Before the
Federal Communications Commission
Washington, D.C. 20554

In re Application of	)	
	)	
Revision of the Commission's Rules to Ensure	)	CC Docket No. 94-102
Compatibility with Enhanced 911 Emergency	)	
Calling Systems	)	

To: The Commission

OPPOSITION TO APCO PETITION FOR RECONSIDERATION OF VOICESTREAM WAIVER

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SUMMARY

VoiceStream Wireless Corporation ("VoiceStream") hereby opposes the Petition for Reconsideration filed by the Association of Public Safety Communications Officials - International, Inc. ("APCO") and supporting Comments filed by QUALCOMM Incorporated ("QUALCOMM"). APCO and QUALCOMM seek reconsideration of the Commission's action granting a highly conditioned waiver to VoiceStream concerning its implementation of E-911 Phase II requirements for its GSM network. Reconsideration is not warranted and the petition should be denied.

It is well-established that the Commission's duty to act in the public interest permits waiver of a rule when circumstances in a particular case justify such action. Here the Commission provided a reasoned explanation for concluding that grant of the waiver subject to conditions would serve the public interest.

Based on preliminary tests (which remain ongoing), VoiceStream demonstrated that the NSS/E-OTD solution is technically feasible and has considerable promise for achieving compliance with FCC Phase II accuracy requirements in its GSM system. Based on available testing and technology status, the Commission concluded that a waiver was justified because NSS/E-OTD had the potential of meeting compliance requirements, while no other solution appeared to have a reasonable prospect of being commercially available in the same timeframe.

Ultimately, the bottom-line justification for the Commission's decision to grant a waiver was its conclusion, based on the record, that NSS/E-OTD may be the only method available to GSM carriers for compliance with Phase II for some time. This conclusion was correct, and nothing APCO and QUALCOMM assert undermines that determination.

To confirm, there is no current Phase II solution commercially available for GSM carriers. Despite VoiceStream's efforts to develop and deploy compliant GSM solutions, the company is dependent on manufacturers and vendors to develop commercially available solutions. Notwithstanding APCO and QUALCOMM's claim, there is no current commercial solution that will permit timely and practical compliance with the Phase II accuracy requirements for GSM systems. Indeed, Nokia confirms in a letter attached to this Opposition that it now plans to offer E-OTD location solutions and has rejected the alternative ofTOA. Moreover, as an interim solution, the Network Software Solution ("NSS") that VoiceStream will deploy pursuant to its waiver will provide location accuracy much greater than Phase I systems, and thus will provide significant public interest benefits.

The waiver grant was procedurally proper. The Commission has broad discretion to develop policies and apply them through case-by-case adjudication or general rulemaking. The VoiceStream waiver, sought in the course of *ex parte* presentations, was fully reflected on the record of the Commission's E-911 docket and, in fact, considerable comment was directed to the *ex parte* request. Commission consideration and grant of the waiver was consistent with its policy of encouraging innovation and remaining technology-neutral. In all events, the Commission has the authority — in response to a specific waiver request or on its own motion — to grant the VoiceStream request. It properly concluded that the waiver would provide benefits and serve the public interest. That determination was correct and should be upheld.

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To: The Commission

OPPOSITION TO APCO PETITION FOR RECONSIDERATION OF VOICESTREAM WAIVER

VoiceStream Wireless Corporation ("VoiceStream") hereby opposes the Petition for Reconsideration of VoiceStream Waiver ("Petition") filed September 20, 2000, by the Association of Public-Safety Communications Officials-International, Inc. ("APCO") and the Comments filed September 29, 2000, in support of the Petition by Qualcomm Incorporated ("Qualcomm"). APCO and Qualcomm have sought reconsideration of the Commission's action in the *Fourth MO&O*[1] granting a highly conditioned waiver to VoiceStream concerning its implementation of the Commission's Phase II E-911 requirements.[2] As shown herein, reconsideration is not warranted, and the Petition should be denied.

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[1] *Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, CC Docket 94-102, *Fourth Memorandum Opinion and Order*, FCC 00-326 (Sept. 8, 2000) (*Fourth MO&O*).

[2] In addition, a letter was filed on September 28, 2000 by the International Fire Chiefs Association supporting the APCO Petition. *See* Letter dated September 28, 2000 from Michael R. Brown, President, International Fire Chiefs Association.

DISCUSSION

I. THE WAIVER GRANTED TO VOICESTREAM WAS AND IS WELL JUSTIFIED AND WILL SERVE THE PUBLIC INTEREST

It is well-established that the Commission's duty to act in the public interest justifies waiving its rules when, in the circumstances of a particular case, following the codified general rules will not further the public interest.[3] This is equally true when the Commission waives a rule on its own motion, as it is when it addresses an explicit waiver request. For example, in deciding to waive its rules on its own motion instead of issuing a requested declaratory ruling, the Commission has stated:

> The Commission may exercise its discretion to waive a rule where there is "good cause" to do so, because the particular facts would make strict compliance with the rule inconsistent with the public interest. Waiver thus is appropriate only if special circumstances warrant a deviation from the general rules, and such a deviation will better serve the public interest than adherence to the general rule.[4]

The Commission must provide an articulated explanation for its waiver decisions.[5] However, it need not "author an essay" in each case; it need only provide enough explanation so that a court can "discern the why and wherefore."[6] Moreover, it is not necessary for the Commission to have and follow some pre-established "waiver policy," since waivers are ultimately governed by the public interest.[7] Here, the Commission provided a reasoned explanation for concluding

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[3] *WAIT Radio v. FCC,* 418 F.2d 1153, 1159 (D.C. Cir. 1969), *cert. denied,* 409 U.S. 1027 (1972).

[4] *Southwestern Bell Mobile Systems, Inc.*, 11 F.C.C.R. 3386, ¶ 17 (1995) (footnotes omitted), *citing WAIT Radio,* 418 F.2d at 1157, 1159; *Northeast Cellular Telephone Co. v. FCC,* 897 F.2d 1164, 1166 (D.C. Cir. 1990).

[5] *WAIT Radio,* 418 F.2d at 1156-57; *Northeast Cellular,* 897 F.2d at 1166.

[6] *ICBC Corp. v. FCC,* 230 U.S. App. D.C. 275, 716 F.2d 926, 929 (D.C. Cir. 1983).

[7] *BellSouth Corp. v. FCC,* 162 F.3d 1215, 1225 (D.C. Cir. 1999).

that grant of a waiver subject to conditions would serve the public interest. Neither APCO nor Qualcomm provides any legitimate basis for reconsideration of that determination.

A. VoiceStream's Preliminary Tests of E-OTD Confirm That This Technology Is Close to Meeting FCC Accuracy Requirements

Three principal technologies have been considered by VoiceStream for Phase II: E-OTD ("Enhanced Observed Time Difference"), TOA ("Uplink Time of Arrival"), and A-GPS ("Assisted Global Positioning System"). VoiceStream has concluded that E-OTD will allow it to come closest to meeting the Commission's Phase II requirements. VoiceStream realized, however, that since E-OTD is a new technology, it would need to be thoroughly tested in order to verify that the technology was sufficient to meet the Phase II requirements. VoiceStream is currently conducting such tests. However, because the technology will likely not meet the Phase II requirements on schedule, VoiceStream plans to enhance it with what it calls the Network Software Solution ("NSS"). This provides more accurate location information than is required by Phase I, and it can be implemented quickly. It is fully compatible with legacy handsets, yet provides location information of 1000-meter accuracy for 67 percent of calls. Compared with the Phase I requirement of providing only the cell-site location, this is a vast improvement.[8]

VoiceStream is undertaking an extensive multiphase test of NSS/E-OTD to assess its accuracy, refine the implementation, and improve the system's performance. The first phase of this test was conducted in a suburban area in the Houston market. The selected area is typical of the type of location containing the highest concentration of VoiceStream's Houston system E-911 calls, as shown on the map appended to Attachment I. As it turned out, this is consonant

[8] In Attachment I, Mark Cosgrove, VoiceStream's Director, R.F. Engineering, provides additional detail regarding the test program and NSS.

with OET Bulletin 71's guidelines.[9] In support of a waiver, VoiceStream submitted preliminary results of its Phase I test simply to show that E-OTD has the potential to meet the Phase II accuracy requirements. These were *preliminary* results from the *first phase* of the test. They were not *proof* that NSS/E-OTD *would* meet those requirements and were not represented as such; but they did provide the Commission with a record basis for concluding that NSS/E-OTD was technically feasible and *may* be a way of achieving compliance with the Phase II accuracy requirements in a GSM system.

Based on those preliminary results, the Commission properly concluded that a waiver was justified, because NSS/E-OTD had the potential of meeting the requirements, while no other solution appeared to have any reasonable prospect of being commercially available in the same time frame. Since that time, VoiceStream has filed its first semi-annual report, in compliance with the reporting conditions attached to the waiver. That report (a copy of which is attached as Attachment II) in fact confirms that the NSS/E-OTD Phase I test produced more accurate location information than was expected.

As pointed out above, this was only the first phase of the test. Necessarily, the area covered by the test was limited, as were the number of data points. VoiceStream selected an area that is representative of where the highest level of E-911 calls are made. This is consonant with OET Bulletin 71's guidelines. In current and future tests, VoiceStream will conduct its tests over larger and more varied areas, with more data points and more types of data.[10] For example, in future tests, VoiceStream will include moving vehicles in addition to stationary vehicles (even though moving vehicle tests are not proposed under the OET-71 guidelines). VoiceStream has

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[9] The original tests were done before OET Bulletin 71 was issued. Since publication, VoiceStream has followed those guidelines.

[10] Further details on the testing plan can be found in Attachment I and in VoiceStream's Semi-Annual Report.

always intended to conduct more expansive tests of the NSS/E-OTD solution, and it has so advised the Commission. The fact that future tests will be progressively more extensive than the initial test phase is no reason to reconsider the grant of the waiver.

B. There Is No Reasonable Alternative to NSS/E-OTD for GSM System Phase II E-911 Compliance

The bottom-line justification for the Commission's decision to grant a waiver was its conclusion, based on the record, that "the NSS/E-OTD approach may be the only method available to GSM carriers for compliance with Phase II for some time."[11] That conclusion was correct, and APCO and Qualcomm have not justified departing from the Commission's decision. Indeed, as VoiceStream's October 2nd Report to the Commission clearly indicates, the initial E-ODT tests are very promising, justifying continued faith in the waiver grant.

The record before the Commission established that Phase II E-911 solutions for GSM carriers have been internationally standardized and are being field tested, but they are at an early stage in commercial development. It is highly unlikely that GSM carriers will have commercially available technology that will allow them to comply completely and in a timely fashion with the Commission's Phase II accuracy requirements. The fact is, there is no current Phase II solution commercially available for GSM carriers. VoiceStream cannot meet the Commission's Phase II accuracy and timeliness requirements because the GSM vendors have not yet finalized development and testing, nor have they scheduled production of the necessary equipment for timely deployment of either a handset or network solution. Despite VoiceStream's efforts to develop and deploy compliant GSM solutions, the company is obviously dependent on manufacturers and vendors for development of commercially available solutions. Ultimately,

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[11] *Fourth MO&O* at ¶ 56.

VoiceStream's compliance with the Phase II requirements is not realistically in its own control; its U.S. market share is much too small to command the necessary vendor attention.

The record shows that VoiceStream is not the only GSM carrier that reached the conclusion that no current Phase II solution exists for GSM carriers. Another GSM carrier, BellSouth, informed the staff last July that it was "concerned that no technology can meet the required accuracy levels" for its GSM markets.[12] The major equipment vendors have also confirmed that there is not yet a Phase II solution for GSM that has been proven to meet the Commission's accuracy requirements or that will be ready for production in time for the October 2001 deadline.[13]

APCO, notwithstanding, claims that the Commission should not have granted the waiver because "there are location technologies available in Europe," where GSM prevails, and there is no "compelling, well-documented evidence that no alternative (including assisted GPS and uplink TOA) exists for GSM."[14] Qualcomm goes further and argues that VoiceStream *could*

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[12] Wireless Telecommunications Bureau, *Minutes from FCC E911 Multi-Party Meeting, July 6, 2000* (*WTB July 6 Minutes*) at 14, filed in CC Docket 94-102 attached to a memorandum from the Wireless Telecommunications Bureau Policy Division, dated August 10, 2000. In a more recent FCC *ex parte* presentation on October 3, 2000, VoiceStream understands that BellSouth and SBC Wireless confirmed that there is no compliant solution available for GSM systems at this time, and that, based on ongoing testing activities, the E-OTD solution holds the most current promise for public safety needs. *See* Letter dated October 4, 2000 filed by Ben G. Almond, BellSouth.

[13] *See, e.g., Ex Parte* letter dated August 18, 2000 from Motorola, Inc., Nokia Inc. and Ericsson Inc. ("MNE Letter"); Wireless Telecommunications Bureau, *Minutes from FCC E911 Multi-Party Meeting, June 29, 2000* (*WTB June 29 Minutes*) at 2-3, filed in CC Docket 94-102 attached to a memorandum from the Wireless Telecommunications Bureau Policy Division, dated July 24, 2000; *WTB July 6 Minutes* at 3-4, 9.

[14] APCO Petition at 4-5 (emphasis in original).

meet the Phase II requirements because "there are compliant technologies available to VoiceStream and other GSM carriers," including TOA and a variant known as Geometrix.[15]

Contrary to APCO's claims, the fact of the matter remains that there is no E-911 Phase II compliant technology available to VoiceStream and other GSM operators. This reality was amply demonstrated in the record in this proceeding. In particular, the record shows that neither TOA nor A-GPS is currently available or under immediate development for GSM Phase II deployment. They are "available" only as theoretical technical approaches, not as a commercial solution that will permit timely and practical compliance with the Commission's Phase II accuracy requirements.

Again, this conclusion is completely supported by the record. Numerous vendors submitted comments and *ex parte* filings and appeared in staff-sponsored fora. Some vendors made representations that they would have particular solutions available that would comply with the Commission's Phase II requirements for CDMA or TDMA, but no vendor made such representations with respect to *any* GSM solutions. In particular, no vendor represented that it had a TOA solution available for GSM systems to timely meet the Commission's Phase II requirements.[16] VoiceStream reported for the record at one staff forum that there was "no TOA

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[15] Qualcomm Comments at 2, 4, 5.

[16] For example, the staff reported that Ericsson had "investigated" TOA, A-GPS, and E-OTD. With respect to E-OTD, Ericsson said it might be able to produce E-OTD solutions "around the deadlines set forth," but it might not be able to meet the accuracy requirements. With respect to A-GPS, Ericsson had done some lab trials and limited field tests for GSM and that its accuracy was good, but delivering handsets on time would be "highly problematic." Ericsson made no report on TOA prospects, since it was "not pursuing an in-house solution." *WTB June 29 Minutes* at 2. Nokia, a handset and infrastructure vendor, made no representations about TOA, a network solution, but it claimed "E-OTD equipment for GSM will be available close to the mandated dates," while GPS-based handsets would take up to two years to develop. *WTB July 6 Minutes* at 3. Motorola, according to the staff summary, discussed E-OTD and A-GPS, but not TOA; the only solution it specifically mentioned with respect to GSM was E-OTD.

(continued on next page)

equipment available from major vendors for GSM," as well as its view that GPS handsets for GSM would not be timely available.[17] Moreover, Qualcomm wisely does not repeat its earlier assertions in the docket (both before and after issuance of the *Fourth MO&O*) that its production of GPS chipsets made an A-GPS GSM solution readily available,[18] since this claim was resoundingly refuted.[19]

Furthermore, Qualcomm's assertion that there are "compliant technologies available" is incorrect. Qualcomm premises its entire claim that TOA is an available solution for GSM carriers on a July 1999 Technical Report by Omnipoint Technologies, Inc. that finds advantages in TOA over E-OTD.[20] However, this fifteen-month-old Technical Report does *not* state that TOA is a solution that will actually be commercially available to carriers for compliance with the Commission's Phase II requirements by October 2001. In fact, the Technical Report did not constitute a representation that any of those technologies had reached compliance with specific FCC requirements, were ready for production, or could be timely and economically implemented. It was not a marketing document; it was a paper evaluating theoretical engineering approaches for review in a standards subcommittee that expressly disclaimed that it

(continued)
Motorola claimed E-OTD might be insufficiently accurate and A-GPS would take more than two years to develop and deploy. *Id.* at 4.

17 *WTB June 29 Minutes* at 2.

18 *See, e.g., id.* at 3; Letter from Veronica M. Ahearn, Esq., dated June 22, 2000; Letter from Dean R. Brenner, Esq., dated July 27, 2000; Letter from Dean R. Brenner, Esq., dated July 28, 2000; Letter from Dean R. Brenner, Esq., dated September 1, 2000; Letter from Dean R. Brenner, Esq., dated September 7, 2000.

19 *See, e.g.,* MNE Letter.

20 Qualcomm Comments at 2-7; *id.,* Exhibit 1 (Omnipoint Technologies, Inc., *GSM Mobile Location Systems,* Doc. No. 0710009-00B (July 2, 1999) ("Technical Report").

was a binding proposal by Omnipoint Technologies.[21] The fact that a vendor submits to a standards committee a paper comparing architectures and technologies that are theoretically "available" for consideration does not mean that those architectures and technologies are readily available for purchase in full compliance with FCC requirements. In fact, the vendor in question, Omnipoint Technologies, Inc., has since been acquired by Xircom, Inc., which is not pursuing TOA for GSM, and has no such product available.[22] In short, the principal vendor to which Qualcomm points for proof of the "availability" of TOA does *not* offer it.[23]

The only other vendor that Qualcomm points to for proof "that there is another compliant alternative for GSM carriers" is Allen Telecom.[24] In fact, the Allen Telecom filing that Qualcomm cites demonstrates just the opposite. It states:

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[21] *See* Technical Report, Abstract and Notice following page 26 (Report is an engineering comparison of "the performance and complexity of the architectures and location methods that have been proposed for GSM location services," which was "prepared . . . as a basis for discussion to assist the Technical Subcommittee T1P1" and "should not be construed as a binding proposal.").

[22] In its September 1 *ex parte* filing, which is relied upon in its Comments, Qualcomm asserted that TOA equipment for GSM was "offered commercially by Omnipoint Technologies." *See* Letter from Dean R. Brenner, Esq., dated September 1, 2000 at 1. Now Qualcomm claims this equipment is being "marketed" by Omnipoint Technologies. Omnipoint Comments at 4. In fact, Qualcomm is relying on an obsolete web site, which apparently has not been updated since February 2000, before Omnipoint Technologies was acquired by Xircom. Omnipoint Technologies no longer markets or commercially offers TOA equipment for GSM. See Attachment I.

[23] The reason why TOA is not currently offered as a GSM Phase II solution is that it is not nearly as attractive technically or economically as E-OTD. Before handset-based solutions were permitted, TOA was the preferred method for GSM Phase II, but once handset-based solutions were permitted, TOA lost favor. The reason for this is that TOA, an uplink-based network technology, must reproduce or have access to the complex functionality of a GSM system's traffic channels. Given the use of frequency hopping, intensive reuse, and adaptive antenna arrays by GSM base stations, this would require unduly complicated and expensive location measuring units. For further technical details, see Attachment I. Moreover, on the following page VoiceStream quotes from a letter included as Attachment III, in which Nokia states its reasons for finding E-OTD technically superior to TOA and for deciding not to offer TOA.

[24] Qualcomm Comments at 5.

> *Geometrix™ is currently capable of operating with all handsets using the AMPS, CDMA, TDMA and iDEN air interfaces.* The system *can be adapted to also support the GSM air interface* if GSM carriers express interest.[25]

In other words, Allen Telecom represents that its technology currently supports everything *except* GSM, which makes it anything but a "compliant alternative." The fact that Allen Telecom is willing to undertake GSM development does not make its GSM equipment available. Qualcomm's irrepressible campaign for GPS-based solutions is as transparent as it is annoying.

VoiceStream notes that major vendors are now working toward Phase II solutions for GSM carriers based on E-OTD and have rejected TOA. In a letter included as Attachment III, Nokia states:

> Nokia has performed its own E-OTD tests and also followed the E-OTD tests performed in Houston in the network of VoiceStream. Nokia considers the results encouraging, and is prepared to provide its customers with the necessary equipment to implement E-OTD, barring any unforeseen circumstances. . . .
>
> One reason why Nokia has selected E-OTD to support LCS [location services] in GSM networks is that E-OTD is a standardized location method for GSM. It is included in the GSM standards Releases 98 and 99, and will also be included in future releases such as Release 4 and 5. In addition, for 3G WCDMA systems, the UMTS standards Release 99 includes support for the Observed Time Difference Of Arrival — Idle Period Down Link (OTDOA-IPL) location method. Full support is planned to be included in the Release 4. OTDOA-IPDL is effectively the E-OTD method adapted for WCDMA environment. In compliance with the 3GPP standardization Nokia is supporting the BSS architecture in 3G. The Qualcomm contribution to 3GPP for NSS based architecture and Standalone SMLC is not supported by Nokia.
>
> As you know, Time Of Arrival (TOA) is a network-based location method for GSM. While Nokia carefully assessed this method, we have decided not to include TOA in the product portfolio we offer to our carrier customers for the following reasons: added complexity, generated extra signaling load, and low location capacity.

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[25] Letter from Eliot J. Greenwald, Esq., dated September 15, 2000, at 2 (emphasis added).

> Our tests and analysis have shown us that E-OTD is superior to TOA in each of these areas.[26]

Nokia's decision to pursue E-OTD and not TOA confirms the validity of the Commission's conclusion that E-OTD may be the only solution available to GSM carriers.

Given the *fact* that both A-GPS and TOA will be unavailable for timely Phase II implementation by GSM carriers, VoiceStream concluded, and the Commission properly agreed, that VoiceStream will have to rely on the only technology currently available for GSM carriers' provision of Phase II location information — E-OTD. Neither APCO nor Qualcomm have presented valid grounds for reconsidering this determination.

C. By Providing Accuracy Much Greater Than Phase I Requirement, NSS Provides a Substantial Public Benefit

As discussed previously, VoiceStream plans to enhance E-OTD with NSS, which will provide more accurate location information than is required by Phase I. It is fully compatible with legacy handsets, and provides location information of 1000-meter accuracy for 67 percent of calls. Compared with the Phase I requirement of providing only the cell-site location, this is a vast improvement. As an interim solution pending the development of commercial E-OTD technology for GSM, it is clearly in the public interest to deploy NSS support.

APCO criticizes this improved accuracy over Phase I, claiming that the added information is essentially useless, because "finding a 9-1-1 caller within a 1-kilometer radius would still be extremely difficult."[27] This misperceives the purpose of Phase I information, which is not to provide a precise location for the caller, but rather to provide information that is useful in routing

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[26] Letter dated October 10, 2000, from Leo R. Fitzsimon, Director, Regulatory and Industry Affairs, Nokia Inc, to Brian O'Connor, Vice President of Legislative and Regulatory Affairs, VoiceStream, reproduced in Attachment III.

[27] APCO Petition at 6.

an E-911 call to the appropriate PSAP. The cell-site location is only a very rough proxy for the jurisdiction in which the caller is located. The serving site may or may not be the closest to the caller, and the serving site may cover a relatively large area, containing many different jurisdictions. This is particularly true in suburban areas, where there may be many different jurisdictions and emergency service providers. A suburban cell site may be 12 or more kilometers in radius. This may not provide enough accuracy to tell whether a caller is in, for example, Fairfax County, Falls Church, or Vienna, Virginia. By narrowing down the radius to 1000 meters, the caller can be better matched to the correct PSAP and emergency service delivery team. Thus, while APCO points out that a square kilometer takes in a large portion of Southwest Washington, there can be no dispute that the identification of a call as coming from this 8 by 8 block area would be far more useful to emergency vehicle dispatchers than knowing only that the call was handled by a cell site in Arlington, Virginia.

APCO also argues that the existence of NSS as a "safety net" is worrisome because it may constitute what carriers have in the way of location solutions if E-OTD does not live up to its expectations. However, the fact is that E-OTD, like *all* Phase II solutions, is still in its testing and development stages. If a carrier relies on a particular solution and it fails, the carrier will not be in compliance with its Phase II obligations. VoiceStream respectfully submits that NSS still provides meaningful public safety benefits as a safety net — the public is better off with an NSS safety net than without it. If E-OTD fails, the public will have its safety enhanced by the availability of NSS, pending deployment of an improved Phase II solution.

In short, the improved accuracy over Phase I provided by NSS is a public interest benefit that reasonably counterbalances the enlargement of the schedule for VoiceStream's Phase II compliance. This improved accuracy certainly is no reason to reconsider the waiver grant.

II. THE COMMISSION'S GRANT OF THE WAIVER WAS PROCEDURALLY PROPER

APCO criticized the Commission's decision to grant a waiver on the ground that by partially exempting a major nationwide carrier from a rule, it has the effect of a rulemaking and should have been considered through a notice and comment procedure similar to that employed in a rulemaking.[28] Commissioners Tristani and Ness, likewise, claimed that the waiver was similar to a rule change and should have undergone notice and comment.[29] Qualcomm, for its part, argues that the Commission should not have granted the waiver because it was "sought through *ex parte* discussions."[30] VoiceStream submits that no further procedures were necessary or required and that the waiver was properly granted.

It is well-established that the Commission has broad discretion to develop policies and apply them through case-by-case adjudications or general rulemakings. In *SEC v. Chenery Corp.*, 332 U.S. 194, 202-03 (1947), the Supreme Court made clear that agencies can to choose between case-by-case adjudication and general rulemaking in establishing forward-looking "rules" and policies, because "any rigid requirement" that rulemaking always be used "would make the administrative process inflexible and incapable of dealing with many of the specialized problems which arise." Indeed, the Commission has the ability to use rulemaking, adjudication, or a blend of the two, depending on the matter before it.[31]

Here, a waiver was sought in the course of *ex parte* presentations fully reflected on the record of the Commission's E-911 docket. The Commission clearly has the authority to respond

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28 APCO Petition at 3-4.

29 *See Fourth MO&O,* Joint Separate Statement of Commissioners Susan Ness and Gloria Tristani.

30 Qualcomm Comments at 8.

31 *See Telocator Network of America v. FCC,* 691 F.2d 525, 551-52 (D.C. Cir. 1982).

to *ex parte* submissions in its rulemaking docket. That is the whole reason why the Commission entertains *ex parte* presentations and filings. The Commission granted relief based on VoiceStream's filings without putting out a specific public notice soliciting comment on the proposal, just as it often takes an action recommended for the first time in *ex parte* filings, and its authority to take into account *ex parte* filings when reaching a decision is clear.[32]

Neither APCO nor Qualcomm have said how they were injured by the grant of this waiver through the *ex parte* submission process. In fact, Qualcomm made multiple *ex parte* filings opposing the VoiceStream waiver request.[33] It had as much notice and opportunity to comment on VoiceStream's request as if the request had been placed in a public notice. Accordingly, the fact that relief was sought through the *ex parte* process, and was granted without separate notice and comment is no basis for reconsidering the waiver grant. Indeed, if this were subject to reconsideration on such a ground, virtually any action the Commission takes in the course of a complex proceeding in response to a party's *ex parte* filing that addresses its own particular situation would be equally subject to reconsideration.

The Commission's consideration and grant of the VoiceStream waiver was consistent with its policy of encouraging innovation and remaining technology-neutral. GSM is one of three technological approaches to the provision of broadband PCS in the United States and is the leading system used elsewhere in the world. Given the complexity of developing a GSM solution for the Commission's Phase II E-911 requirements, a waiver was necessary because there is no commercially available solution yet. Denial of the GSM waiver at the instigation of Qualcomm, the leading proponent of CDMA, a competing technology, would have favored

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32 *See MCI WorldCom, Inc. v. FCC*, 209 F.3d 760, 765 (D.C. Cir. 2000).

33 *See, e.g.*, Letter from Dean R. Brenner, Esq., dated July 27, 2000; Letter from Dean R. Brenner, Esq., dated July 28, 2000; Letter from Dean R. Brenner, Esq., dated September 1, 2000; Letter from Dean R. Brenner, Esq., dated September 7, 2000.

CDMA over GSM. This would have sent the wrong message — that the Commission's commitment to marketplace-driven technology development is wavering.

The Commission should stay out of the business of picking technology winners and continue to support innovation and competition in the development of technological solutions, consistent with Section 7 of the Communications Act, which states: "It shall be the policy of the United States to encourage the provision of new technologies and services to the public."[34] If the Commission were to penalize companies not employing Qualcomm's technical approach here, it will discourage investment in new technologies not only in PCS but in other fields as well.

Qualcomm also has urged the Commission to reconsider its grant because of some confusion as to whether the grant was on the Commission's own motion or was, instead in response to a specific waiver request.[35] It does not matter, either way. The Commission is specifically empowered by Section 403 of the Communications Act to act on its own motion as though it had an appropriate petition before it.[36]

For the record, VoiceStream *had* a waiver request before the Commission. Aerial Communication, Inc. ("Aerial"), a company that was subsequently merged into VoiceStream, had filed a waiver request that was dismissed in the *Third Report and Order*,[37] and that waiver re-

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[34] 47 U.S.C. § 157(a); *see also* 47 U.S.C. §§ 309(j)(3)(A)-(B).

[35] Qualcomm Comments at 7-8.

[36] 47 U.S.C. § 403. APCO argues that the "most telling failing of the VoiceStream waiver is that it does not even satisfy the test that the Commission established in the *Fourth MO&O* for consideration of future waivers." APCO Comments at 8. As APCO acknowledges, the waiver tests established in the *Fourth MO&O* apply to *future* waiver requests. More importantly, there is no requirement that the Commission establish specific waiver criteria in advance of granting particular waiver requests. *See BellSouth Corp. v. FCC*, 162 F.3d at 1225.

[37] *Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, CC Docket 94-102, *Third Report and Order*, 14 F.C.C.R. 17,388, 17429-30 (1999). The VoiceStream acquisition of Aerial was concluded on May 4, 2000. *See*

(continued on next page)

quest was still before the Commission because Aerial had sought reconsideration of the dismissal prior to its acquisition by VoiceStream.[38] VoiceStream's May 8, 2000 *ex parte* filing was submitted expressly because the Aerial waiver request remained outstanding when it closed its Aerial acquisition.[39] Later, on June 22, 2000, VoiceStream submitted an *ex parte* filing containing a document entitled "VoiceStream Wireless Petition for Waiver — Discussion with the FCC — June 15, 2000."[40] This document, which contains pages captioned, "VoiceStream Proposal," "VoiceStream Proposal Meets FCC's Goals," and "Recommendations," among others, as well as a brief description of some of the tests to be conducted, clearly constitutes a waiver request.

As indicated above, it ultimately does not matter whether there were one, two, or no petitions for waiver, or whether the petitions meet certain formal requirements, because the Commission has the power to grant a waiver whether or not it has been formally sought, if it finds that the public interest warrants a waiver. Here, the Commission concluded that a waiver would provide public benefits and would serve the public interest. That determination was correct and should be upheld here.

(continued)
Letter dated May 5, 2000 (received on May 8, 2000) from Brian T. O'Connor, VoiceStream Wireless (VoiceStream May 8 *ex parte*).

38 The Commission concluded in its *Fourth MO&O* that Aerial had not sought reconsideration of its waiver dismissal. However, in Aerial's petition for reconsideration of the *Third Report and Order*, Aerial specifically alleged that the dismissal of its waiver request was improper. *See* Petition for Reconsideration, Aerial Communications, Inc., CC Docket 94-102, filed Dec. 6, 1999, at 3.

39 *See* VoiceStream May 8 *ex parte*.

40 *See* Letter dated June 22, 2000 from Robert A. Calaff, VoiceStream Wireless.

CONCLUSION

For the foregoing reasons, the APCO Petition for Reconsideration of VoiceStream Waiver should be denied.

Respectfully submitted,

VOICESTREAM WIRELESS CORPORATION

By: _____
Brian Thomas O'Connor, Vice President
Legislative and Regulatory Affairs

_____
Robert Calaff, Corporate Counsel
Governmental and Regulatory Affairs

1300 Pennsylvania Avenue, N.W.
Suite 700
Washington, D.C. 20004

(202) 204-3099

October 10, 2000

ATTACHMENT I

Engineering Declaration
of Mark Cosgrove

1. My name is Mark Cosgrove. I serve as the Director, R.F. Engineering, for VoiceStream Wireless, Inc.

2. I have been involved in Telecommunications since 1980 initially being employed by British Telecommunications in the UK, in its Microwave Radio Development division. In 1990 I joined Cellnet in the UK to work specifically on GSM, overseeing the initial development programs for GSM, and managing Cellnet's Research and Development activities. I was an active member of the ETSI SMG-2 sub group, which authored the GSM recommendations for the air interface. In 1994 I joined AirTouch International, being responsible for the construction and design of a PCS network in Tokyo, Japan; in 1997 I became Technical Director in Walnut Creek, CA, being responsible for the technical program management for the research, development, and application of CDMA, GSM, PCS, Mobile Satellite, Wireless Data, WLL, Advanced Intelligent Networks, and Enhanced Services. In 1998 I joined Omnipoint Communications as Principal Engineer for RF Engineering and became Director of RF Engineering at VoiceStream in May of this year.

3. As Director of RF Engineering I am responsible for the development and performance of the Base Station Sub-system. This includes technical specification of all BSC, BTS and RF products and functionality. My group is responsible for vendor management, equipment approval and software acceptance. My group is responsible for the technical aspects of Location Based Services, managing the field trials in Houston,

supervising and directing VoiceStream's efforts to comply with the Commission's Phase II E-911 requirements.

Comparison of E-OTD and TOA.

4. Qualcomm's Comments emphasize the availability of TOA as an alternative solution to E-OTD. It is not an alternative that has been field tested and it is not commercially available to VoiceStream.

5. E-OTD and TOA share the same basic principles of operation — both measure the relative timing differences of transmission signals, and both use triangulation to compute the position. TOA works by using the Uplink (Mobile to Base) transmissions, while E-OTD works by using the Downlink (Base to Mobile) transmissions.

6. TOA initially was the favored method considered for GSM, and it was the first method to be standardized within the GSM Specifications. TOA was the concept that was adopted when the E-911 Phase II rules specified that operators had to support legacy handsets as well as new activations.

7. When the rules changed to allow handset solutions, E-OTD became the desirable solution. In theory, TOA offered the most accurate system in that the source of error was limited to the Location Measurement Unit (LMU), positioned at the base stations. But E-OTD also uses LMUs as well as relying on mobile measurements, thus theoretically interjecting two sources of error. Therefore, further testing is needed to address the issue.

8. TOA uses known signals from on the Uplink — Handover Access Messages — to allow multiple LMUs to derive the Relative Timing Measurement (RTD). These messages are transmitted on the Traffic Channels (TCH). The TCHs in GSM are used

extremely efficiently and use several techniques to increase the spectrum efficiency of the system: (a) frequency hopping over tight reuse patterns (a 1/1 reuse is common in GSM) using fractional loading; (b) interference cancellation equipment (ICE), with software now being installed in base stations to further increase the efficiency of the TCH; and (c) adaptive antenna arrays (known as "Smart Antennas"), which are in trials that again offer increased spectrum efficiency.

9. All these methods mean that the TOA LMU would need to reproduce all this complex functionality, or have direct access to, the base station functionality. This implies that, not only the LMU at the base station nearest the mobile, but all LMU involved in the measurement process, have information on the hopping algorithm and timing being used by the mobile in question. Also, the LMU would need to either have access to the ICE or again reproduce the functionality. The alternative would be for the LMU to operate in a very extreme carrier-to-interference (C/I) environment, with performance characteristics that do not exist in GSM receivers.

10. Thus, the LMU for TOA would be a very complicated and very expensive unit. Ideally it would need to be integrated into the base station as part of the transmitter-receiver (TX/RX) unit. Several vendors looked at integrating TOA LMU in to the existing base station structure, but no vendor actually achieved it. Hence TOA LMUs would be a separate unit.

11. Being a separate unit increased the price of the LMU to an extent that it was expected to be 3 to 4 times the cost of an E-OTD LMU. LMU deployment densities would need to be also 2 to 3 times higher for TOA. This meant that the cost of TOA was some 6 to 12 times the cost of E-OTD.

12. The alternative was to only use the TOA based location techniques on calls being handled by the less interference intensive Broadcast Control Channel (BCCH) RF carrier. Handover from a non-BCCH carrier to the BCCH carrier would have to occur prior to the location response. This would increase the time it took to locate a mobile. Such a system would also be capacity-limited, due to the lower number of calls that can be handled on the BCCH. This resource is also needed by several data services. Such a BCCH based TOA system would be less complex but could only handle small amounts of traffic and would not be suitable for commercial location-based services.

13. TOA also required the use of GPS units at every LMU in order to provide an accurate clock reference. The availability of accurate GPS in dense urban canyons and also inside buildings presented problems for operators who had many microcells and in-building systems. Looking at the economic costs of deploying TOA, vendors and operators (both in the US and worldwide) have shied away from TOA.

14. Currently there is no known GSM vendor who is offering a TOA-based location system for FCC Phase II compliance. Rather, all VoiceStream's vendors have proposed an E-OTD based systems. It is my understanding, based on my experience at a recent trade conference, that TOA-based systems are not currently under development for GSM.

15. Qualcomm claims that Omnipoint Technologies, Inc. currently offers TOA technology for GSM. While Omnipoint Technologies had in the past pursued TOA, the company was acquired by Xircom, Inc. earlier this year, and it is no longer marketing TOA for GSM. I note that the Omnipoint Technologies web site from which Qualcomm draws its evidence about Omnipoint Technologies' TOA marketing,

<http://www.omnipoint-oti.com>, is obsolete. The company news and links pages on that site were last updated in February 2000. Accordingly, the fact that a page may still be included on the site concerning TOA is not reliable evidence of what Xircom, the successor company, is offering today.

16. The potential market for TOA in GSM systems worldwide is very small, as it is far easier and economical to deploy an E-OTD system. This lack of volume would make any offering even more expensive than the economics that effectively killed TOA.

17. A practical TOA system using BCCH location only could not be deployed on a wide scale although it could be used as a small scale deployment, if the economics could be solved. In conclusion, the complexity of TOA made it impractical to deploy. This led to all major vendors and the GSM community worldwide focusing on E-OTD as the preferred solution for GSM. The 3G standards bodies for future radio systems have also adopted E-OTD.

The VoiceStream NSS/E-OTD Test in Houston.

18. The objective of the initial testing in Houston was to prove whether E-OTD was technically feasible and not specifically to prove whether it currently meets the most stringent E-911 accuracy requirements. The test set-up in Houston is a development system. The LMU are not commercial quality and have been made specifically for the trial. The suburban environment of Houston was chosen as an environment which was easily assessable, and we were able to create a reasonable sized testing environment of some 100 Km^2 with a reasonable low number of LMUs.

19. The initial testing focused on proving that the basic technology worked in a real environment. Short Message Signaling (SMS) was used to overcome the lack of in-

channel signaling capabilities. The intention was to prove the technology worked in Houston and move to other environments and perform more detailed modeling to understand the accuracy requirements of E-OTD and how it could be improved.

20. The initial testing took place before the FCC's OET Bulletin 71 was published, and measurement techniques were dependent on the functionality of the development system. Measurements have been made at set (known via DGPS) locations. Single-shot instantaneous measurements were made. Several measurements were made some minutes apart, such that they are statistically independent. In the future, measurements will exploit the 30 second averaging period allowed in OET-71.

21. GSM specifications allow for up to three measurement sets to be stored and processed in the mobile (the development system uses a single measurement set), with further processing performed in the SLMC. This will improve the accuracy of the system.

22. Test results from Houston are very encouraging. The accuracy of the system is better than expected at 57 m, at 67 % of calls. This is better than early modeling results showed, although the LMU density is at unity in Houston, whereas models produced by T1P1 assumed lower LMU deployment densities. Testing as prescribed in OET-71 will add to the accuracy of the results.

23. Understanding how the accuracy changes with respect to LMU density will be an important next step, as this defines the practicality and cost of rolling out an E-OTD system. The test system in Houston is now able to support in-call locating and we will start testing involving moving mobile units this week.

24. As the development measurement techniques are improved, it should be possible to perform full in-call, moving mobile tests by next month. In-building testing is also being carried out this week. Test results and a more detailed report on the testing in Houston is scheduled to be available in time for Voicestream's November 9th report to the Commission. The FCC has been advised about the testing parameters and status.

25. Beyond Houston, the trial results will be assessed and compared to the modeling results available to extrapolate the performance of E-OTD in other environments. VoiceStream needs to review the data from Houston to understand how the E-OTD system can be improved and also what steps are needed within our own planning process to improve on E-911 accuracy. However, based on the E-911 distributions measured in the VoiceStream network and the allowance in OET-71 for scaling of measurements to reflect call distribution, the suburban environment will remain the most important area for validating E-911 performance.

26. It is expected that future trials will focus on the commercial system, readying VoiceStream for real-world deployments. Commercial LMUs are not expected till the end of the first quarter of 2001, at which time it may be possible to have additional trials, including areas characterized as high density urban. Such trial dates are dependent on network software availability from our major vendors. As soon as VoiceStream can secure the right software for the network to undertake further testing we will invite the FCC to take an active part and will share our test results with the Commission.

27. It is VoiceStream's intention to take a step by step approach to validating both the practical steps needed to deploy E-OTD and verifying that the system can meet E-911

Phase II requirements. The start we have made in Houston is very promising and shows the clear potential of E-OTD.

Network Software Solution (NSS).

28. In suburban and rural areas, the use of NSS will improve accuracy significantly over the current Phase I system. Cell sites in these areas can cover tens of kilometers, and hence the 1000 meter-accuracy will be a big improvement. In many areas, coverage is not from the nearest cell or the most logical site but a cell site some kilometers away. Having the NSS-based solution will remove these anomalies. In urban areas where cell site radii are smaller, the improvement from the NSS system will be less but will still be positive.

29. One improvement from the NSS-based system is the speed with which VoiceStream can deploy the basic Phase II service in an area Regardless of technology choices, operators will experience significant deployment time lags. LMUs need to be installed at sites, which is a non-trivial task. Additional antennas may need to be placed at mast heads, requiring landlord negotiations, possible re-zoning and local authority approval, and tower crews to climb towers. In some areas, zoning of new antennas can take six to nine months. Physical deployment of LMU may take several months for a single market. This speed of deployment and the support of legacy handsets make the NSS based solution very advantageous.

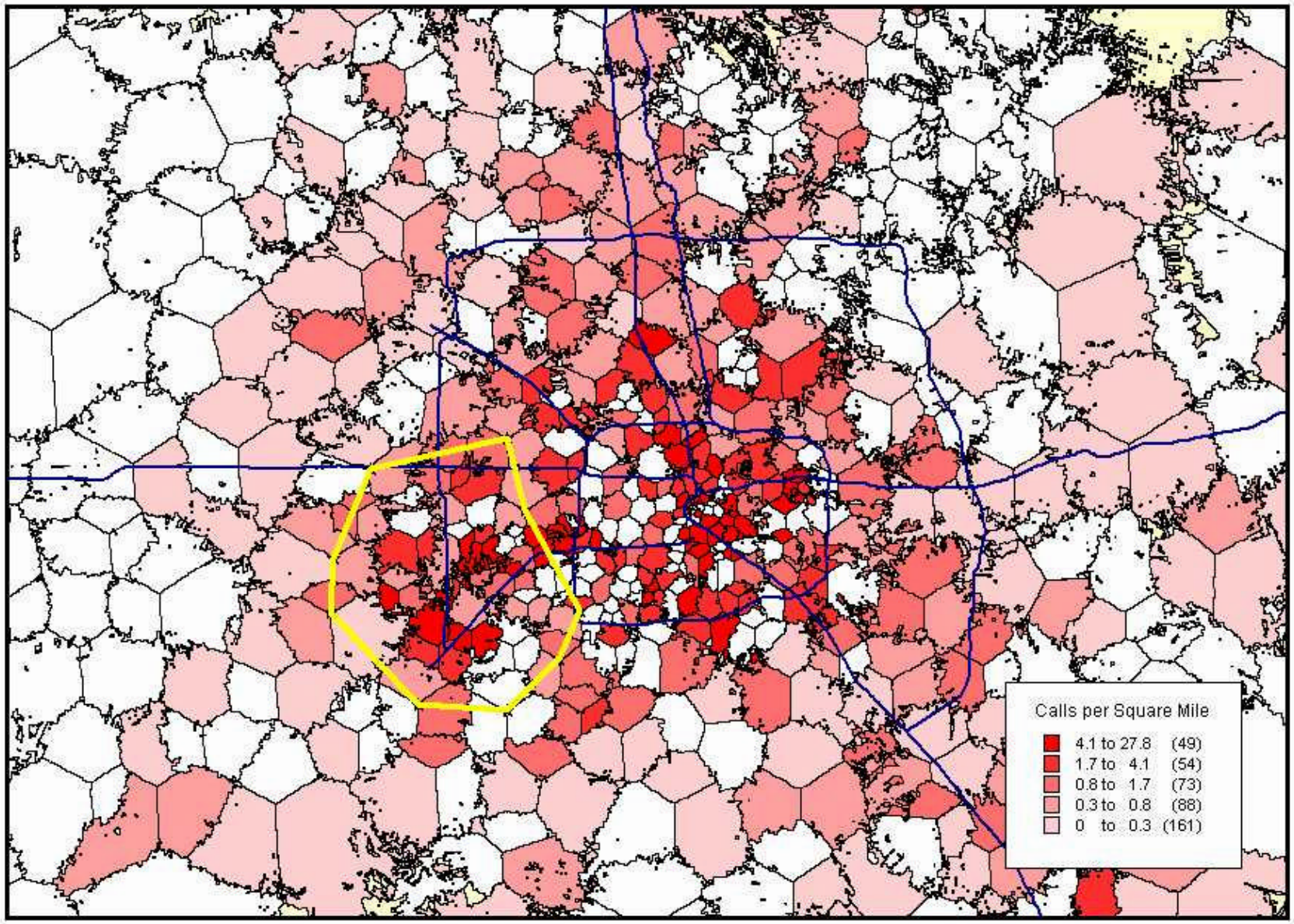
30. I have reviewed the "Opposition to APCO Petition for Reconsideration of VoiceStream Waiver" and declare the factual statements therein, and the foregoing statements, to be true and correct under penalty of perjury, based on personal knowledge, information, and belief.

_____

Mark Cosgrove

Executed: October 10, 2000

Houston E911 Calls



ATTACHMENT II

VOICESTREAM SEMI-ANNUAL REPORT
Filed October 2, 2000

October 2, 2000

Ms. Magalie Roman Salas
Office of the Secretary
Federal Communications Commission
445 Twelfth Street, S.W.
Washington, D.C. 20554

RE: VoiceStream Semi-Annual Report, CC Docket No. 94-102

Dear Ms. Salas:

On September 8, 2000, the Commission released a Fourth Memorandum Opinion and Order (FCC 00-326) in its E-911 rulemaking proceeding, CC Docket No. 94-102. This order granted VoiceStream Wireless Corporation (Voicestream) a waiver of the Commission's E-911 rules, 47 C.F.R. 20.18 *et. seq*., in order to allow it to pursue a hybrid automatic location information (ALI) approach.

VoiceStream's waiver was made subject to compliance with a number of conditions. In particular, VoiceStream is required to report to the Wireless Telecommunications Bureau semi-annually, beginning October 1, 2000, on "its experience with NSS and E-OTD, including actual deployment and the results of all tests and trials." The information contained in this report is intended to meet this requirement.

Sincerely,

Brian Thomas O'Connor
Vice President,
Legislative and Regulatory Affairs
VoiceStream Wireless Corporation
1300 Pennsylvania Avenue, N.W.
Suite 700
Washington, D.C. 20004

cc: Thomas J. Sugrue
Jim Schlichting

Kris Monteith
Blaise Scinto

BEFORE THE

FEDERAL COMMUNICATIONS COMMISSION

WASHINGTON, DC 20554

In the Matter of	)	
	)	
Revision of the Commission's Rules	)	CC Docket No. 94-102
To Ensure Compatibility with	)	
Enhanced 911 Emergency Calling Systems	)	

To: Wireless Telecommunications Bureau

SEMI-ANNUAL REPORT

VoiceStream Wireless Corporation

Brian Thomas O'Connor, Vice President,
Legislative and Regulatory Affairs

Robert Calaff, Corporate Counsel
Governmental and Regulatory Affairs

1300 Pennsylvania Avenue, N.W.
Suite 700
Washington, D.C. 20004

October 2, 2000

BEFORE THE

FEDERAL COMMUNICATIONS COMMISSION

WASHINGTON, DC 20554

In the Matter of	)	
	)	
Revision of the Commission's Rules	)	CC Docket No. 94-102
To Ensure Compatibility with	)	
Enhanced 911 Emergency Calling Systems	)	

To: Wireless Telecommunications Bureau

SEMI-ANNUAL REPORT

On September 8, 2000, the Commission released a Fourth Memorandum Opinion and Order (FCC 00-326) in its E-911 rulemaking proceeding, CC Docket No. 94-102. This order granted VoiceStream Wireless Corporation (Voicestream) a waiver of the Commission's E-911 rules, 47 C.F.R. 20.18 *et. seq*., in order to allow it to pursue a hybrid automatic location information (ALI) approach. This approach consists of implementing two elements: (1) a Network Software Solution (NSS) that would provide better than Phase I accuracy for all 911 calls on the VoiceStream network and (2) a location technology known as Enhanced Observed Time Difference of Arrival (E-OTD) that would over time meet the Commission's location accuracy requirements.

VoiceStream's waiver was made subject to compliance with a number of conditions. In particular, VoiceStream is required to report to the Wireless Telecommunications Bureau semi-annually, beginning October 1, 2000, on "its experience with NSS and E-OTD, including actual deployment and the results of all tests and trials." The information contained in this report is intended to meet this requirement.

This Report is divided into two basic sections. The first section covers VoiceStream's current efforts to develop and deploy NSS for positioning handsets. The second section covers VoiceStream's preparations to implement E-OTD, including up-to-date information on its negotiations with handset and infrastructure vendors, a more comprehensive report on Stage One of its E-OTD technology trial, and plans for its upcoming Stage Two of that trial. On a concluding note, the report will summarize VoiceStream's participation in the Location Interoperability Forum (LIF), an effort that was announced September 26, 2000. Spearheaded by Nokia, Motorola and Ericsson, the LIF is dedicated to developing global interoperability between mobile positioning systems.

I. NETWORK SOFTWARE SOLUTION (NSS)

VoiceStream is actively working with its equipment vendors to develop and deploy NSS. The key aspects of this technology are that it:

- uses signal strength data currently collected by the handset and/or timing advance information collected by the base station to improve the accuracy of the position estimate.
- impacts only on network elements, allowing <u>any</u> mobile making a 911 call on the network to be located – including non-ALI capable handsets and roamers.
- will provide increased accuracy over Phase I alone (cell ID) – 1000 meters, 67 percent of calls.
- can generate an improved accuracy result (over Phase I) even if the mobile can hear only one cell site. Accuracy improves if additional cell sites can be heard.
- will be deployed sooner than E-OTD or Assisted GPS (A-GPS) technologies can be deployed for GSM customers in the U.S. (by December 31, 2001).
- can continue to be used as a fallback location method for non-ALI capable handsets even after more accurate handset-based location technologies (such as E-OTD or A-GPS) have been deployed.

VoiceStream remains on track to develop and deploy the NSS throughout its network by the FCC implementation date of December 31, 2001. VoiceStream is currently working with its equipment vendors to sort out multi-vendor equipment interoperability issues related to the advanced algorithms of NSS. The solution is based on the GSM R99 LCS standards, using the cell ID + timing advance method. Some vendors are also incorporating signal strength measurements to increase the accuracy of the method.

II. E-OTD

A) Infrastructure

Since release of the Commission's order granting its waiver, VoiceStream has been negotiating with its infrastructure vendors in order to assure that the company will have E-OTD-capable network equipment in a timely manner. All of VoiceStream's infrastructure vendors have confirmed that they will have products available incorporating an E-OTD location solution by the Third Quarter, 2001. VoiceStream is anticipating 90 days to install and commission E-OTD equipment, dependent upon the size of the system.

B) Handsets

Similarly, since release of the Commission's order granting its waiver, VoiceStream has been actively negotiating with its handset vendors so that it can comply with the handset deployment goals incorporated as a condition of the waiver (50 percent of new handset

activations with E-OTD capability by October 1, 2001; 100 percent of new handset activations with E-OTD capability by March 31, 2002). While those negotiations are currently proceeding and no contractual commitments have been made, VoiceStream does believe that these negotiations will conclude in a manner that will allow it to meet the Commission's handset deployment goals. In particular, one vendor has indicated that it currently believes that it can provision a low-end, high volume handset and a high-end handset to VoiceStream, both with E-OTD capability, by July 1, 2001. Further, another vendor has indicated that it will have E-OTD technology in certain handsets that will be available in the fourth quarter of 2001. All future handsets from this vendor launched after the first E-OTD product will be E-OTD compliant.

C) Technology Trials

As the Commission is aware, VoiceStream has been participating in an ongoing E-OTD technology trial, along with Cambridge Positioning Systems, Ltd. (CPS) in Houston, TX. On August 9, 2000, VoiceStream reported preliminary results of Stage One of the trial to the FCC, based on data taken from five hundred individual measurements inside and outside a stationary vehicle across an area of approximately 22.5 square kilometers (km^2). At that point, VoiceStream reported that these preliminary results compared very favorably with the FCC's handset accuracy requirements (50 meters for 67 percent of calls; 150 meters for 95 percent of calls). On August 11, 2000, Stage One of the trial was completed, with over 1000 individual measurements taken under these testing conditions at 26 fixed points. The final results continue to compare very favorably with the FCC's accuracy requirements: 67 percent of the measurements taken were within 57 meters of the actual position (determined via differential GPS), 92 percent were within 100 meters, and 97.5 percent were within 150 meters. There was little difference between measurements made inside and outside vehicles. As a preliminary matter, therefore, it appears that E-OTD performs well in suburban Houston, an area representative of a substantial majority of VoiceStream's 911 calls, and can approach the FCC's E-911 accuracy requirements. VoiceStream is attaching to this report a short presentation summarizing the final results of Stage One of the Houston trial. See Attachment.

Stage Two of the trial is scheduled to be conducted on October 9 and 10, 2000, during which time operators and trial participants will be able to make measurements. The objectives of Stage Two are:

- ***Increase the size of the testing area:*** The total commissioned test region is approximately 325 km^2 of suburban housing and shopping malls containing about 20 BTS sites each with an Location Measurement Unit (LMU) installed. The measurement area for Stage Two will be increased from 22.5 km^2 (the area covered by Stage One) to about 100 km^2. This increases the variety and type of measurement locations but still avoids the problem of edge effects where LMU/BTS coverage is sparse.

- ***Test in dedicated mode:*** Stage One testing was conducted using handsets that collected their E-OTD data during idle mode. Dedicated-mode software that will allow the collection of stationary measurements from voice calls is expected to be ready for testing in Houston at the beginning of October. Moving dedicated mode handset software is expected to be available later in the month.

- ***Test in a moving vehicle:*** CPS has developed an interim handset solution for moving tests implemented on an idle-mode platform. It is clearly an interim solution since a moving handset used for a 911 emergency call will need the combination of dedicated mode and moving software, which as indicated above will not be available in time for Stage Two.

- ***In-building testing:*** Testing during Stage One focused on the accuracy at set external points whose position was known and pre-calculated. Tests in Stage Two will allow in-building measurements to be carried out.

- ***OET 71 testing:*** Stage One of the trial was conducted in a suburban Houston, an area substantially representative of VoiceStream's 911 call patterns, consistent with the guidelines published in OET Document 71. VoiceStream will continue to adhere to OET's guidelines as closely as possible during the run-up to Stage Two, in order to provide as realistic a view as possible of the current state of E-OTD in the Houston network to the participants and to the FCC. Further, VoiceStream will conduct additional FCC compliance testing during the period from October 11 to October 18**.**

Beyond Houston, VoiceStream intends to focus testing on the commercial implementation of E-OTD. This will focus on using infrastructure vendors' equipment and not development LMUs, the main advantage being the support of in-band signaling (dedicated signaling channels). Testing will focus on a wider variety of areas including urban and rural environments. This testing is envisioned to take place in the first quarter of 2001 -- the earliest time frame for the availability of commercial LMUs and development handsets supporting dedicated signaling. Phase II trial results and OET 71 type testing are scheduled to be available by VoiceStream's next submission date (November 9, 2000)

III. CONCLUSION

In conclusion, VoiceStream would like to note that, on September 26, 2000, Nokia, Motorola and Ericsson announced the formation of the Location Interoperability Forum (LIF). [1] The LIF is an industry effort dedicated to developing global interoperability between mobile

[1] See *Major wireless manufacturers unite to advance development of global location-based services and applications*, http://press.nokia.com/PM/791335.html

positioning systems. Many of the issues VoiceStream is currently addressing with its network and handset vendors are the main initiatives of the LIF[2].

VoiceStream was invited to LIF prior to public announcement to provide input and guidance for the direction and initiatives the LIF will take, and will play an active role in the LIF's Market Advisory Group. VoiceStream's strategy with regard to E911 Phase II very closely resembles the views of the LIF founding members – namely, support for legacy handsets through the NSS; E-OTD technology as VoiceStream's main E911 Phase II locating technology; and Assisted GPS handsets, when available, for advanced commercial services and E911 Phase II. VoiceStream believes that the formation of the LIF is a significant step towards meeting the E911 Phase II requirements for the GSM community, and it is prepared to take steps necessary to achieve its objectives.

VoiceStream hopes that this report helps the Commission verify that NSS and E-OTD are progressing and remain realistic options at the present time for meeting the requirements of the VoiceStream waiver. As always, we remain available to answer questions and provide further information.

VoiceStream Wireless Corporation

By: _____

Brian Thomas O'Connor, Vice President,
Legislative and Regulatory Affairs

Robert Calaff, Corporate Counsel
Governmental and Regulatory Affairs

1300 Pennsylvania Avenue, N.W.
Suite 700
Washington, D.C. 20004

October 2, 2000

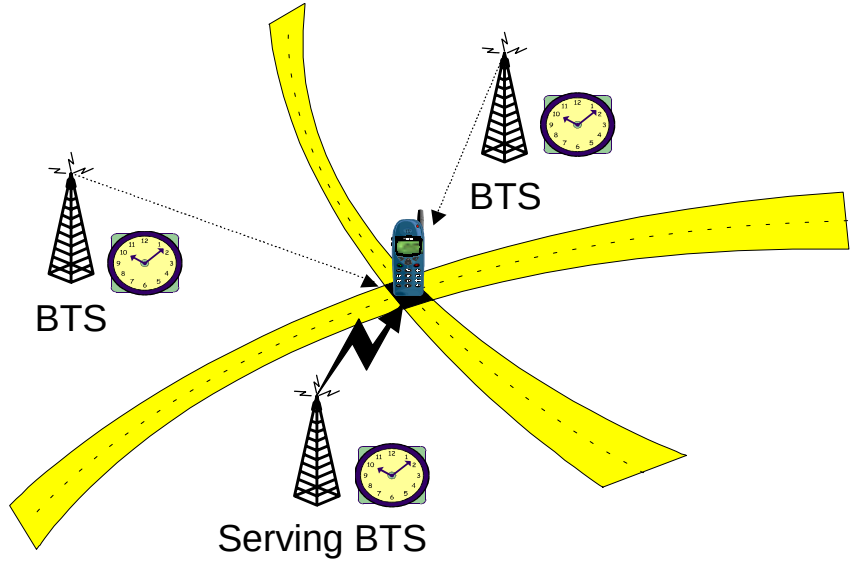
[2] For more information see the LIF Website: www.locationforum.org

E-OTD Location Technology Trial
Phase I Results

EOTD Location Method

E-OTD Network Operation

- **Mobile listens to bursts sent from neighboring BTSs**
- **Mobile records burst arrival times**
- **Position is triangulated from:**
  - **Coordinates of BTSs**
  - **Burst arrival time from each BTS**
  - **Timing differences between BTSs**



3G Systems use E-OTD as the intrinsic method for position determination

E-OTD - Handset Implementation

No Change to Antenna Structure

No Change to DSP or RF Hardware

Software Modification Required to Enhance Existing Measurements Process

Trial Description & Goals

- **Understand the accuracy of EOTD**
  - In suburban areas
  - In commercial suburban areas
  - In building / In car / Outdoor

- **What factors impact the performance of EOTD and how**
  - Effects of LMU density
  - Effects of BTS visibility from mobile
  - Effects of BTS visibility from LMU
  - Effects of cell geometry
  - Effects of LMU Antenna Placement
  - Effects of mobile velocity

Trial Description & Goals

- **Trial Area**
  - **325 Km^2 trial area in Houston commercial/suburban setting**
- **Equipment**
  - **CPS E-OTD LMUs co-located with 19 contiguous BTS**
  - **Sites comprised of rooftops and towers**
  - **LMU Antennas**
    - Rooftops: mag mount omni mounted on BTS cabinet
    - Towers: 9dbi omni mounted to ice bridge or equivalent, some mounted 10m up tower to improve line of sight and visibility
  - **Mobiles**
    - Mitsubishi handsets flashed with CPS EOTD software
  - **MLC**
    - SUN E250 with software provided by CPS for location calculation and operation and maintenance of LMU network
  - **Messaging run over SMS in the VoiceStream Houston network**

Trial Plan and Phase I Description

- Implementation / Deployment / Commissioning
  - Begin April 2000
  - Design LMU network
  - Customize the messaging interfaces in the network
  - Deploy LMUs with associated antennas and SMLC
  - Commission System through field testing
- Phase I Testing
  - Begin July 2000
  - Stationary testing in idle mode, in-car / outdoor
  - Involve GSMNA operators and equipment vendors
  - Invite operators and vendors to test July 31 – August 11
  - Distribute all results and detailed report to trial participants by September 1

FCC Guidelines vs. Testing Methodology

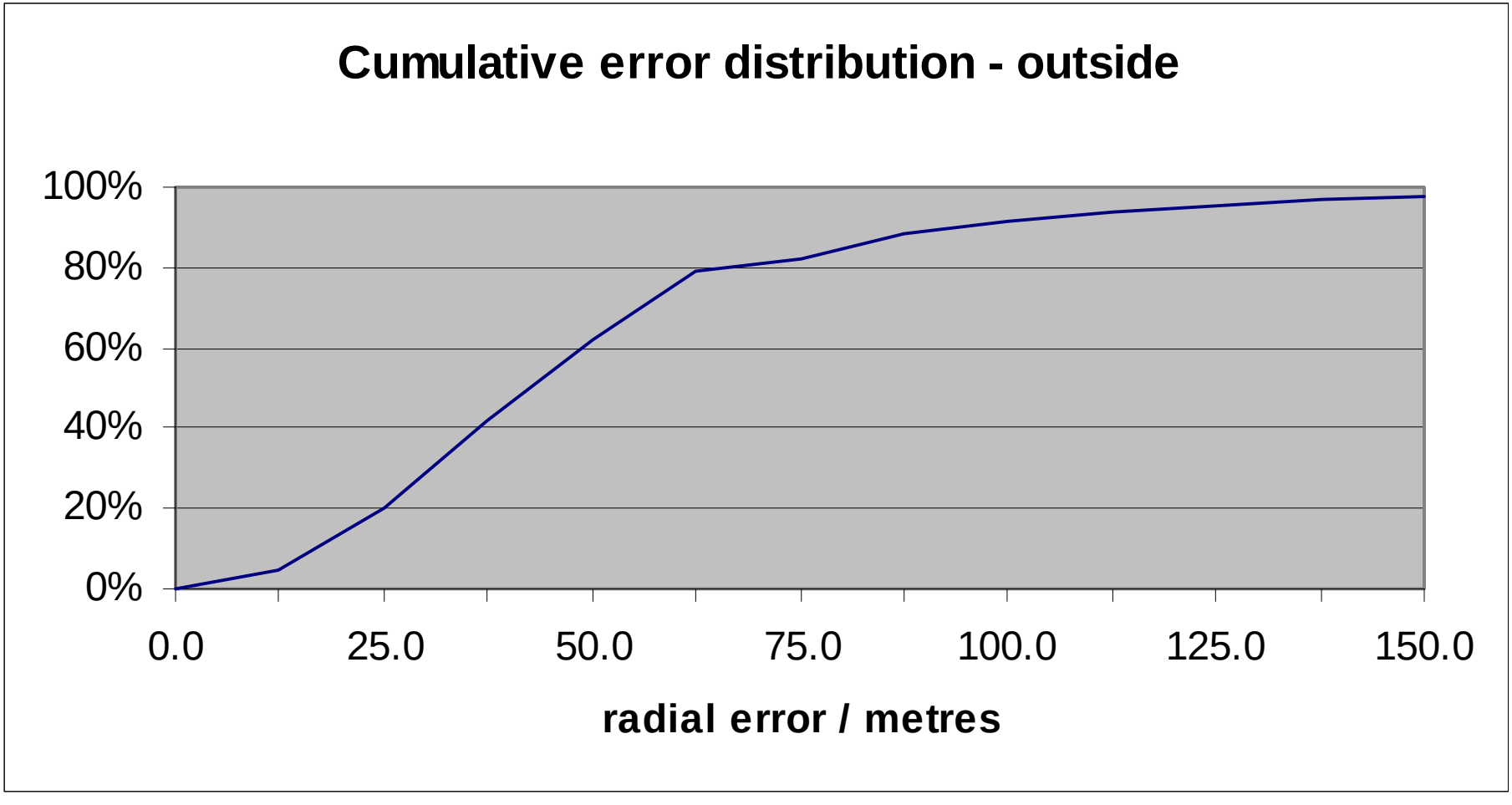
- **Phase I Testing Methodology**
  - **Trial area divided into 67 test grids**
  - **4 random measurement locations per test grid to allow for uniform distribution**
  - **5 individual measurements per location**
  - **3 minutes between measurements to allow for independent results in idle mode**
  - **Over 1000 In-car and outdoor measurements in suburban radio environment collected**
  - **Data is collected by pressing a button on the handset and recording the returned position**
  - **The position is provided in real time**
  - **Testing period July 28th – August 14th**

FCC Guidelines vs. Testing Methodology

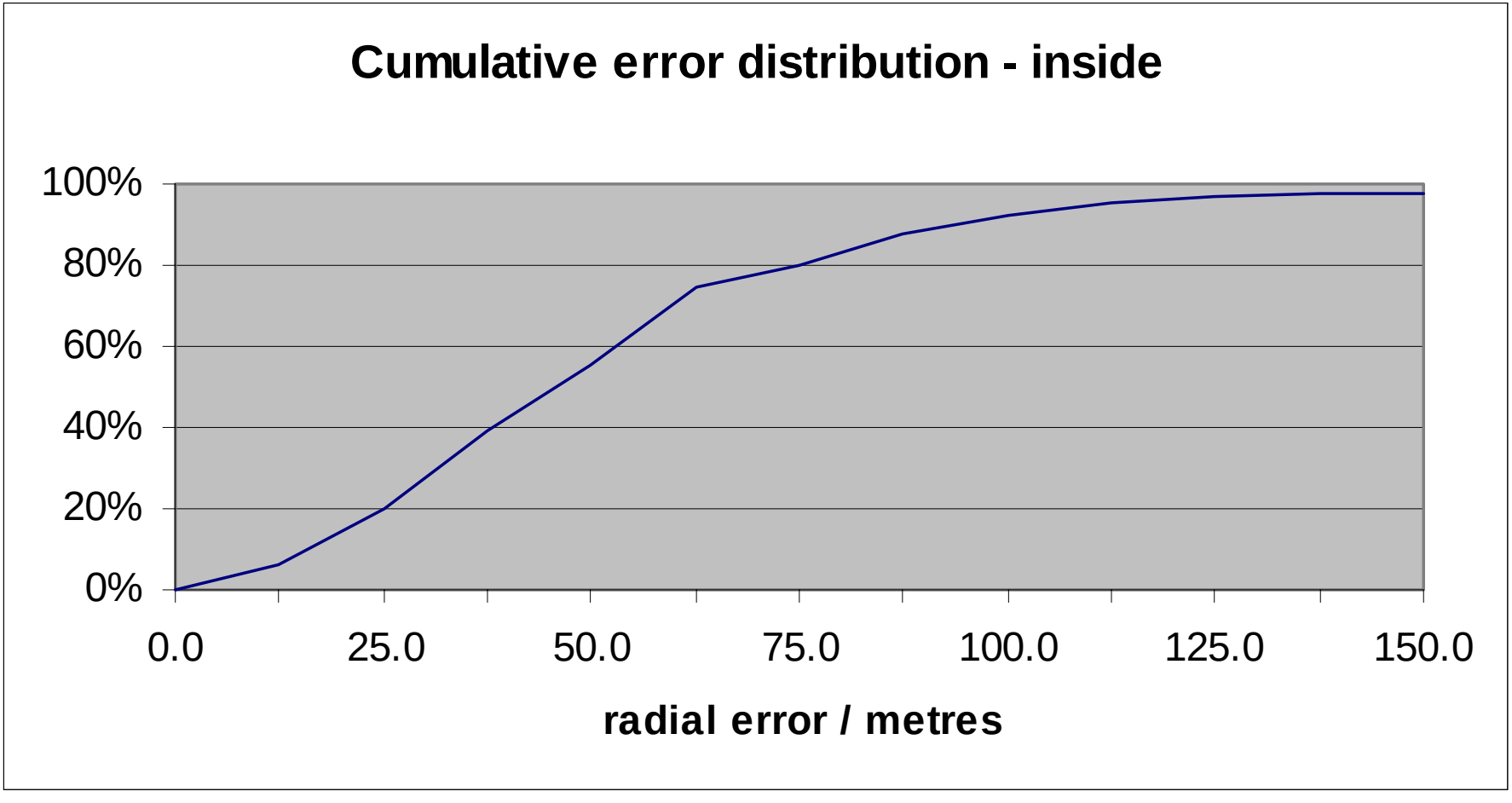
- **FCC Compliance Guidelines**
  - **Testing allows scaling by actual 911 call distribution**
  - **Allows 30 seconds for successive location fixes**
  - **Moving measurements to be used when a suitable testing platform is available, this is in development presently**

- **Conclusions**
  - **The data presented does *not* accumulate measurements throughout a call to improve accuracy**
  - **Stationary measurements are allowable**
  - **No in-building measurements made**
  - **Distribution of measurement locations in suburban radio environment representative of ~ 70% of wireless 911 calls**
  - **Active mode operation with 30 seconds additional measurements will improve accuracy**

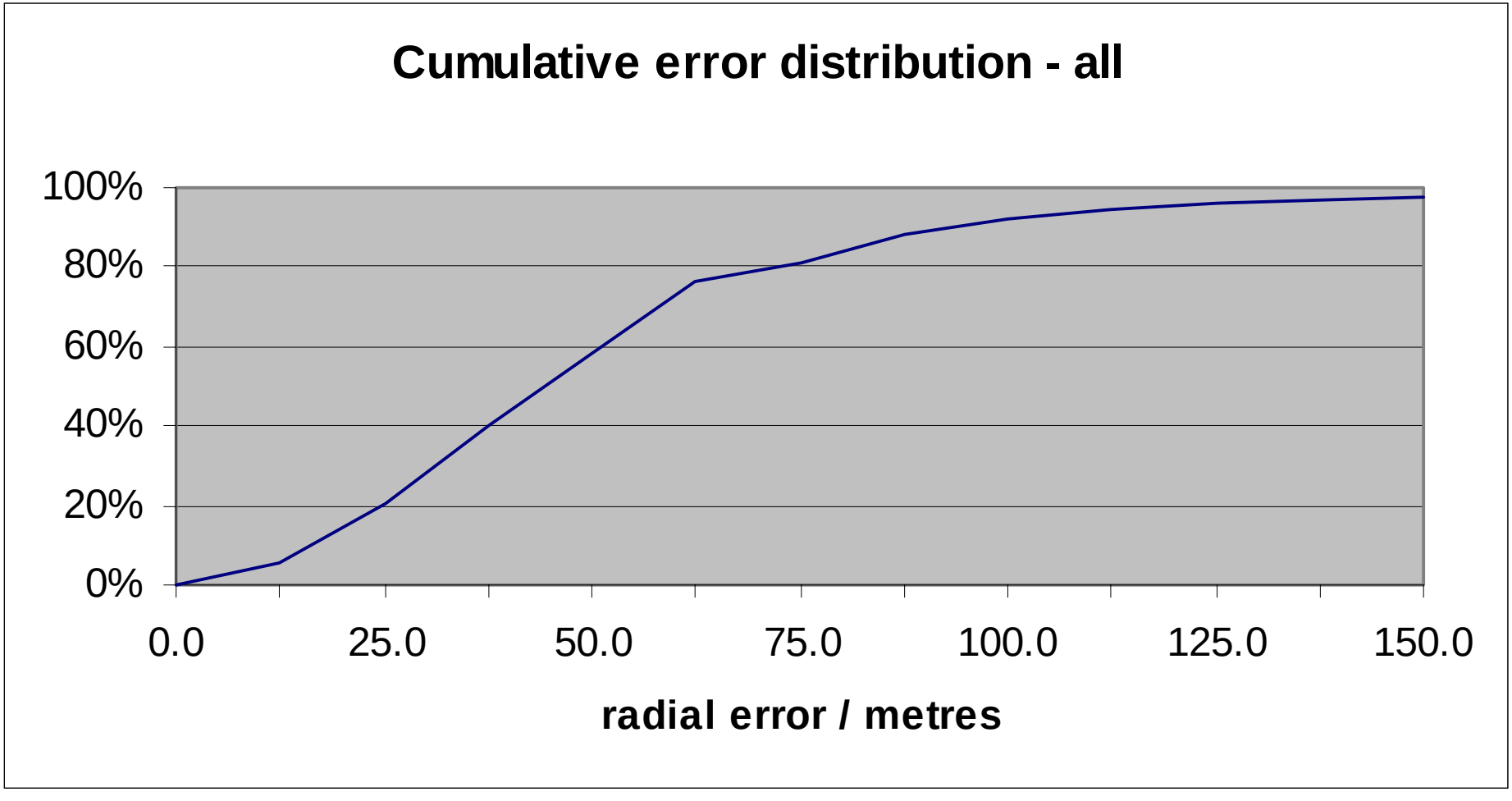
Phase I Results: Outdoor Measurements



Phase I Results: In-vehicle Measurements



Phase I Results: All measurements



Phase I: Results Summary and Conclusions

All Measurements	Inside the vehicle	Outside the vehicle
58.6 % within 50 m	55.5 % within 50 m	61.8 % within 50 m
67.0 % within 57 m		
92.0 % within 100 m	92.4 % within 100 m	91.6 % within 100 m
97.5 % within 150 m	97.5 % within 150 m	97.6 % within 150 m

- The results indicate that E-OTD can approach the handset accuracy requirements of the FCC in these areas
- E-OTD appears, at this stage, to perform well in areas representing ~ 70 % of E911 calls
- Full data set is 7m over the 50m accuracy limit
- Full data set exceeds the 150m (95%) accuracy statistic
- Full data set fully meets accuracy rules in VoiceStream waiver

ATTACHMENT III

NOKIA LETTER TO VOICESTREAM
Dated October 10, 2000

NOKIA

1101 Connecticut Ave. N.W., Suite 910, Washington, D.C. 20036

October 10, 2000

Mr. Brian O'Connor
Vice President of Legislative and Regulatory Affairs
VoiceStream Wireless
1300 Pennsylvania Avenue, NW, Suite 700
Washington, DC 20004

Dear Mr. O'Connor:

Pursuant to your request, this letter provides additional information regarding Nokia's product development plans needed to support Location Services (LCS) in GSM networks. Nokia has a roadmap for products needed to support LCS in GSM networks and has selected BSS-based LCS architecture. In the first phase of this architecture, the following location methods will be supported: Cell Identity (CI) and Timing Advance (TA); Enhanced Observed Time Difference (E-OTD); and stand-alone Global Positioning System (GPS). For the NSS part Nokia plans to provide the Gateway Mobile Location Center (GMLC), and software upgrades to support LCS for the MSC/VLR and HLR.

Nokia has performed its own E-OTD tests and also followed the E-OTD tests performed in Houston in the network of VoiceStream. Nokia considers the results encouraging, and is prepared to provide its customers with the necessary equipment to implement E-OTD, barring any unforeseen circumstances. This equipment includes Location Measurement Units (LMU) type B, E-OTD capable handsets, and software upgrades for BSCs, and BTSs.

One reason why Nokia has selected E-OTD to support LCS in GSM networks is that E-OTD is a standardized location method for GSM. It is included in the GSM standards Releases 98 and 99, and will also be included in future releases such as Release 4 and 5. In addition, for 3G WCDMA systems, the UMTS standards Release 99 includes partial support for the Observed Time Difference Of Arrival – Idle Period Down Link (OTDOA-IPDL) location method. Full support is planned to be included in the Release 4. OTDOA-IPDL is effectively the E-OTD method adapted for WCDMA environment. In compliance with the 3GPP standardization Nokia is supporting the BSS architecture in 3G. The Qualcomm contribution to 3GPP for NSS based architecture and Standalone SMLC is not supported by Nokia.

As you know, Time Of Arrival (TOA) is a network-based location method for GSM. While Nokia carefully assessed this method, we have decided not to include TOA in the product portfolio we offer to our carrier customers for the following reasons: added complexity, generated extra signaling load, and low location capacity. Our tests and analysis have shown us that E-OTD is superior to TOA in each of these areas.

I trust that this letter has been responsive to your request for more information regarding Nokia's

product development plans needed to support Location Services (LCS) in GSM networks. If you have any questions or need additional information, please do not hesitate to call me at (202) 887-5330.

Sincerely,

/s/ Leo R. Fitzsimon
Leo R. Fitzsimon
Director, Regulatory and Industry Affairs
Nokia Inc
Matti Lankinen
LCS Business Program
Nokia Networks