SHULMAN
ROGERS
GANDAL
PORDY &
ECKER, P.A.

March 5, 2004

VIA ELECTRONIC MAIL
Marlene H. Dortch, Secretary
Federal Communications Commission
445 Twelfth Street, S.W.
Washington, D.C. 20554

Re: WT Docket No. 02-55
Ex Parte Presentation

On Friday, May 9, 2003, Alan S. Tilles, Esquire of Shulman, Rogers, Gandal, Pordy & Ecker, P.A. (Counsel to the City and County of Denver, Colorado); Steve Cooper, Division Chief of Technology and Support for Denver; and Steve Browne, Deputy Manager of Safety for Technology and Operations for Denver, met with John Muleta, Chief of the Wireless Telecommunications Bureau; Catherine Seidel, Deputy Chief of the Wireless Telecommunications Bureau; Tom Stanley, Chief Engineer of the Wireless Telecommunications Bureau; D'wana Terry, Chief of the Public Safety and Private Wireless Division; Jeanne Kowalski, Deputy Chief of the Public Safety and Private Wireless Division; and Michael Wilhelm of the Wireless Telecommunications Bureau.[1]

During the May 9, 2003 meeting, Bureau personnel requested that Denver continue to supply the Commission with periodic updates on interference resolution in the City. Recently, Denver received reports from Nextel Communications, Inc. and AT&T Wireless Services documenting their efforts in Denver. Denver's engineering consultant is presently reviewing the submissions, and is preparing a response. However, in accordance with Denver's commitment to the Commission, Denver is filing the Nextel and AT&T reports now, and Denver will supplement the record with it's engineering consultant's response when it is available.[2]

[1] The meeting was the subject of a previous Denver ex parte notification.

[2] It should be noted that page 4 of AT&T's report includes in its original format inserts which are summaries of meetings between the parties. The embedded documents are not included in this ex parte filing, only the summary. However, should it be the Commission's

Pursuant to Section 1.1206(b)(2) of the Commission's Rules, 47 C.F.R. §1.1206(b)(2), this letter is being filed electronically for inclusion in the public record in the proceeding.

Sincerely,

Alan S. Tilles

Attachments

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desire to review the minutes, Denver would be pleased to supply the additional documents.

Nextel Communications, Inc.
6575 Corners Parkway
Norcross, Georgia 30092

February 17, 2004

Dr. Stephen F. Browne
City and County of Denver
Department of Public Safety
1331 Cherokee St, Suite 302
Denver, Colorado 80204
(Via e-mail)
brownes@ci.denver.co.us

Dr. Browne:

In response to your request at the February 9, 2004 meeting among the City of Denver (the "City"), its consultant Pericle Communications ("Pericle"), AT&T Wireless ("AWE") and Nextel Communications, Inc. ("Nextel"), we have compiled a summary of actions Nextel has taken in attempting to mitigate CMRS – public safety interference on the City's control channels in the vicinity of four specific intersections. All four locations involve co-located or near co-located AWE and Nextel base stations.

Background

By way of background, the four locations are among the 24 locations the City identified in February 2001 where its public safety radios were experiencing interference from the operations of commercial cellular carriers, including Nextel. In response, Nextel sent a "swat team" to Denver to collect data, study the problem and to identify and understand the interference mechanisms involved. Based on the information collected, Nextel determined that intermodulation products from Nextel's channels could be created in the front ends of the City's public safety radio units, and that this was the primary cause of the radios being unable to communicate in the immediate vicinity of Nextel base stations. Nextel also found that wideband noise generated in the immediate vicinity of its base stations was a contributing interference factor. Nextel concluded that these interference mechanisms – intermodulation and wideband noise – could similarly cause interference in the vicinity of cellular A Band (and possibly B Band) base stations. AWE is the A Band cellular licensee in Denver.

By July 2001, Nextel developed and tested at one interference site an intermodulation-free channel set and a custom-designed transmitter filter to reduce wideband noise. The

test was successful, thereby demonstrating that this approach could be used as part of an interim mitigation toolbox. Over the next year and a half, Nextel developed and deployed intermodulation-free channel sets at the 24 sites and/or implemented various combination of site down-powering, custom transmit filters, antenna up-tilting, antenna replacements, adding or replacing combiners, and removing or redirecting site sector orientation.

Given Nextel's available channels, the fact that the City's first-responder system contains 24 channels, and the interleaved and intermixed FCC licensing of 800 MHz public safety and commercial channels, Nextel found that it could not eliminate or mitigate interference on all 24 City channels at all sites. The City decided, therefore, that having interference-free control channels – giving an officer an opportunity to get a usable voice channel within the first few attempts -- was better than the officer having no communications capability at all. Accordingly, Nextel has implemented channel use restrictions at all of the 24 originally identified base station sites to protect the City's five control channels from intermodulation interference; the remaining 19 voice channels are still susceptible to intermodulation interference. However, additional testing by Nextel and Denver demonstrated that interference was still occurring at four remaining sites.

This improvement, while valuable in reducing the risk to first-responders, represents a tenuous compromise for both the City and for Nextel because it (1) can add extra seconds to a first-responders' call attempts; and (2) forces Nextel to substantially restrict its channel usage and reuse plans throughout the Denver metropolitan area. Thus, after more than two years of deploying the mitigation techniques identified in the industry "Best Practices Guide," the best Nextel was able to achieve was to minimize the probability of CMRS – public safety interference on Denver's control channels in the vicinity of only 20 of the 24 originally identified interference areas. This is why Nextel has entered into an agreement with the City for a channel swap consistent with the 800 MHz channel realignment proposed in the Consensus Plan. Separating commercial and public safety channels into separate exclusive channel blocks is essential to successfully eliminating the probability of CMRS – public safety interference for Denver and for other 800 MHz public safety systems around the country.

The Four Co-Located Nextel – AWE Sites

The last four of the original 24 interference areas in Denver are co-locations or near co-locations of Nextel and AWE. These have proved to be much more difficult to mitigate, even though the objective is still limited to mitigating interference to the City's five control channels and not all 24 channels. After securing the operating frequencies for both AWE and Nextel at the interference locations, Pericle conducted drive-tests and specific transmitter on/off testing and concluded that the interference was being generated in the City's radios by intermodulation mixes between the AWE and Nextel frequencies.

In December 2003, a site walk by Denver, Pericle, Nextel and AWE determined the City's public safety radios continue to be unusable at the three of the remaining locations.

Although the City was not able to reproduce the interference at the final location, Yale and Colorado, the City continues to believe that during the busy hour, with all the AWE transmitters on air, interference will still occur on the City's five control channels, much less its voice channels. This example illustrates the limitations of testing as an interference prediction tool. The dynamic channel use inherent in commercial systems is designed to respond to changing capacity requirements by increasing and/or reducing the number of channels in use and, therefore, the possible intermodulation combinations that can be created at any given moment.

Here is a brief timeline of the actions that Nextel has taken, at the four co-located sites, which have lessened, but not mitigated, the interference on the five City control channels:

Colfax + Colorado / Nextel site: CO-0555 City Park / AWE on same building

- 1 Mar 02 Tested site with the BaseStar Interference Analyzer
- 28 Jun 02 Retuned to be IM-free on five control channels
- 26 Jul 02 Added autotune cavity combiners on all three sectors
- 26 Jul 02 Down-powered all three sectors by at least 1.5 dB
- 15 Apr 03 Pericle testing
- 2 Dec 03 Denver, Pericle, AWE and Nextel testing confirmed interference

14^{th} + Market / Nextel site: CO-0061 16^{th} St Mall / AWE on same building

- 4 Mar 02 Tested site with the BaseStar Interference Analyzer
- 28 Aug 02 Added autotune cavity combiners on all three sectors
- 28 Aug 02 Down-powered all three sectors by at least 1.5 dB
- 13 Oct 02 Retuned to be IM-free on five control channels
- 18 May 03 Installed new antennas with side-lobe suppression on one sector
- 18 May 03 Up tilted antennas 3 degrees on all three sectors
- 15 Apr 03 Pericle testing
- 2 Dec 03 Denver, Pericle, AWE and Nextel testing confirmed interference

2^{nd} + Detroit (was 1^{st} + University) / Nextel site: CO-0128 Cherry Creek / AWE nearby

- 4 Mar 02 Tested site with the BaseStar Interference Analyzer
- 22 Aug 02 Added autotune cavity combiners on two sectors
- 22 Aug 02 Down-powered two sectors by at least 1.5 dB
- 13 Oct 02 Retuned to be IM-free on five control channels
- 15 Apr 03 Pericle testing
- 2 Dec 03 Denver, Pericle, AT&T and Nextel testing confirmed interference

Yale + Colorado / Nextel site: CO-0466 Yale + Colorado / AWE nearby

- 27 Feb 02 Tested site with the BaseStar Interference Analyzer
- 22 Aug 02 Added autotune cavity combiners to one sector
- 22 Aug 02 Down-powered one sector by at least 1.5 dB
- 13 Oct 02 Retuned to be IM-free on five control channels
- 15 Apr 03 Pericle testing
- 2 Dec 03 Denver, Pericle, AWE and Nextel testing did not find interference

Conclusion

In conclusion, Nextel's calculations confirm that all of the interference generated by Nextel alone is currently mitigated on the City's five control channels, **so long as** Nextel maintains the channel use restrictions and operating limitations described above. Nextel emphasizes that changes in customer demand and customer growth will make maintaining these restrictions impossible at some point in the future. AWE may have already found such restrictions impractical.

CMRS – public safety interference continues to occur on the City's control channels at the sites noted above as well as the City's voice channels through the City's system. Spectral separation between the City's system and the cellular (Nextel and AWE) systems as proposed in the Consensus Plan is necessary not only to mitigate the interference from the City's five control channels, but also to mitigate the interference on all of the channels in City's voice system.

Respectfully,

J. H. "Sandy" Edwards
Vice President - Public Safety Solutions

Efforts to Mitigate AWS Contributions to Public Safety Interference in Denver

02/13/03

Introduction:

Efforts to assist in the mitigation of Public Safety interference in Denver have been ongoing for over 2 years in addition to testing conducted with Nextel and Pericle Communications. This tracker is intended to formalize the work that AWS has undertaken in order to mitigate interference at the five locations outlined by the City of Denver's "Cellular Radio Interference to Denver's 800 MHZ Public Safety Network" dated June 10, 2003.

We have chosen to format the tracker based on the industry Best Practice Guide as outlined by the document "Avoiding Interference Between Public Safety Wireless Communications Systems and Commercial Wireless Communications systems at 800 MHZ, Version 1, December 2000".

This document is not intended to clearly define whether or not mitigation efforts have been successful; only formalized re-testing can do that. This document is only intended to identify the efforts of AWS, in coordination with Nextel and the City of Denver, in identifying potential solutions.

Please note; AWS feels that the repeater trial mentioned in Section I, is still considered to be a viable solution if implemented in a proper location. To date, no RF planning nor implementation discussions have taken place.

The following is a summary of efforts that have minimized the potential for interference and the plans for additional mitigation (Section I). Section II contains a summary of action items common to all sites and Section III outlines the five (5) locations identified by Denver Public Safety as experiencing interference problems, and details of specific options for reducing interference.

Section I
Summary progress updates are as follows:

10/16/03: To date, our ongoing evaluations have resulted in viable solutions for 3 of the 5 locations.
Site-specific progress: frequency modifications have been implemented at 3 of the 5 locations to reduce the likelihood of interference.

10/24/03:
Progress common to all interference sites:
- Shifting allocation of spectrum from TDMA to GSM
- Shifting GSM spectrum to a lower portion of the 850MHz band
- Designating 1 Public Safety control channel as a primary control channel

Site-specific progress:
- Analysis of Rad Center increases

10/31/03:
Progress common to all interference sites:
-Plans for shifting additional spectrum from TDMA to GSM
-Plans for shifting GSM spectrum to the lower portion of the 850MHz band
Site-specific progress:
-Analysis of Rad Center increases complete. Results indicate a viable solution for increase in rad center at 1 of the 5 sites.

11/07/03:
Progress common to all interference sites:
-Shifted additional spectrum from TDMA to GSM
-Shifted GSM spectrum to the lower portion of the 850MHz band
-Designating 3 Public Safety channels as control channels
Site-specific progress:
-New intermod studies produced following recent spectrum shifts

11/14/03:
Progress common to all interference sites:
-GSM spectrum shift intermod study results (d)
-Designating 3 Public Safety channels as control channels (f)
-Conference call held to determine next steps in mitigation. Additional face-face meeting scheduled for 11/19 to discuss results to date and plans moving forward. See attachment:


"AWSDenver public safety interference -

11/21/03:
Progress common to all interference sites:
-Plans for shifting additional spectrum from TDMA to GSM (c)
-Updated intermod study results (d)
-Conference call held to determine next steps in mitigation and status of action items. Face-face meeting with Denver Public Safety held 11/19/03 to discuss results to date and plans moving forward. See attachment:


"FW AWSDenver public safety interfere

-Field trip scheduled for 12/2003 to review locations of interference concern and explore other options for mitigation.

12/05/03:
Progress common to all interference sites:
-Face-face meeting held with local FCC representatives 12/01/03 to communicate actions to date.
-Field trip completed 12/02/03 to review locations of interference concern and explore other options for mitigation (i). Results to be reviewed during next conference call scheduled for 12/02/03. Implementation of repeaters remains a viable solution (h).

12/12/03:
Progress common to all interference sites:
-Conference call held to review results of field trip completed 12/02/03, determine next steps in mitigation, and review status of action items. See attachment:


"AWSDenver public safety interference -

-Implementation of repeater at a test location is next step in determining viability of this option (h)
-New interference study (i)

Section II
Action items common to all 5 interference sites (Actions based on the Best Practice Guide as outlined by the document "Avoiding Interference Between Public Safety Wireless Communications Systems and Commercial Wireless Communications systems at 800 MHZ, Version 1, December 2000")

a. Assure proper operation of our base equipment.
Base station equipment performance is evaluated daily and problems are addressed as required. AWS equipment is operating within FCC guidelines.

b. Implement enhanced power control feature.
A feature was implemented on base station equipment in 04/2003, which provided better downlink power control on all TDMA voice frequencies. This provided fine-tuned control of output power on a per-call basis, resulting in reducing the possibility of interference.

c. Shift TDMA spectrum to GSM.
As a part of efforts to transition the network from 2G (TDMA) to 2.5G (GSM), 850MHz spectrum is gradually shifted from TDMA channels to GSM channels as subscriber requirements/traffic patterns allow. The re-allocation of TDMA spectrum to GSM reduces the number of intermod hits and power spectral density of those hits and has the potential to reduce interference on Public Safety. This is due to the fact that the same power level is spread out over a wider bandwidth GSM channel and the number of frequencies combining to produce intermod hits is reduced. The overall amplitude of the interference is therefore reduced. The re-allocation of TDMA spectrum to GSM also reduces the number of channels that would possibly need retuning to mitigate intermod hits due to the fact that each GSM channel replaces over 6 TDMA channels. TDMA channels have been re-allocated to GSM gradually since 06/2003. During the week of 10/20/03, an additional 6 TDMA channels were allocated to a 13th GSM channel. A total of 94 TDMA channels have now been shifted to GSM.
10/31/03: The next planned re-allocation is planned for 11/04/03, when an additional 6 TDMA channels will be allocated to a 14th GSM channel. This will increase the total TDMA channels shifted to GSM to 100.
11/07/03: An additional 6 channels were allocated to a 14th GSM channel on 11/05/03, resulting in a total of 100 TDMA channels shifted to GSM.
11/21/03: A plan to allocate an additional 6 channels to GSM is being developed for implementation in 12/2003.

d. Shift 850 GSM spectrum to lower portion of the band.
Most contributors to interference are a result of TDMA channels in the lower A and A' areas of the 850MHz band. Shifting the 850MHz GSM spectrum would

reduce the number of intermod hits and power spectral density of those hits and has the potential to reduce interference on Public Safety. We continue to work on updating our WNS-00539 standards referencing coordination with other carriers to ensure this is a viable solution and relationships/ border performance is not compromised. The most recent standards continue to show a recommended allocation of 850MHz GSM spectrum in the lower portion of the band. Therefore, plans will be developed the week of 10/27/03 to make this shift.
10/31/03: This shift is planned to occur on 11/04/03. The existing TDMA voice channels will be moved to the upper portion of the 850MHz band and all GSM 850 channels will be shifted to a lower portion of the 850MHz band, adjacent to the existing TDMA control channels. The total spectrum shift is 180 TDMA channels, or 5.4MHz. New intermod studies will be produced to determine the frequencies which would need to be removed to clear Public Safety control channels.
11/07/03: The spectrum shift was completed 11/05/03. In conjunction with this shift, the channel clearing completed at 3 of 5 sites on 10/16/03 is no longer applicable, since the channels cleared prior are now in the GSM portion of the band. New intermod studies have been produced to determine the new frequencies which would need to be removed to clear PS control channels. These will be reviewed the week of 11/10/03 in conjunction with the developments discussed in item 'f'.
11/14/03: Results of the new intermod studies following the spectrum shift show a significant reduction in number of AWS channels contributing to Public Safety interference. In 9 of the 13 sectors, the reduction was 50% or more. A conference call was held 11/12/03 between Denver Public Safety, Nextel, AWS, and Pericle Communications to discuss next steps in mitigation efforts. Nextel has retuned their system, and updated intermod studies are to be developed by 11/18/03. Additional testing to quantify current level of interference in the field is also being pursued.
11/21/03: Results of the updated intermod studies show that attempts to clear more than 1 Public Safety channel would cause congestion on the AWS network.

e. Replace existing public safety mobile and handheld units with more interference-resistant equipment.
Denver uses a M/A-COM EDACS system with 4200 radios. Estimated cost is $2000 per radio. Next step is to determine if M/A-COM has followed suit with Motorola's recommended modifications to solve interference.
10/31/03: Denver is using the latest radios that M/A-COM offers.

f. Designate 1 Public Safety control channel as a primary control channel
Existing operation of the Denver Public Safety network includes allocation of 5 channels as control channels. Investigation into mobile operation has revealed that there is an option to allocate one of the 5 Denver Public Safety control channels a primary control channel. While the agreement between Nextel and Denver Public Safety includes the mitigation of interference on all 5 control channels, we are investigating the possibility of this change with Denver Public

Safety. This option has the potential to minimize the intermod impact on the Public Safety network. It would reduce the need to clear more than the 1 Public Safety control channel at each location and also reduce the mitigation impact on the AWS network.
11/07/03: Discussions with Denver Public Safety have resulted in the elimination of the 1 primary control channel option. Another option to keep the control channels on 3 of the 5 channels is being pursued.
11/14/03: Further discussions have resulted in limiting the option to clear 3 of the 5 channels as an initial first step only.

g. Incorporate filters into our site's transmission equipment (to combat side band noise).
While this solution may apply in other situations, this solution is not appropriate as side band noise is not an interference mechanism at the sites outlined below.

h. Incorporate repeaters in PS system to increase interference rejection.
Pericle created an analysis to determine the feasibility of repeaters at the 5 locations. This option will be further discussed during the conference call scheduled for 12/09/03.
12/12/03: Next step is to estimate costs/timeline associated with a test installation of a broadband repeater for the Colfax & Colorado location. This is the highest priority location from a Public Safety perspective. Option to be discussed further at high level meeting to be scheduled.

i. Review status of interference problem following system changes made since 04/2003 study.
Field trip completed 12/02/03 to review locations of interference concern and explore other options for mitigation. Practical data and PS radio performance experience was obtained. Initial testing indicates that one of the locations (Federal and I-70) is interference and problem free (as confirmed by all parties involved). More analysis is needed at another of the locations (Yale and Colorado) but subjective performance tests show a substantial reduction in interference related problems. The remaining three locations will require more aggressive analysis and mitigation actions.
12/12/03: AWS recommends a new interference study be produced to provide a current view on the interference impact and scope at each of the interference locations. This is based on the results from the field trip and the expectation that the frequency changes made since the Pericle study of 04/2003 have reduced the severity of the interference. Option to be discussed further at high level meeting to be scheduled.

Section III
Site Specific Actions

1. Site 1-015 -- 2nd and Detroit (formerly known as Cherry Creek or 1st and University)

a. Retune our channels away from public safety (PS) channels.
This site has 3 sectors (Alpha, Beta, Gamma) and is 34th in a ranking of 326 sites in traffic carried. Updated intermod studies have been completed and are being evaluated following the recent re-allocation of 90 TDMA channels to 850 GSM. The updated study shows 10, 12, and 8 frequencies, respectively, would need removal out of 24 channels/set available now to clear 1 Public Safety control channel. Given a requirement of 12, 21, and 14 frequencies to carry traffic, frequencies have not been removed from service at this location. Utilization of current frequencies is 86% on the busiest sector, but would increase to an impractical 198% if the required frequencies were removed.

b. Modify our site power levels.
We currently operate at 5W output powers (~50W ERP). This is already below typical wireless systems operation. Reduction of power would need to be significant (>3 dB) in order to eliminate the interference. The negative impact on coverage in this area would be significant. There is no overlapping coverage from surrounding sites, with the 3 nearest sites 1.2-1.3 miles away. In addition, significant capacity issues would result from reduction in coverage at this high traffic site which covers affluent residential and major shopping areas and 2 major thoroughfares east of downtown Denver.

c. Modify our site antenna height.
Currently site Rad Center is 66' and significant zoning issues would prevent approval of anything higher. Additional height would also create increased interference. The Rad Center is being reviewed week of 10/27/03 to determine the max height at which antennas could be raised without significant impact to the AWS network. Results of the analysis are expected by 10/31/03.

10/31/03: An interference analysis of this site was conducted using drive test data, local market knowledge of topography, morphology, and network design. The purpose was to determine the impact of an increase in rad center of the existing antennas on interference in the AWS network. If a potential increase in rad center was possible without unacceptable impact to the AWS network, the associated potential benefit to the Public Safety network was also estimated. An interference threshold of –95dBm and an industry standard predictive increase in signal strength of 1dB per 10' rad center increase were used.

The analysis for this site shows that 2 of the 3 existing sectors cause unacceptable interference in the AWS network at the existing height and any

increase in rad center on these 2 sectors would therefore exacerbate the interference problem. The third sector, Beta, causes significant levels of AWS network interference, but was analyzed further at rad center increments of 10' over the existing height. An increase in rad center of 20' to 86' would result in an increase in drive test inteference samples above –95dBm of 10 percentage points (from 25% to 35%), which is unacceptable. An increase in rad center of 10' to 76' would result in an increase in drive test inteference samples above –95dBm of 3 percentage points (from 25% to 28%). While this is a more modest increase, the Beta sector also experiences the heaviest utilization at this site (see notes on this site in letter 'a'). Therefore, the impact of a 3 percentage point interference increase is more significant than a typical sector in the system.

An analysis of benefit to the Public Safety network of a 10' increase in rad center, based on the antenna vertical beamwidth pattern, shows AWS signal strength would decrease by only 1.7dB at a distance of 200' from the site. This modest benefit, combined with the increased interference potential leads to the conclusion that an increase in rad center is not a viable solution.

d. Modify antenna characteristics of our site (changing the antenna radiation pattern, employing tighter beam-width antennas, etc.).
Antenna configuration has been optimized in efforts to obtain and maintain TDMA ARQs green. Cell density has dictated that the antenna configuration be fine tuned to minimize interference in our own network. In conjunction with the power setting, the geographic area of interference both on AWS and Public Safety bands is already minimized and any further modifications would significantly reduce needed AWS coverage.

e. Sectorize omnis to direct energy away from PS.
Site is already sectorized.

f. Reorient antennas so a null is aimed at the PS interference area.
See letter d. In addition to the negative effects on coverage, the problem area would likely just move slightly, due to lack of Public Safety transmitter density.

g. Improve the signal strength of the public safety system (more proximate public safety base stations, increasing ERP, providing better transmission antennas).
We believe this would help mitigate the interference problem, but ultimately this is the decision of Public Safety.

2. Site 1-034 – 48th and Elm

a. Retune our channels away from public safety (PS) channels.
This site has 2 sectors (Alpha and Gamma). Updated intermod studies have been completed and are being evaluated following the recent re-allocation of 90 TDMA channels to 850 GSM. The updated study shows 5 and 2 frequencies, respectively, would need removal out of 24 channels/set available now to clear 1 Public Safety control channel. Given a requirement of 7 and 7 frequencies to carry traffic, the 5+2=7 frequencies were removed from service on 10/16/03. This effort cleared 1 Public Safety control channel from intermod hits produced by AWS-only frequencies. Additional mitigation of intermod hits produced by a combination of Nextel and AWS frequencies, if required, would be coordinated with Nextel.
11/07/03: Per efforts to shift 850 GSM spectrum to lower portion of the band, the channel clearing completed on 10/16/03 is no longer applicable, since the channels cleared prior are now in the GSM portion of the band. New intermod studies have been produced and are being reviewed to determine the next step in frequency removals.

b. Modify our site power levels.
We currently operate at 5W output powers (~50W ERP). This is already below typical wireless systems operation. Reduction of power would need to be significant (>3 dB) in order to eliminate the interference. The negative impact on coverage in this area would be significant. There is no overlapping coverage from surrounding sites, with the 2 nearest sites 1.2 and 1.7 miles away. Prior to this site coming on-line, dropped calls were virtually guaranteed on I70 and coverage in the surrounding residential/commercial areas and US287 was non-existent.

c. Modify our site antenna height.
Currently site Rad Center is 26' and significant zoning issues would prevent approval of anything higher. Additional height would also create increased interference. This is a 'stealth' application. The Rad Center is being reviewed week of 10/27/03 to determine the max height at which antennas could be raised without significant impact to the AWS network. Results of the analysis are expected by 10/31/03.

10/31/03: An interference analysis of this site was conducted using drive test data, local market knowledge of topography, morphology, and network design. The purpose was to determine the impact of an increase in rad center of the existing antennas on interference in the AWS network. If a potential increase in rad center was possible without unacceptable impact to the AWS network, the associated potential benefit to the Public Safety network was also estimated. An interference threshold of –95dBm and an industry standard predictive increase in signal strength of 1dB per 10' rad center increase were used.

The analysis for this site shows that both of the 2 existing sectors cause unacceptable interference in the AWS network at the existing height and any increase in rad center on these 2 sectors would therefore exacerbate the interference problem. Additional analysis of increase in rad center was therefore not performed. An increase in rad center is not a viable solution.

d. Modify antenna characteristics of our site (changing the antenna radiation pattern, employing tighter beam-width antennas, etc.).
Antenna configuration has been optimized in efforts to obtain and maintain TDMA ARQs green. Cell density has dictated that the antenna configuration be fine tuned to minimize interference in our own network. In conjunction with the power setting, the geographic area of interference both on AWS and Public Safety bands is already minimized and any further modifications would significantly reduce needed AWS coverage. Since multiple faces are involved, the ability to change antenna configuration changes to mitigate interference is further constrained.

e. Sectorize omnis to direct energy away from PS.
Site is already sectorized.

f. Reorient antennas so a null is aimed at the PS interference area.
See letter d. In addition to the negative effects on coverage, the problem area would likely just move slightly, due to lack of Public Safety transmitter density.

g. Improve the signal strength of the public safety system (more proximate public safety base stations, increasing ERP, providing better transmission antennas).
We believe this would help mitigate the interference problem, but ultimately this is the decision of Public Safety.

3. Site 1-058 – 14th and Market

a. Retune our channels away from public safety (PS) channels.
This site has 4 sectors (Alpha, Beta, Gamma, Delta) and is 35th in a ranking of 326 sites in traffic carried. Updated intermod studies have been completed and are being evaluated following the recent re-allocation of 90 TDMA channels to 850 GSM. The updated study shows 11, 8, 22, and 9 frequencies, respectively, would need removal out of 24 channels/set available now to clear 1 Public Safety control channel. Given a requirement of 12, 14, 23, and 11 frequencies to carry traffic, frequencies have not been removed from service at this location. Utilization of current frequencies is 95% on the busiest sector, but would increase to an impractical 5153% if the required frequencies were removed.

b. Modify our site power levels.
We currently operate at 5W output powers (~50W ERP). This is already below typical wireless systems operation. Reduction of power would need to be significant (>3 dB) in order to eliminate the interference. The negative impact on coverage in this area would be significant. With the emphasis on indoor coverage in this downtown area, the 3 nearest sites are 0.3-0.5 miles away. In addition, significant capacity issues would result from reduction in coverage at this 'Key Area', high traffic site which covers the western portion of downtown including several high profile venues and colleges/universities.

c. Modify our site antenna height.
Currently site Rad Center is 91' and significant zoning issues would prevent approval of anything higher. Additional height would also create increased interference. The Rad Center is being reviewed week of 10/27/03 to determine the max height at which antennas could be raised without significant impact to the AWS network. Results of the analysis are expected by 10/31/03.

10/31/03: An interference analysis of this site was conducted using drive test data, local market knowledge of topography, morphology, and network design. The purpose was to determine the impact of an increase in rad center of the existing antennas on interference in the AWS network. If a potential increase in rad center was possible without unacceptable impact to the AWS network, the associated potential benefit to the Public Safety network was also estimated. An interference threshold of –95dBm and an industry standard predictive increase in signal strength of 1dB per 10' rad center increase were used.

The analysis for this site shows that 3 of the 4 existing sectors cause unacceptable interference in the AWS network at the existing height and any increase in rad center on these 3 sectors would therefore exacerbate the interference problem. The fourth sector, Delta, points in the same direction as Beta, with additional electrical down-tilt for close-to-site coverage. The Delta sector configuration provides capacity relief for the Beta sector and therefore reduces the interference caused by the Beta sector. Increasing the rad center of

the Delta sector would defeat the purpose of the sector. Turning off the Delta sector would exacerbate the inteference problem on the Beta sector. Additional analysis of increase in rad center was therefore not performed. An increase in rad center is not a viable solution.

d. Modify antenna characteristics of our site (changing the antenna radiation pattern, employing tighter beam-width antennas, etc.).
Antenna configuration has been optimized in efforts to obtain and maintain TDMA ARQs green. Cell density has dictated that the antenna configuration be fine tuned to minimize interference in our own network. In conjunction with the power setting, the geographic area of interference both on AWS and Public Safety bands is already minimized and any further modifications would significantly reduce needed AWS coverage. Since multiple faces are involved, the ability to change antenna configuration changes to mitigate interference is further constrained.

e. Sectorize omnis to direct energy away from PS.
Site is already sectorized.

f. Reorient antennas so a null is aimed at the PS interference area.
See letter d. In addition to the negative effects on coverage, the problem area would likely just move slightly, due to lack of Public Safety transmitter density.

g. Improve the signal strength of the public safety system (more proximate public safety base stations, increasing ERP, providing better transmission antennas).
We believe this would help mitigate the interference problem, but ultimately this is the decision of Public Safety.

4. Site 1-102 -- Colfax & Colorado

a. Retune our channels away from public safety (PS) channels.
This site has 2 sectors (Alpha, Beta). Updated intermod studies have been completed and are being evaluated following the recent re-allocation of 90 TDMA channels to 850 GSM. The updated study shows 10 and 4 frequencies, respectively, would need removal out of 24 channels/set available now to clear 1 Public Safety control channel. Given a requirement of 10 and 12 frequencies to carry traffic, the 10+4=14 frequencies were removed from service on 10/17/03. This effort cleared 1 Public Safety control channel from intermod hits produced by AWS-only frequencies. Additional mitigation of intermod hits produced by a combination of Nextel and AWS frequencies, if required, would be coordinated with Nextel.
11/07/03: Per efforts to shift 850 GSM spectrum to lower portion of the band, the channel clearing completed on 10/16/03 is no longer applicable, since the channels cleared prior are now in the GSM portion of the band. New intermod studies have been produced and are being reviewed to determine the next step in frequency removals.

b. Modify our site power levels.
We currently operate at 5W output powers (~50W ERP). This is already below typical wireless systems operation. Reduction of power would need to be significant (>3 dB) in order to eliminate the interference. The negative impact on coverage in this area would be significant. There is no overlapping coverage from surrounding sites, with the 2 nearest sites 0.8 and 1.1 miles away. This site covers a busy commercial area including I70 Business and CO State Highway 2.

c. Modify our site antenna height.
Currently site Rad Center is 61' and significant zoning issues would prevent approval of anything higher. Additional height would also create increased interference. The Rad Center is being reviewed week of 10/27/03 to determine the max height at which antennas could be raised without significant impact to the AWS network. Results of the analysis are expected by 10/31/03.

10/31/03: An interference analysis of this site was conducted using drive test data, local market knowledge of topography, morphology, and network design. The purpose was to determine the impact of an increase in rad center of the existing antennas on interference in the AWS network. If a potential increase in rad center was possible without unacceptable impact to the AWS network, the associated potential benefit to the Public Safety network was also estimated. An interference threshold of –95dBm and an industry standard predictive increase in signal strength of 1dB per 10' rad center increase were used.

The analysis for this site shows that both of the 2 existing sectors cause unacceptable interference in the AWS network at the existing height and any increase in rad center on these 2 sectors would therefore exacerbate the

interference problem. Additional analysis of increase in rad center was therefore not performed. An increase in rad center is not a viable solution.

d. Modify antenna characteristics of our site (changing the antenna radiation pattern, employing tighter beam-width antennas, etc.).
Antenna configuration has been optimized in efforts to obtain and maintain TDMA ARQs green. Cell density has dictated that the antenna configuration be fine tuned to minimize interference in our own network. In conjunction with the power setting, the geographic area of interference both on AWS and Public Safety bands is already minimized and any further modifications would significantly reduce needed AWS coverage. Since multiple faces are involved, the ability to change antenna configuration changes to mitigate interference is further constrained.

e. Sectorize omnis to direct energy away from PS.
Site is already sectorized.

f. Reorient antennas so a null is aimed at the PS interference area.
See letter d. In addition to the negative effects on coverage, the problem area would likely just move slightly, due to lack of Public Safety transmitter density.

g. Improve the signal strength of the public safety system (more proximate public safety base stations, increasing ERP, providing better transmission antennas).
We believe this would help mitigate the interference problem, but ultimately this is the decision of Public Safety.

5. Site 1-106 -- Yale & Colorado

a. Retune our channels away from public safety (PS) channels.
This site has 2 sectors (Alpha, Beta). Updated intermod studies have been completed following the recent re-allocation of 90 TDMA channels to 850 GSM. The updated study shows 6 and 3 frequencies, respectively, would need removal out of 24 channels/set available now to clear 1 Public Safety control channel. Given a requirement of 9 and 10 frequencies to carry traffic, the 6+3=9 frequencies were removed from service on 10/16/03. This effort cleared 1 Public Safety control channel from intermod hits produced by AWS-only frequencies. Additional mitigation of intermod hits produced by a combination of Nextel and AWS frequencies, if required, would be coordinated with Nextel.
11/07/03: Per efforts to shift 850 GSM spectrum to lower portion of the band, the channel clearing completed on 10/16/03 is no longer applicable, since the channels cleared prior are now in the GSM portion of the band. New intermod studies have been produced and are being reviewed to determine the next step in frequency removals.

b. Modify our site power levels.
We currently operate at 5W output powers (~50W ERP). This is already below typical wireless systems operation. Reduction of power would need to be significant (>3 dB) in order to eliminate the interference. The negative impact on coverage in this area would be significant. There is no overlapping coverage from surrounding sites, with the 4 nearest sites 0.7-1.2 miles away. Even with this site, there is little to no coverage south of it on CO State Hwy 2. This site, which covers a busy commercial area and CO State Hwy 2 was built as a part of a major 'Tall Site Reduction' project; following the addition of several lower sites, including this one, a tall sector was removed from service, which significantly reduced interference in southern Denver metro.

c. Modify our site antenna height.
Currently site Rad Center is 34' and significant zoning issues would prevent approval of anything higher. Additional height would also create increased interference. The Rad Center is being reviewed week of 10/27/03 to determine the max height at which antennas could be raised without significant impact to the AWS network. Results of the analysis are expected by 10/31/03.

10/31/03: An interference analysis of this site was conducted using drive test data, local market knowledge of topography, morphology, and network design. The purpose was to determine the impact of an increase in rad center of the existing antennas on interference in the AWS network. If a potential increase in rad center was possible without unacceptable impact to the AWS network, the associated potential benefit to the Public Safety network was also estimated. An interference threshold of –95dBm and an industry standard predictive increase in signal strength of 1dB per 10' rad center increase were used.

The analysis for this site shows that 1 of the 2 existing sectors cause unacceptable interference in the AWS network at the existing height and any increase in rad center on this sector would therefore exacerbate the interference problem. The second sector, Alpha, causes significant levels of AWS network interference, but was analyzed further at rad center increments of 10' over the existing height. An increase in rad center of 10' to 44' would result in an increase in drive test interference samples above –95dBm of 0.7 percentage points (from 3% to 3.7%).

An additional factor was included in the analysis of an increase in rad center of 20' to 54'. This is due to its relatively low existing rad center of 34' with respect to surrounding morphology/terrain. Increasing the rad center to 54' would raise the antennas above the tree-line and other building clutter. The standard increase in signal strength of 1dB per 10' rad center increase was increased conservatively from 2dB to a total of 3dB in the analysis of a 54' rad center. An increase in rad center of 20' to 54' would result in an increase in drive test interference samples above –95dBm of 2 percentage points (from 3% to 5%). This increase in interference is likely tolerable.

An analysis of benefit to the Public Safety network of a 10' increase in rad center, based on the antenna vertical beamwidth pattern, shows AWS signal strength would decrease by only 1dB at a distance of 200' from the site. An analysis of benefit to the Public Safety network of a 20' increase in rad center, based on the antenna vertical beamwidth pattern, shows AWS signal strength would decrease by 3.1dB at a distance of 200' from the site. This benefit, combined with the tolerable increase in interference potential leads to the conclusion that an increase in rad center of up to 20' is a viable solution from a technical perspective.

As stated earlier, significant zoning issues in this area would likely prevent approval of anything higher than the existing rad center. Additional investigation is required to verify this is still the case at the current time. If possible from a zoning perspective, cost estimates would then need to be evaluated.

d. Modify antenna characteristics of our site (changing the antenna radiation pattern, employing tighter beam-width antennas, etc.).
Antenna configuration has been optimized in efforts to obtain and maintain TDMA ARQs green. Cell density has dictated that the antenna configuration be fine tuned to minimize interference in our own network. In conjunction with the power setting, the geographic area of interference both on AWS and Public Safety bands is already minimized and any further modifications would significantly reduce needed AWS coverage. Since multiple faces are involved, the ability to change antenna configuration changes to mitigate interference is further constrained.

e. Sectorize omnis to direct energy away from PS.

Site is already sectorized.

f. Reorient antennas so a null is aimed at the PS interference area.
See letter d. In addition to the negative effects on coverage, the problem area would likely just move slightly, due to lack of Public Safety transmitter density.

g. Improve the signal strength of the public safety system (more proximate public safety base stations, increasing ERP, providing better transmission antennas).
We believe this would help mitigate the interference problem, but ultimately this is the decision of Public Safety.