

**FCC Region 19 APPLICATION
764-776MHz and 794-806MHz Channels**

(1.) Agency Name:
City of Stamford

Address:
888 Washington Blvd. FL6
Post Office Box 10152
Stamford, CT 06094-2152
Attn: Captain Gregory D. Tomlin

Broadband Channel Requests

Please identify spacing requirements between channels _____

Site Name	Channel	Frequency	Bandwidth	Latitude	Longitude	Ground Elev.	Power Out	ERP	Ant. Tip	Ant. Gain	Ant. Tilt	Ant. Dir.
None												

(15) Channel Loading

Agency	# of Vehicles	# of Portables	# of Aircraft	# of Marine	# of Pagers	# Laptops/data devices (data req.)
Stamford Fire	50	200	0	0	0	N/A
Stamford Police	75	400	0	0	0	N/A
Stamford EMS	15	15	0	0	0	N/A
Stamford Operations	200	200	0	0	0	N/A
Stamford Public Safety	15	15	0	0	0	N/A

Belltown Fire Department	15	15	0	0	0	N/A
Long Ridge Fire Department	15	15	0	0	0	N/A
Turn of River Fire Department	15	15	0	0	0	N/A
Springdale Fire Department	15	15	0	0	0	N/A

(16) Frequencies Returned

List

None

(17) Frequencies utilized with 700MHz

Site Name	Channel	Frequency	Latitude	Longitude
186 Butternut Hollow Road	A-B-C-D-E	See 17A	41-05-49.3 N	073-38-19.5 W
Landmark Square	A-B-C-D-E	See 17A	41-03-17.1 N	073-32-18.0 W
366 Old Long Ridge Road	A-B-C-D-E	See 17A	41-09-17.3 N	073-35-30.5 W
1349 Newfield Ave	A-B-C-D-E	See 17A	41-06-20.4 N	073-31-34.3 W

(17A) Frequencies utilized with 700MHz

#	Frequency
1	851.1125
2	851.3875
3	851.6625
4	851.7625
5	852.0875

6	852.3375
7	852.7875
8	852.8125
9	853.0875
10	853.3375

(18) Intercommunication Requirements

Agency	Frequencies Used
Belltown Fire Department	Frequencies listed 17A & 154.130 (fire alerting)
Long Ridge Fire Department	Frequencies listed 17A & 154.130 (fire alerting)
Turn of River Fire Department	Frequencies listed 17A & 154.130 (fire alerting)
Long Ridge Fire Department	Frequencies listed 17A & 154.130 (fire alerting)
Springdale Fire Department	Frequencies listed 17A & 154.130 (fire alerting)
City of Greenwich	800 MHz ICALL/ITAC channels
State of Connecticut	800 MHz ICALL/ITAC channels

(19) In the application a list of frequencies will be returned (see # (16)) when the system is completed. Explain how these frequencies are being used.

No frequencies are being returned as a result of this new application. This application is for low-power frequencies to be used by various City of Stamford agencies in mobile repeaters. The mobile repeaters are used to improve portable radio coverage within the City of Stamford operating area. The City operates a 4 site, 10 channel, 800 MHz simulcast trunked radio network that provides in street coverage throughout the City. The mobile repeaters are used to extend coverage into large concrete structures and underground areas that are not served directly by the trunked system. The mobile repeaters use 700 MHz channels in a low power configuration to relay the radio signals from the 800 MHz mobile radio to the portable radio operating at 700 MHz.

(20) Identify how you plan to integrate a list of all frequencies that will not be returned when the system is completed. Explain how you will integrate the existing frequencies with the 700MHz frequencies (see # (17)). Explain the intended use of all frequencies.

The operation of mobile repeaters is a new concept in the City of Stamford. There are no channels currently being used that would be given back when this application is complete.

(21) Explain how the users of the new system will intercommunicate with other public safety agencies operating in lower bands during emergency or disaster situations. Identify the intercommunication requirements of your dispatch center (see # (18))

This application is for low power mobile repeater operation. The 700 MHz channels requested for mobile repeater use will allow first responders using mobile repeaters interfaced to the Stamford 800 MHz trunked system and with VHF and UHF radios for interoperability with other agencies in Fairfield County. Stamford's operation with the 700 MHz low power channels involves 700 MHz between the portable radio(s) and a vehicle mounted repeater. The vehicle mounted repeater is interfaced to 700/800 MHz, UHF and VHF mobile radios. When appropriate for interagency operations portable vehicle repeater radios using 700 MHz are interfaced to radios in other bands through the vehicle allowing cross band communications. In addition to the vehicle based operation the trunked system is interfaced (patched) through the Stamford Dispatch Console to Stamford's VHF High band fire channel- 154.130 used for alerting.

(22) Explain the needs of your agency for a new system in the 700MHz spectrum and why those needs cannot be served by existing communications resources. Explain the deficiencies of your existing system which caused you to apply for new spectrum.

The City of Stamford operates an 800 MHz 4 site trunked radio network with 1500 subscriber units. This system serves all Stamford agencies. The City has grown into a

metropolitan area with a significant number of multi-story high rise buildings, many of which with underground parking areas to which city agencies must respond in performance of their duties. The type of construction used in these buildings inhibits reliable radio communications directly from the mobile or portable radio to the system. To overcome this challenge, the City seeks to operate a number of mobile repeaters that will serve to extend portable/mobile radio coverage into these areas. The mobile repeaters must operate on channels that are sufficiently separated from the system frequencies to prevent interference between the system frequencies and the mobile repeater frequencies. With the recent 800 MHz rebanding there are no channels in the 800 MHz band available to the City that meet this criteria. The City has therefore selected channels in the Region 19 700 MHz allocation that meet these criteria and are set aside for low power mobile operation such as this.

(23) System Justification: Explain why you require this spectrum.

As indicated on line 22, 700 MHz spectrum is required because there is no 800 MHz spectrum that is compatible with the operation of mobile repeaters integrated with our 800 MHz trunking system. All the City's subscriber units (mobile and portable) can be programmed to operate in both the 700 and 800 MHz band. 700 MHz channels for mobile repeater use will allow the City to use the same subscriber units both on the trunk system directly and through the mobile repeater. Mobile repeater operation is required to provide emergency radio communications for first responders in areas where system coverage is inhibited by heavy buildings and/or underground areas

(24) Implementation Time Table: Explain the proposed implementation schedule of your required system.

The City of Stamford is prepared to begin operation on these channels as soon as licensing is acquired. The City has already purchased the equipment required for operation and has been using this equipment on a limited basis with 700 MHz channels available from outside the Region 19 allocation. The City has always intended to move to the Region 19 allocation as soon as licensing could be completed.

(25) Provide detailed information and supporting documentation showing the budget commitments for the completion of the system within the time allowed. (RPC expects a letter committing funds to system buildout.)

As indicate above, the system has already been constructed and equipment is in operation on other channels.

(26) Provide a time schedule of all significant implementation phases including funding, licensing, initial operation, channel loading and completion of your system.

- Funding: Allocated with system contract September 2006.
- Licensing: Rebanded 800 MHz system license STA granted 3/10/2008.

- Licensing: 700 MHz Inherent Channels for temporary operation of mobile repeaters granted January 17, 2007
- Fully Loaded System Operation Commence: July 2008

System is currently in full operation awaiting additional low power 700 MHz channel licensing for full operation of mobile repeaters in all agencies.

(27) Provide an area of operation map detailing city/town/county/state boundaries and waterways. Identify any overlap coverage into neighboring cities/towns/counties/states and waterways. Provide marker identifications and a legend.

(28) Provide engineering studies as identified in "Procedure for Frequency Coordination". The Technical Sub-committee plans to utilize software engineering known as "Comstudy". The Longley-Rice model is used for coverage and interference prediction methodology (See Below - 1. Interference Determination/Protection) because it is freely available in the public domain and has consistent implementations across propagation modeling programs of different sources, unlike Okumura Hata Davidson. All radiated and received power levels are referenced to a dipole antenna. The Technical Sub-committee will verify the accuracy of all engineering studies submitted to the committee. The engineering studies must be submitted in a version of "Comstudy" that is presently in use by the Technical Sub-committee. The Sub-committee in the future may change engineering software and will identify the software engineering required for submission in advance of any Window.

INTERFERENCE DETERMINATION/PROTECTION

This following procedure is the method that Region 8, 19 and 30 have agreed to for defining and evaluating "interference of a substantive nature" as specified in its letter "Mutual Agreement to protect against radio interference in the 700 MHz NPSAC band." Recommended System Reliability

It is recommended that proposed facilities in Region 8, 19 and 30 be designed to provide 50 dBμ receive power levels for reliable portable coverage operations, and 40 dBμ receive power levels for reliable mobile coverage operations.

Coverage and Interference Prediction Methodology

Both TSB-88 (latest edition) and the Longley-Rice propagation model in median mode (50/50/50) shall be used to evaluate coverage and interference for proposed systems in either Region. The Longley-Rice model is used because it is freely available in the public domain and has consistent implementations across propagation modeling programs of different sources, unlike Okumura Hata Davidson. All radiated and received power levels are referenced to a dipole antenna.

Responsible Radiation Control and System Design

In order to promote responsible use of 700 MHz spectrum resources, all applicants are required to control unnecessary radio-frequency (RF) radiation. Therefore for all proposed facilities within the Region, 80% of the 50 dBμ Protected Service Area (PSA) must lie within the relevant jurisdictional boundary, plus an additional eight kilometer buffer zone. The 50 dBμ Protected Service Area shall be assessed using Longley Rice tile analyses.

Reliability Degradation Threshold

All licensed and previously-approved (by Regions 8, 19 and 30) facilities are required to provide co and adjacent channel interference protection to other similarly approved or licensed facilities.

Further, any new application or operations (which may consist of either single multiple facilities) must pose no more than 2.5% Area Reliability Degradation (ARD) at 90% reliability levels to any incumbent's protected service area (PSA), with each individual PSA not to exceed a county-size jurisdiction. All facilities (including licensees and all approved allotments) in aggregate must pose no more than 5.0% cumulative area reliability degradation at 90% reliability levels to any incumbent's protected service area.

The process for determining ARD is as follows:

- Compute the baseline Longley Rice 3-second tile coverage for each incumbent (Victim) co- and adjacent-channel licensee within their jurisdictional area. If the PSA coverage is provided by multiple sites, the coverage is assumed to be the most likely server coverage at each tile location.
- Evaluate the baseline total number of tiles within the Victim jurisdiction that achieve 90% or greater reliability levels using TSB-88 in conjunction with the deployed parameters for Channel Performance Criterion (CPC) at a delivered audio quality of 3.0, and receiver noise floor, and log-normal standard deviation (σ).

◦ Example for typical parameters:

- Receiver Noise Floor = -124 dBm

- $CPC_f = 18$ dB

- $\sigma = 7$ dB

- These, along with the 40 dBμ (approximately -93 dBm at 807.5 MHz) give the following reliability throughout the service area:

$$R = 1 - \tilde{Q}[(-93 \text{ dBm} - (-124 \text{ dBm}) - 18 \text{ dB})/7 \text{ dB}] \sim 97\%$$

where: R = Reliability in decimal, converted to percent, and

$\bar{Q}$ = Marcum's function, representing the cumulative area under a Gaussian distribution curve.

- Evaluate the received power levels of all proposed facilities at all tiles within the Victim jurisdictional area. Combine these into an equivalent interferer using the process outlined in TSB-88.
- Re-evaluate the total number of tiles within each Victim jurisdiction that achieve 90% or greater reliability levels, considering the effects of all proposed facilities.
- The ARD is defined as one minus the ratio of the number of tiles at 90% reliability (or greater) considering proposed facilities and the baseline number of tiles at 90% reliability (or greater).

Evaluation of Adjacent Channel Effects

The evaluation of adjacent channel interference will follow Sections 0 through 0, except that the effective radiated power of the adjacent channel proposed stations will be de-rated to account for Adjacent Channel Coupled Power Ratio (ACCPR) effects as specified in TRS-88. After this de-rating, they will be treated at the same time and using the method as if they as the co-channel interferers.

(29)

Table 1, Horizontal Antenna Pattern, and Table 2, Vertical Antenna Pattern.

dBd at the main lobe.

Polarization, and Gain.

Site Name: No Fixed Sites in this application – Mobile Repeater Only.

Location Number: _____
Antenna Number: _____

**Horizontal Antenna Pattern:
and numbered clockwise (CW).**

Table 1, Horizontal Antenna Pattern

Pattern Reference (degrees)	0
Normalized Horizontal Antenna Pattern (dBd)	1
	2
	3

Pattern Reference (degrees)
Normalized Horizontal Antenna Pattern (dBd)

	180
	181
	182
	183

51	
50	
49	
48	
47	
46	
45	
44	
43	
42	
41	
40	
39	
38	
37	
36	
35	
34	
33	
32	
31	
30	
29	
28	
27	
26	
25	
24	
23	
22	
21	
20	
19	
18	
17	
16	
15	
14	
13	
12	
11	
10	
9	
8	
7	
6	
5	
4	

184	
185	
186	
187	
188	
189	
190	
191	
192	
193	
194	
195	
196	
197	
198	
199	
200	
201	
202	
203	
204	
205	
206	
207	
208	
209	
210	
211	
212	
213	
214	
215	
216	
217	
218	
219	
220	
221	
222	
223	
224	
225	
226	
227	
228	
229	
230	
231	

52	232
53	233
54	234
55	235
56	236
57	237
58	238
59	239
60	240
61	241
62	242
63	243
64	244
65	245
66	246
67	247
68	248
69	249
70	250
71	251
72	252
73	253
74	254
75	255
76	256
77	257
78	258
79	259
80	260
81	261
82	262
83	263
84	264
85	265
86	266
87	267
88	268
89	269
90	270
91	271
92	272
93	273
94	274
95	275
96	276
97	277
98	278
99	279

147	
146	
145	
144	
143	
142	
141	
140	
139	
138	
137	
136	
135	
134	
133	
132	
131	
130	
129	
128	
127	
126	
125	
124	
123	
122	
121	
120	
119	
118	
117	
116	
115	
114	
113	
112	
111	
110	
109	
108	
107	
106	
105	
104	
103	
102	
101	
100	

327	
326	
325	
324	
323	
322	
321	
320	
319	
318	
317	
316	
315	
314	
313	
312	
311	
310	
309	
308	
307	
306	
305	
304	
303	
302	
301	
300	
299	
298	
297	
296	
295	
294	
293	
292	
291	
290	
289	
288	
287	
286	
285	
284	
283	
282	
281	
280	

Table 2, Vertical Antenna Pattern

Pattern Reference (degrees)	Normalized Vertical Antenna Pattern (dbd)
-180	
-179	
-178	

Pattern Reference (degrees)	0		
Normalized Vertical Antenna Pattern (dbd)	1		
	2		

Vertical Antenna Pattern:

Site Name: No Fixed Site in this application – Mobile Repeater Only
Location Number:
Antenna Number:

148	
149	
150	
151	
152	
153	
154	
155	
156	
157	
158	
159	
160	
161	
162	
163	
164	
165	
166	
167	
168	
169	
170	
171	
172	
173	
174	
175	
176	
177	
178	
179	

328	
329	
330	
331	
332	
333	
334	
335	
336	
337	
338	
339	
340	
341	
342	
343	
344	
345	
346	
347	
348	
349	
350	
351	
352	
353	
354	
355	
356	
357	
358	
359	
360	

-130	50
-131	49
-132	48
-133	47
-134	46
-135	45
-136	44
-137	43
-138	42
-139	41
-140	40
-141	39
-142	38
-143	37
-144	36
-145	35
-146	34
-147	33
-148	32
-149	31
-150	30
-151	29
-152	28
-153	27
-154	26
-155	25
-156	24
-157	23
-158	22
-159	21
-160	20
-161	19
-162	18
-163	17
-164	16
-165	15
-166	14
-167	13
-168	12
-169	11
-170	10
-171	9
-172	8
-173	7
-174	6
-175	5
-176	4
-177	3

-129	51
-128	52
-127	53
-126	54
-125	55
-124	56
-123	57
-122	58
-121	59
-120	60
-119	61
-118	62
-117	63
-116	64
-115	65
-114	66
-113	67
-112	68
-111	69
-110	70
-109	71
-108	72
-107	73
-106	74
-105	75
-104	76
-103	77
-102	78
-101	79
-100	80
-99	81
-98	82
-97	83
-96	84
-95	85
-94	86
-93	87
-92	88
-91	89
-90	90
-89	91
-88	92
-87	93
-86	94
-85	95
-84	96
-83	97
-82	98

99	100
	101
	102
	103
	104
	105
	106
	107
	108
	109
	110
	111
	112
	113
	114
	115
	116
	117
	118
	119
	120
	121
	122
	123
	124
	125
	126
	127
	128
	129
	130
	131
	132
	133
	134
	135
	136
	137
	138
	139
	140
	141
	142
	143
	144
	145
	146

-81	-80
	-79
	-78
	-77
	-76
	-75
	-74
	-73
	-72
	-71
	-70
	-69
	-68
	-67
	-66
	-65
	-64
	-63
	-62
	-61
	-60
	-59
	-58
	-57
	-56
	-55
	-54
	-53
	-52
	-51
	-50
	-49
	-48
	-47
	-46
	-45
	-44
	-43
	-42
	-41
	-40
	-39
	-38
	-37
	-36
	-35
	-34

Channel #	Frequency Requested	Used By	Allocation
A	769.00625/799.00625	Stamford Police	Region 19 Low Power

These specific channels are requested by the City of Stamford for compatibility with mobile repeater and 800 MHz system frequencies. These channels are requested because they provide sufficient separation from 800 MHz system frequencies assigned during 800 MHz rebanding. 12.5 KHz. operation on these low power channels is authorized within the Region 19 plan to allow for use of either analog or digital modulation on these channels. The City intends to use both analog and digital modulation on these channels. Analog modulation is preferred by the City for Fire Ground operations and digital is preferred by other user agencies within the City.

(30) Comments: Provide any supplemental information, explanation, or requirements.

	-33
	-32
	-31
	-30
	-29
	-28
	-27
	-26
	-25
	-24
	-23
	-22
	-21
	-20
	-19
	-18
	-17
	-16
	-15
	-14
	-13
	-12
	-11
	-10
	-9
	-8
	-7
	-6
	-5
	-4
	-3
	-2
	-1
147	
148	
149	
150	
151	
152	
153	
154	
155	
156	
157	
158	
159	
160	
161	
162	
163	
164	
165	
166	
167	
168	
169	
170	
171	
172	
173	
174	
175	
176	
177	
178	
179	
180	

Approved as to Form
 Corporation Counsel
 By *[Signature]*
 Date *3-4-09*

The technical information contained in this application has been reviewed by me and is true and correct.

Frequency Coordinator's Signature _____

Printed Name _____

Date _____

Frequency Coordinators Name	
Frequency Coordinators Title	
Coordinators Telephone Number	
Coordinators FAX Number	
Coordinators Company Name	
Coordinators Company Address	
Coordinator Email	

Application Prepared by:	Bob Cruikshank
Title:	Sales Manager
Preparer's Telephone Number	617-312-2682
Preparer's FAX Number	(847) 761-1099
Company Name	Motorola
Company Address	900 Chelmsford Street Lowell, Massachusetts 01851
Preparers Email	Bob.cruikshank@motorola.com
Authorized Company Signature	
Printed Name:	
Date:	

B	769.01875/799.01875	Stamford Fire Ground 1	Region 19 Low Power
C	769.03125/799.03125	Stamford Fire Ground 2	Region 19 Low Power
D	769.04375/799.04375	Stamford Fire Ground 3	Region 19 Low Power
E	769.50625/799.50625	Stamford Fire Ground 4 in fire situations with mutual aid agencies listed on Line 18	Mobile Repeater Interoperability-Region 19

This agency has a firm intention to implement a new/expanded/modified 700MHz system with the time permitted by the FCC and to return for use by other public safety eligible's existing unneeded channels/frequencies. We will provide the committee with semi-annual copies of all progress reports. Should implementation not begin or be completed with the time approved by the FCC or channel loading projections are not achieved, the channels will be returned for re-allocation to other public safety agencies.

This agency will comply with all applicable requirements for common channel implementation and participation as required in the 700 MHz Plan - Region 19

The information contained in the application and attachments is true and correct.

Applicants Name	
Applicants Title	
Applicants Telephone Number	
Applicants FAX Number	
Applicant Agency Name	City of Stamford, Connecticut
Applicant Address	
Applicant Email	

Signature *George D. Tomlin*
 Printed Name George D. Tomlin
 Date 03-04-2009

Approved as to Form
 Corporation Counsel
 By *GA*
 Date 3.4.09