echostar</b>	217,247	1,303,482	\$711,871	\$0.55
<b>US Cellular</b>	40,570	486,841	\$400,638	\$0.82
<b>Vulcan Spectrum (Paul Allen)</b>	7,019	84,228	\$112,793	\$1.34
<b>Others</b>	n/a	2,147,677	\$1,746,294	\$0.81
<b>Total</b>	<b>285,620</b>	<b>14,852,263</b>	<b>\$19,120,378</b>	<b>\$1.29</b>

\* AT&T also holds Lower C Block spectrum covering 196 million POPs acquired from Aloha Partners in 2008 for \$2.5 billion (~\$1.06/MHz-POP)

Source: FCC, Company reports, BMO Capital Markets

## **700 MHz Spectrum Auction Value – Taking a Stab at Predicting the Unpredictable**

We have often said that spectrum auction proceeds have more to do with the motivation of the bidders, the availability of capital and the structure of the auction than with the economic value of the spectrum itself (refer to the appendix for details). That said, applying the U.S. 700 MHz auction as an indicative benchmark metric at \$1.29/MHz-POP, one can infer that the upcoming Canadian auction could generate roughly \$2.5–3.0 billion in total proceeds. With the migration to 4G LTE technology progressing much faster than most had anticipated, one may argue that these figures are conservative. That said, we note that within the U.S. 700 MHz auction, AT&T was a motivated bidder due to its existing Aloha Holdings spectrum, bidding on average \$3.15/MHz-POP for their Lower B block spectrum. Somewhat ironically, Verizon was able to secure its arguably superior national Upper C block spectrum at a discount of just under \$0.80/MHz-POP. Using the Canadian AWS indicative benchmark metric of \$1.55/MHz-POP (which exceeded analysts' expectations by a wide margin at the time), a valuation of total proceeds closer to \$3.3 billion could be implied. While this gives a sense of the order of magnitude of the auction costs to carriers, it is difficult to take a stab at the unpredictable until we at least see how the auction rules come out. We have factored in \$750 million for 700MHz licenses at each of the incumbent carriers as place holders in the interim before the rules are announced.

## **AWS Spectrum – Provide Urban Capacity but Rural Deployments Less Economic**

We note that the 4G LTE ecosystem also includes AWS spectrum, which is a unique spectrum allocation in North America. AWS spectrum is generally distributed amongst North American carriers and is the spectrum on which the Canadian new entrants have deployed their HSPA networks. AWS spectrum is suitable for urban deployment of LTE but is disadvantaged owing to lack of in-building penetration (relative to 700 MHz) and in areas requiring rural coverage.

## **Path to 4G LTE on 700MHz & AWS More Advanced Than 2.5 GHz**

While most of the focus has been on 700 MHz spectrum, an auction is also expected for 2.5 GHz spectrum with timing either concurrent with the 700 MHz auction or delayed. As outlined above, 700 MHz has superior propagation and LTE equipment/devices are currently being developed. In addition to poorer propagation characteristics, the 2.5 GHz band plan is much more uncertain for 2.5 GHz in terms of international (TDD) and U.S. standards (FDD), and LTE on 2.5 GHz is in a much earlier stage of development – notwithstanding Clearwire's recent announcement of its intention to adopt TDD-LTE subject to available financing.

## **700 MHz Sub-band Alignment Key to LTE Equipment Ecosystem**

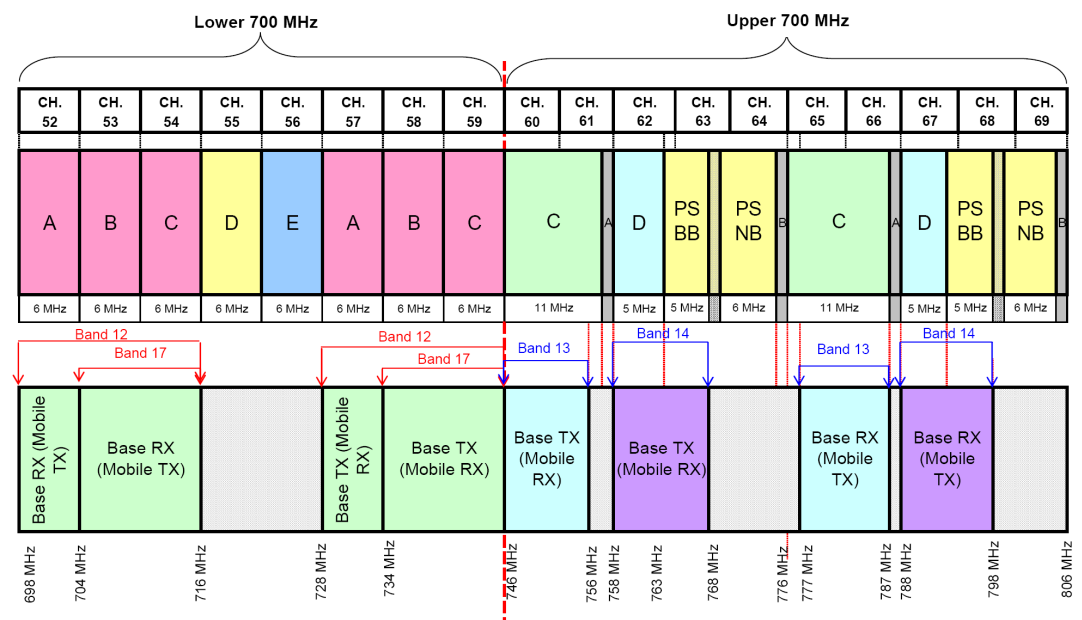
With the U.S. currently driving the LTE equipment ecosystem for 700 MHz spectrum, it is our view that Canada will likely adopt the U.S.'s 700 MHz band plan, as this would offer the obvious benefits of equipment harmonization, economies of scale from access to a wide selection of low-cost equipment, and cross-border roaming and frequency coordination. The U.S.'s 700 MHz band plan and corresponding 3GPP's band specifications for equipment are illustrated in Charts 2 and 3. We are of the view that Canada will not adopt the 700 MHz band plan being proposed in Asia by the Asia-Pacific Telecommunity (namely, the APT band plan).

While this band plan would be spectrally more efficient than the U.S.'s, the key drawbacks of near- to mid-term LTE equipment/device unavailability and troublesome U.S./Canada cross-border frequency coordination outweigh the benefits.

With AT&T and Verizon currently deploying LTE networks on different blocks of 700 MHz spectrum (namely, Lower B+C and Upper C, respectively, as shown in Chart 3), we highlight two important themes:

1. With AT&T and Verizon driving the LTE ecosystem on 700 MHz, there is clear visibility on LTE equipment/device availability supporting the Lower B, Lower C and Upper C blocks. On the contrary, there is currently low visibility on LTE equipment/device availability supporting the Lower A block (partly due to potential technical issues from Channel 51 broadcasting interference).
2. While AT&T and Verizon are driving the LTE ecosystem on 700 MHz, they are each doing so for their respective blocks. LTE devices manufactured for AT&T's Lower B+C blocks do not currently interoperate on Verizon's Upper C block and vice-versa, due to apparent chip set limitations according to Qualcomm. Qualcomm has indicated that it can only support two bands below 1GHz and three above with one band necessary on AWS, 1.9Gz or 800MHz, to provide 3G roaming. Holders of Lower A have appealed to the FCC to mandate interoperability between bands. Our read of the situation is that with no interoperability mandated by the FCC among the sub bands that the carriers are not willing to make the performance compromises that may need to be made to accommodate the full 700MHz band plan (excluding channel 51). Moreover, it gives the carriers some scope to better leverage their investment in 4GLTE deployments. Our expectation is that over time, chip set capability will be enhanced and interoperability will become less of an issue.

**Chart 2: U.S. 700 MHz Band Plan & 3GPP Band Standards for LTE Equipment**



Source: FCC, 3GPP, BMO Capital Markets

Notes: RX: receive downlink, TX: transmit uplink

PS BB: public safety broadband, PS NB: public safety narrowband,

Upper D block pending FCC review, given proximity to public safety blocks

Unpaired Lower D+E held by Qualcomm (pending sale to AT&T) and Lower E held by EchoStar

Chart 3: U.S. 700 MHz Spectrum &amp; LTE Ecosystem Dynamics

U.S. 700 MHz Paired Spectrum Blocks for Commercial Mobile Services				
	Lower A	Lower B	Lower C	Upper C
<b>Frequency Ranges (MHz)</b>	698-704, 728-734	704-710, 734-740	710-716, 740-746	746-757, 776-787
<b>FCC Bandwidth</b>	12 MHz (2 x 6 MHz)	12 MHz (2 x 6 MHz)	12 MHz (2 x 6 MHz)	22 MHz (2 x 11 MHz)
<b>3GPP LTE Equipment Bandwidth</b>	10 MHz (2 x 5 MHz)	10 MHz (2 x 5 MHz)	10 MHz (2 x 5 MHz)	20 MHz (2 x 10 MHz)
<b>Potential Interference Issues</b>	High power DTV transmission in adjacent DTV channel 51	None/Low	High power broadcast transmission from adjacent unpaired Lower D block	None/Low
<b>Key License Holders</b>	Verizon, MetroPCS, US Cellular, Cellular South, Cincinnati Bell, Cox Wireless, CenturyLink	AT&T, Verizon	AT&T	Verizon
<b>Current LTE Network Deployments</b>	No	Yes (AT&T)	Yes (AT&T)	Yes (Verizon)
<b>Visibility on LTE Equipment Availability</b>	Low	High	High	High

Source: FCC, 3GPP, Company reports, BMO Capital Markets

## Canadian 700 MHz Spectrum Set-Aside Considerations

Industry Canada is expected to release its 700 MHz (and potentially 2.5GHz) spectrum auction rules by year-end. The issue of whether some 700MHz spectrum will be reserved for existing new entrants (or other new entrants) via set-asides or more flexible spectrum caps has been increasingly topical as incumbents and new entrants publicly campaign for opposite outcomes: (1) the incumbents have urged consumers to write to their local MP's to protest more wireless spectrum set-asides for current new entrants; (2) Mobilicity has called the incumbent's public campaign an insult to consumers who would ultimately pay for the return of high wireless rates; (3) some new entrants have indicated that their businesses would ultimately prove uneconomic without timely and economic access to additional spectrum – in particular 700MHz; and (4) WIND Mobile has reportedly secured conditional financing that could exceed half a billion from VimpelCom, available only for "set-aside" 700 MHz spectrum. To be clear, new entrants' public stance has been for all, or the vast majority, of the 700MHz spectrum to be reserved for them.

We note that Industry Canada looks at auctions as a transparent way to allocate a valuable resource to the industry with a mindset to ensuring that sufficient spectrum is allocated in an efficient manner to allow the deployment of competitive advanced wireless services in urban and rural markets on a national basis. While not an explicit policy objective of these auctions, securing bidding tension in order to raise significant proceeds for Canada is undoubtedly a major consideration as well.

We have developed some scenarios to help frame the issue for investors to better assess the proposed rules when they are issued later this fall.

## Open Auction – ROBELUS Would Likely Dominate

If the auction were open to all qualified bidders (subject to foreign ownership restrictions – an issue we ignore in our discussion), Industry Canada would increase the risk that the scaled incumbent operators Rogers, Bell and TELUS (“ROBELUS”) would likely dominate the auction to ensure they had sufficient spectrum to drive future growth and to limit the spectrum available to other players to deploy 4G. Without access to the preferred blocks in 700 MHz spectrum, it could be argued that new entrants’ ability to deploy cost-effective 4G LTE services would be limited, particularly those with only 10–20MHz of spectrum in a market.

## Spectrum Reserve for New Entrants – Current U.S. Band Plan

In the event that Industry Canada adopts the U.S. 700MHz band plan and sets aside some 700 MHz spectrum (or otherwise reserve spectrum through a cap mechanism) for existing or greenfield new entrants, the block(s) selected will prove critical to determining the impact on each carrier’s 4G business plan. Under this plan, Industry Canada would make available four paired spectrum blocks per service area (namely, Lower A, Lower B, Lower C and Upper C) with Lower A currently considered “non-prime” 700 MHz spectrum.

For example, should Industry Canada choose to set aside one of the prime blocks that are aligned with either AT&T or Verizon’s spectrum blocks (Lower B+C – 24 MHz combined or Upper C – 22MHz, respectively), this would help ensure that new entrants have access to the latest and most cost-effective LTE equipment/devices. For incumbents this would leave only two prime bands for the three incumbent operators, which increases the risk that one carrier gets locked out of owning the spectrum or the more likely case of balkanized ownership positions across Canada. This would likely prevent the seamless deployment of 4G LTE services at this frequency and could reduce competitive rivalry.

In contrast to this, should Industry Canada choose to set aside the Lower A block, this would likely place new entrants at a near- to mid-term competitive disadvantage as there is no large scale demand for this sub-band and there are interference issues. Similarly, incumbents would likely be reluctant to bid aggressively for this spectrum.

## Spectrum Reserve for New Entrants – Modified U.S. Band Plan

Industry Canada could seek to modify the U.S. band plan to increase the number of prime bands available from three to four and to equalize the bandwidth available on each band. Under this scenario, Industry Canada could split the Upper C block (22 MHz) into 2 smaller blocks (12 MHz and 10 MHz). This would enable one of the prime bands to be reserved for new entrants and leave three relatively narrow prime bands available to the incumbents. Bidding tension would be ensured as each incumbent operator would likely be willing to bid aggressively to secure greater bandwidth while only one reserved band for new entrants would ensure bidding tension for this spectrum. From a policy perspective, the downside of such a structure is as follows:

1. Incumbents owning 11–12MHz of spectrum would not fully benefit from wider bandwidth allocation for 4G LTE, making rural deployment less robust.
2. By definition two of the three “greenfield” new entrants get locked out of 700 MHz spectrum, thereby putting stress on their business plans. More likely than not, this



could lead to consolidation amongst the new entrants which, given the pricing in the market would be a positive for the industry's outlook, and we consider as inevitable longer term.

3. Should the "regional" existing telecom operators Shaw, SaskTel, MTS and Videotron/Quebecor be allowed to bid as new entrants, we believe that Industry Canada runs the risk that the greenfield new entrants could be denied access to spectrum in some regional markets, putting them at a competitive disadvantage as national coverage using 700MHz would not be possible.
4. Should the "regional" existing telecom operators no longer be considered entitled to bid for reserved spectrum, this potentially pushes up spectrum costs in some key markets for incumbent wireless carriers and increases the risk of gaps in national 700 MHz coverage.

## Investment Implications

### Positive Scenarios for Incumbents

- An open auction
- Sub-prime Lower A block spectrum reserved for new entrants
- Modified U.S. 700 MHz Band Plan with open auction for three of four "prime" bands

### Negative Scenarios for Incumbents

- U.S. 700 MHz Band Plan with one or more prime bands reserved for new entrants
- Modified U.S. 700 MHz Band Plan with open auction for one/two of four prime bands
- Regional Telecom Carriers no longer considered new entrants with one band reserved for new entrants

## Expanding on the Modified Band Plan with New Entrant Reserve

We believe the modified U.S. 700 MHz band plan as discussed above would be a positive for incumbent operators as they all would secure prime 700 MHz spectrum to provide rural and urban in-building coverage. Moreover, it would present the opportunity for BCE and TELUS to consider a joint venture to work together in a similar format to their current HSPA network agreement to more efficiently utilize spectrum. From a new entrant perspective, it would help ensure that one "greenfield" operator would emerge medium term, which could help stabilize pricing within the marketplace.

## Appendix

The section below entitled "Value of Spectrum Reflects Scarcity Value" is a verbatim from an earlier report entitled "AWS Spectrum Auctions" published May 27, 2008 ([link](#)) ahead of the AWS auctions. This section provides insight into our general views on spectrum auctions, much of which is still relevant today. That said, our observation that Canadian spectrum auctions typically value spectrum at a discount to the U.S. was upended in the AWS auctions when Canadian carriers bid \$4.5 billion equivalent to ~\$1.55 per MHz POP, which was a premium to the U.S. at \$0.54 reflecting highly motivated bidding by incumbents against one another and new entrant activity. This was covered in our July 23, 2008 report on the AWS auctions ([link](#)).

### Value of Spectrum Reflects Scarcity Value

With the wireless industry on the cusp of introducing 3G services including broadband data and video on a commercial mass market basis, wireless carriers are focused on securing sufficient bandwidth to cost effectively provide these services. Insufficient bandwidth can prevent carriers from offering a full suite of services (particularly video) and/or makes it economically prohibitive to do so, owing to the requirement to split cell sites in order to provide the required capacity via spectrum reuse. Indeed much of the performance of WiMAX in terms of throughput is associated with the spectrum channel bandwidth (10 to 20MHz channels) for 2.5GHz spectrum.

In looking at auctions it would be ideal to have a simple relationship between spectrum bandwidth and capital intensity in order to gauge the appropriate value to be paid for spectrum. Unfortunately, no such rules of thumb exist and the relationship has to be developed based using market specific network models as there are far too many other factors impacting capital spending than bandwidth alone. That said, investing in spectrum is key to managing network capacity. There are plenty of examples of carriers having spectrum constraints in various markets resulting in poor network quality and/or constrained growth. Sprint-Nextel has in the past experienced significant network capacity constraints on its iDEN network.

One can look at spectrum auctions to gain a sense of valuations placed on spectrum provided one considers the differences in auction structure and the competitive intensity of an auction. Comparisons amongst similar, if not identical spectrum bands, is most appropriate as spectrum frequency and bandwidth impact capacity and propagation (distance and penetration). Auction benchmark valuations include:

1. \$1.29 per MHz POP for the 700MHz auctions in the U.S. that ended in March;
2. \$0.54 per MHz POP for the U.S. AWS auctions held in 2006;
3. \$0.94 per MHz POP for PCS spectrum re-auction in the U.S.; and
4. \$1.19 per MHz POP for the PCS auctions in Canada held in 2001.

Within the auctions themselves the amounts paid per MHz POP varied considerably by market and by carrier. Generally, more difficult to cover, densely populated urban markets tend to command premium as do markets where a carrier may have insufficient spectrum relative to its size and growth ambitions. Chicago and New York City have consistently commanded significant valuation premiums versus the average valuation paid in auctions over the years.

There are exceptions of course with some relatively small urban centers commanding larger center valuations. Other benchmarks can be derived from transactions in the market when AT&T purchases Aloha in October 2007 (\$1.06 per MHz POP) and when Clearwire and Sprint-Nextel merged their WiMAX business (\$0.28 per MHz POP).

Auctions in Canada tend to value spectrum at a lower price than in the U.S. reflecting a number of factors including the fact that generally Canadian wireless operators have more spectrum available per addressable licensed POP, than their U.S. counterparts as shown below. Rogers for example has close to 85MHz of spectrum in most markets across Canada plus a 50% interest in Inukshuk, which has another 98MHz. The largest carrier in the U.S. has a similar amount of spectrum with a subscriber base almost 10x larger. We note that the 700MHz auctions were dominated by the two largest incumbents AT&T and Verizon, which represented 80% of the bid value. We believe that with Sprint-Nextel/Clearwire owning over 100MHz of clean spectrum at 2.5GHz, both AT&T and Verizon, realized they had to secure large amounts of 700MHz spectrum in order to ensure they could maintain a low cost structure (cost per byte) and provide sufficient network capacity to remain competitive long term.

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Buy	Outperform	35.8%	11.9%	31.8%	40.7%	44.2%	55.9%
Hold	Market Perform	62.2%	14.7%	68.2%	56.2%	54.6%	39.3%
Sell	Underperform	2.0%	0.0%	0.0%	3.0%	1.3%	4.8%

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Und = Underperform - Forecast to underperform the market;

(S) = speculative investment;

NR = No rating at this time;

R = Restricted – Dissemination of research is currently restricted.

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