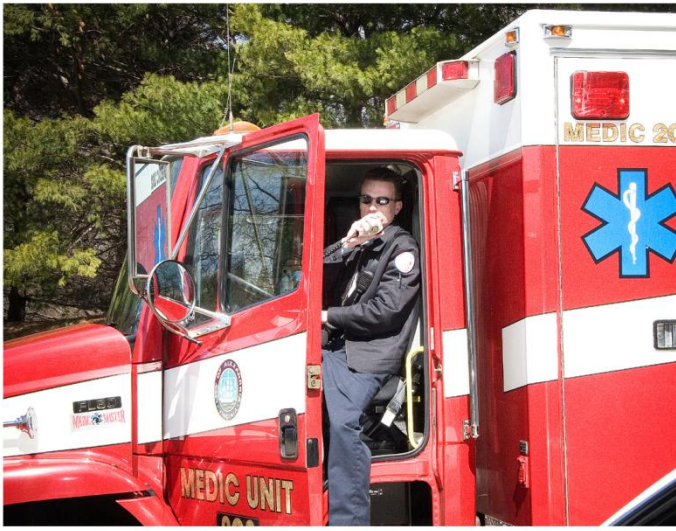

A Practical Guide to Narrowbanding

Homeland Security

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Introduction – What is Narrowbanding?

In December 2004, the Federal Communications Commission (FCC) announced that all non-Federal radio licensees operating 25 kHz systems in the 150-174 MHz and 421-512 MHz bands (VHF and UHF) must migrate to more efficient 12.5 kHz (narrowband) channels by January 1, 2013.[1] Unfortunately, many critical emergency response radio systems used today still operate on 25 kHz radio channels.

The FCC rule applies to both conventional and trunked radio systems and affects all FCC-licensed State and local emergency response radio systems. Wideband radio operation will violate FCC regulations beginning in 2013, and agencies that do not meet the deadline face "enforcement action, including admonishments, monetary forfeitures, and/or license revocation, as appropriate." [2]

Transitioning to narrowband radio can make some portable, mobile, paging, base-station and repeater radios obsolete, resulting in a loss of coverage or capacity. Emergency response radio system operators across the US have begun implementing these changes, but coordination with interoperability partners is necessary to avoid disruption of crucial communications capabilities.

This guide is provided by the US Department of Homeland Security's (DHS) Office of Emergency Communications (OEC) to showcase best practices for overcoming common challenges when transitioning to narrowband. The guide contains five State case studies that illustrate lessons learned by emergency response communities during the narrowband transition. The appendices give further assistance in terms of a customizable letter to raise awareness of the narrowband transition among local stakeholders, background information about the narrowbanding decision, and a step-by-step guide to narrowbanding one's FCC license. This guide is an ideal companion to the "FCC Narrowbanding Mandate: A Public Safety Guide for Compliance" published by the International Association of Fire Chiefs and the International Municipal Signal Association.

Key Deadlines

(1) As of **January 1, 2011**, the FCC no longer accepts applications for new wideband 25 kHz operations or expansion of existing wideband 25 kHz operations.

(2) By **January 1, 2013**, all non-Federal FCC licensees operating on the VHF and UHF bands must use 12.5 kHz (11.25 kHz occupied bandwidth) or narrower channels or use technology that achieves the narrowband equivalent of one voice channel per 12.5 kHz of channel bandwidth or a data rate of at least 4800 bits per second per 6.25 kHz.

As of **January 1, 2011**, no new 150-174 MHz or 421-512 MHz wideband equipment may be certified. Production and sale of existing models may continue until January 1, 2013. After January 1, 2013, all 150-174 MHz or 421-512 MHz band equipment manufactured, imported, or certified in the United States must be capable of super-narrowband transmissions (6.25 kHz).

Risks

Non-Compliance: The FCC has stated it will take any non-compliant systems off the air after the deadline or assess Federal penalties including fines. Additionally, the FCC will begin refarming the new 12.5 kHz channels created by narrowbanding, which could result in interference with any wideband channels still in operation.

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[1] Federal Communications Commission Third Memorandum Opinion and Order, Third Further Notice of Proposed Rule Making and Order, WT Docket No. 99-87, 19 FCC Rcd 25045 (2004).

[2] FCC Public Notice DA-09-2589, released December 11, 2009.

Reduced Coverage: Some jurisdictions may experience a reduction in narrowband coverage compared with wideband. It may be necessary to install additional equipment to maintain coverage, particularly in large rural areas.

Confusion about the mandate: There are several myths about narrowbanding which may hinder compliance. See below for a list of common myths with corrections.

- Myth: Only digital radios are narrowband-compliant.
  - **Truth:** Project 25 (P25) radios satisfy the narrowbanding requirement, but purchasing digital equipment is not necessary in order to narrowband.
- Myth: Narrowbanding doubles each licensee's channels.
  - **Truth:** Narrowbanding does not entitle licensees to twice as many channels, or any extra channels.
- Myth: Frequencies will shift.
  - **Truth:** Channel centers will stay the same, so there is no need to change frequencies. Licensees will simply narrow around their existing channel center.
- Myth: Only new equipment is narrowband-compliant.
  - **Truth:** Equipment may not need to be replaced. Many radios, particularly models manufactured after 1997, are narrowband-capable and can be reprogrammed.
- Myth: Narrowbanding and rebanding are the same.
  - **Truth:** Rebanding is currently taking place in the 800 MHz bands and is unrelated to narrowbanding.

Benefits

More space/More efficient use of spectrum: The emergency response community is running out of channels in the VHF and UHF bands. The FCC plans to redistribute (refarm) newly created channels to help new emergency responder agencies obtain channels and enable existing agencies to expand.

Transition of old equipment: Since manufacturers began making narrowband-capable equipment in 1994, non-compliant equipment is likely to be more than 16 years old. Many agencies will realize significant safety benefits by upgrading to new equipment with more capacity and features.

Practical Steps for a Smooth Narrowband Transition

The deadline is drawing near, and there is varied and often conflicting guidance about narrowbanding. The following steps should help affected VHF and UHF licensees comply with the narrowbanding mandate while making wise long-term investments.

Getting Started

1. **Assign personnel to lead the narrowbanding effort.**

- Assemble a small team to lead your agency's narrowbanding transition.
- Research FCC notices and other public narrowbanding guidance.
    - Please see the Bibliography for a list of helpful narrowbanding resources.

2. **Communicate frequently with neighbors and any interoperable groups, making use of interoperability resources such as Statewide Interoperability Coordinators (SWICs) and Statewide Interoperability Governing Bodies (SIGBs).**

- **Challenge:** Members of multi-jurisdictional or multi-agency communications groups such as MARs and HSRs may find their interoperability compromised if group members narrowband at different times.
- **Mitigation:** Make sure to consider interoperable groups such as Homeland Security Regions (HSRs) or Mutual Aid Regions (MARs). Coordinate with your SWIC if possible.
    - If you need contact information for your SWIC, email OEC@dhs.gov.
- **Mitigation:** Establish a mutual timeframe for narrowbanding.
- **Challenge:** Local radio shops and service stations may be overwhelmed if multiple groups request narrowbanding assistance.
- **Mitigation:** Contact radio shops in advance to schedule narrowbanding.
- Consider using OEC's Frequency Mapping Tool (FMT) to assess the status of narrowband efforts in your area and find your FCC Registration Number (FRN).[3]

3. **Assess current equipment for narrowband capability.**

- Perform field tests if you are uncertain about your equipment's narrowband capabilities.
- Determine any additional needs, such as P25 upgradeable equipment or narrowband-capable pagers.
- Consider possible coverage reductions due to narrowbanding, and anticipate any new infrastructure that may be necessary to maintain range.
- Consider using a chart such as the example below to take stock of your current equipment.

[3] The FMT is an OEC Technical Assistance (TA) tool which uses FCC license data to depict the narrowbanding status of all radio licensees within a certain area. FMT allows for specific searches by Call Sign or Frequency. The results can then be displayed via the map interface or the reporting capability to identify additional data such as FRN, contact information and license expiration dates. It is available online at http://www.publicsafetytools.info/start_fmt.php

Table 1: Sample narrowband equipment inventory

Equipment Inventory	Radios	Repeaters	Voters	Pagers
Narrowband Capable	#			
Analog				
Digital				
P25 Compliant				
Brand				
Frequencies				
Encrypted				
Non-encrypted				
Number of Channels				

- **Challenge:** Range of radios may be reduced. Although not universal, some narrowband receivers may experience reduced coverage compared with their wideband counterparts.
- **Mitigation:** Radio users with large jurisdictions may need to install more towers and repeaters to maintain their range.

4. Determine quantity of equipment to be replaced or retuned.

- **Challenge:** Different step size/Lower margin for error when tuning
  - It is necessary to be more precise when tuning to a 12.5 kHz channel than a 25 kHz channel; some older radios may not have step sizes compatible with your new channels.
- **Mitigation:** Consider step size when assessing radios for narrowband capability.
- Depending on the volume of equipment being replaced, you may decide it is a good time to switch to a different frequency.
- **Challenge:** Very few pagers are narrowband capable.
  - Some paging tones may need to be reassigned.
  - There are 14 paging-only channels exempt from narrowbanding:
    - 152.0075 and 157.4500 MHz in the Public Safety Pool
    - 152.480, 157.740, 158.460, 462.750, 462.775, 462.800, 462.825, 462.850, 462.875, 462.900, 462.925, and 465.000 MHz in the Business Industrial Pool[4].
- **Mitigation:** Purchase narrowband-capable pagers or use replacement technology.

5. Check FCC licenses for any special concerns, such as super-narrowband emissions, proprietary emissions, or quiet zones.

- Add narrowband emissions to your FCC license, if planning to narrowband within the next 12 months.
- See Appendix C, "How to Modify your FCC License for Narrowband."

6. Get quotes from vendors.

- Avoid discounted sales of wideband-only equipment.
- Check radio step size carefully to ensure that new equipment can tune to necessary frequencies. Old radios or scanners that used 5 kHz or 6.25 kHz steps may need to be replaced with 2.5 kHz step models.[5]

[4] Med Channels 163.250, 150.775 and 150.790 MHz are not exempt, as these channels are shared with Federal Government users who must narrowband as part of the Federal Government narrowbanding effort.

[5] 7.5 kHz spacing was chosen for the VHF band in order to reduce the burden on existing licensees.

- If purchasing digital equipment, determine whether it meets P25 standards or is P25 upgradeable. Increasing numbers of super-narrowband, digital radios are on the market. Since the FCC has not mandated a digital standard, those radios (even some popular brands) will not all meet P25 standards.
- Consider purchasing from the State contract system to avoid supply problems.
- Check the Civil Air Patrol list of narrowband-capable radios.[6]
- Consider how many channels the radio can accommodate. Radios with only 4 or 16 channels may fill up and be unable to accommodate UHF Tactical[7] and other interoperability channels.

7. Request funding and/or apply for grants.

- **Challenge:** Public services are facing deep budget cuts.
- **Challenge:** Public budget cycles limit the pace at which officials can act before January 1, 2013.
- **Mitigation:** Start the budgeting process early to allow adequate time for securing funding.
- **Challenge:** Some grant opportunities may not apply to narrowbanding expenses.
- **Mitigation:** Identify and apply for grants that allow for narrowbanding activities.
  - Review available grant resources, such as the FCC narrowbanding website: http://www.fcc.gov/narrowbanding
  - Review the SAFECOM 2011 Grant Guidance[8] (excerpt below). Narrowbanding costs are allowable under the Interoperable Emergency Communications Grant Program.

3.3 Consider the FCC Narrowband Mandate

In December 2004, the Federal Communications Commission (FCC) mandated that all public safety licensees operating 25 kHz systems in the 150-174 MHz and 421-512 MHz bands (VHF and UHF) move to 12.5 kilohertz (kHz) narrowband voice channels and highly efficient data channel operations by January 1, 2013.

To assist State, regional, local, and tribal levels of government in achieving this mandate, many grants that fund interoperable communications equipment (i.e., most DHS grants) allow grant funds to be used for narrowband-related activities, including:

- Development of narrowband plans
- Assessment of narrowband compliant assets and capabilities
- Training associated with narrowband transition
- Replacement of non-narrowband compliant equipment
- Acquiring/upgrading tower sites needed to comply with narrowband conversion[9]
- Reprogramming existing equipment to comply with narrowband conversion

Grantees are encouraged to allocate grant funds (where allowable) to plan and implement narrowbanding activities that will ensure compliance by the FCC-mandated deadline of January 1, 2013. Generally, Federal licensing fees are *not* allowable under most Federal grants. Grantees are encouraged not to delay on the implementation of this effort as non-compliant public safety agencies may not be able to communicate with systems operating on new narrowband channels; even if communications are possible, they may be degraded.[10]

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[6] https://ntc.cap.af.mil/comm/equipment/equipment.cfm

[7] U-TAC (UHF Tactical), V-TAC (VHF Tactical), and I-TAC (International Tactical) channels are low power narrowband simplex channels. They are national interoperable channels and can be used by any public safety agency as simplex tactical channels. For more information, please see the DHS OEC-published National Interoperability Field Operations Guide (NIFOG), which lists all national interoperable channels. http://www.safecomprogram.gov/SAFECOM/nifog/ Another resource is the FCC 00-348 Third Memorandum Opinion & Order, Third Report & Order, currently available online at: http://www.siec.wa.gov/projects/files/FCC_Report_and_Blanket_Authorization_Order.pdf

[8] http://www.safecomprogram.gov/SAFECOM/grant/default.htm

[9] Some Federal grants do not allow construction or similar ground-disturbing activities. Consult the specific grant guidance and the grant office.

8. **Pick a good time to narrowband, considering the schedules of neighbors, staff availability, and radio shop resources. If possible, coordinate with other reprogramming activities.**

- Determine how many times you will need to touch (reprogram) the radios.
- Ensure that vendor efforts are coordinated if you have multiple vendors.
- Consider incorporating narrowbanding into normal annual or bi-annual equipment maintenance.
- Consider sharing technical resources (radio technicians, trainers, etc.) with surrounding agencies.
- Notify any surrounding agencies that may have the same radio channels programmed into their equipment.

Switching to Narrowband

9. **Switch to narrowband on or before December 31, 2012.**

- **Challenge:** Interference during the transition process
  - Narrowbanded audio will seem weak (quiet) when transmitting to a wideband radio.
  - Wideband audio will seem loud and voice peaks may be clipped when received by a narrowbanded radio.
- **Mitigation:** Narrowband infrastructure and subscribers simultaneously if possible. Once the infrastructure is narrowbanded, you will need to narrowband the subscribers in order to communicate. If your agency has multi-channel radios, the new narrowband channels can be added in advance and then activated after narrowbanding the infrastructure. A best practice is to mark the radios to show (1) whether they have been reprogrammed, and (2) whether they are currently set to wideband or narrowband mode. After January 2013, it is best to remove all wideband modes of operation from the radio to prevent confusion.
- Coordinate and collaborate with interoperable jurisdictions up front to reduce the number of times radios need to be adjusted or reprogrammed. There is no set number of times that you should touch the radios. Make sure to find out when other agencies are changing their frequencies, and communicate when you are narrowbanding so that everyone can transition as efficiently as possible.
- Use gateway solutions and bridging systems only as an interim solution for maintaining interoperability with neighbors while your transition is under way, not as a long-term solution to replace the need for narrowbanding.
  - **Challenge:** Level of effort/Lack of agency technicians. Whether purchasing new radios or simply retuning, it will take time for radio users to adjust and become familiar with their new equipment. Many agencies which previously had in-house radio technicians have lost personnel due to budget cuts.
- **Mitigation:** Train staff in-house to reprogram radios.
- **Mitigation:** Combine narrowbanding with normally scheduled equipment maintenance.

10. **Adjust FCC licenses to remove wideband emissions.**

- See Appendix C, "How to Modify your FCC License for Narrowband."

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[10] *Office of Emergency Communications: Fiscal Year 2011 SAFECOM Guidance for Federal Grant Programs, Section* 3.3. Online. http://www.safecomprogram.gov/NR/rdonlyres/7C73CFA8-DC8B-487C-82A0-42BD7C06F3BA/0/FY_2011_SAFECOM_Guidance_121510.pdf

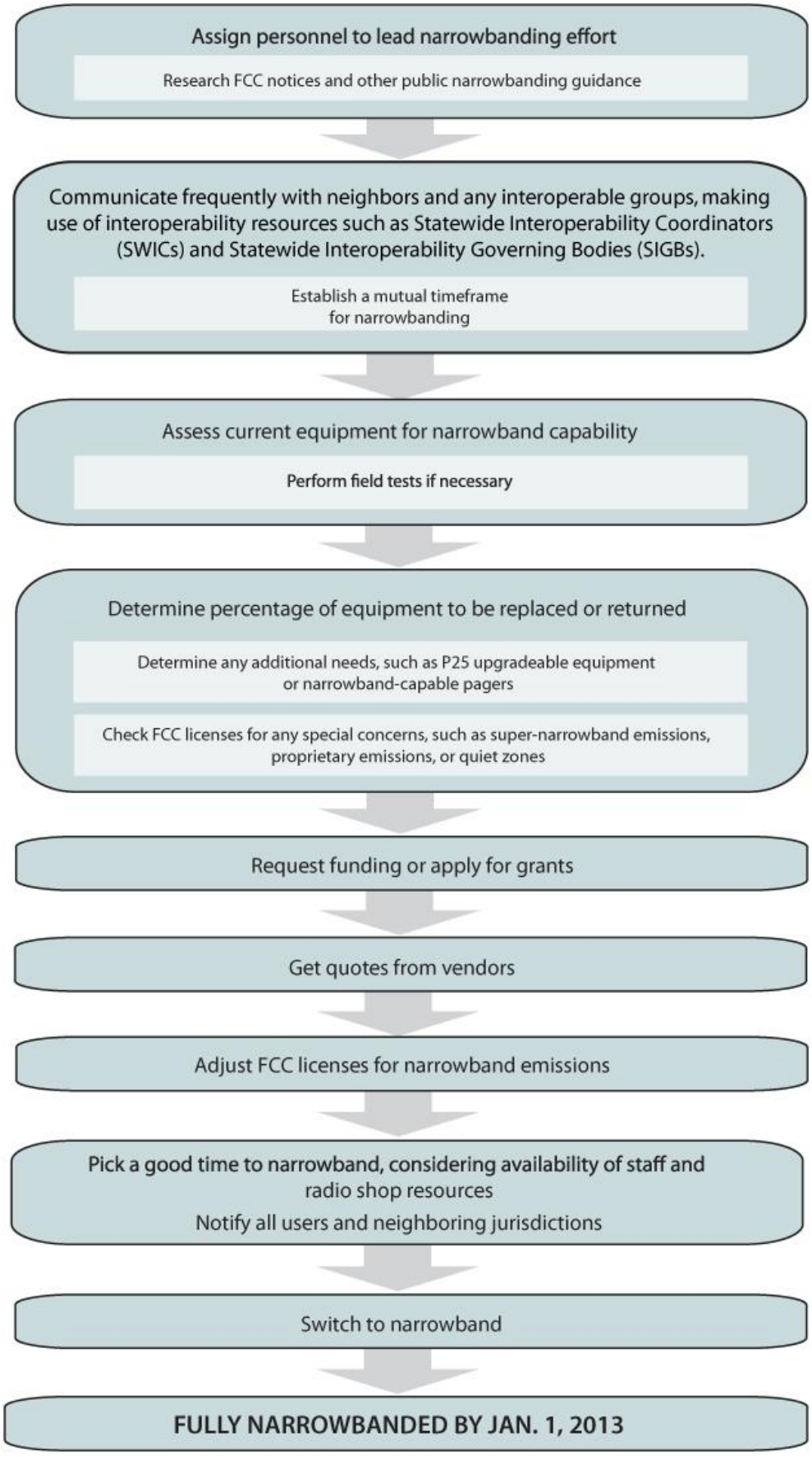


Figure 1: Suggested steps to narrowbanding

Case Studies: Lessons Learned by Emergency Response Communities

The following are narrowband transition case studies from California, Massachusetts, Missouri, Nevada, and Virginia. Read on to see how emergency responders around the Nation are overcoming narrowbanding challenges and pioneering best practices.

State of California

California and the City of Fresno work to comply with the narrowbanding mandate while coping with logistical issues and budget cuts.

> "One thing we're taking advantage of while making the investment in narrowbanding now is the chance to use IP communications as the backbone. We've been using a voting system that requires channel banks and lots of hardware, but now we can go digital with no distortion or audio issues. It allows us to get rid of the voting system and multiplexing hardware, simplifying the fixed radio infrastructure."
>
> --Mike Dottai, Communications Manager for the City of Fresno

"The major challenge in California will be coordination," said Don Root, Assistant Communications Manager for the San Diego County Sheriff's Department and a former California Statewide Interoperability Coordinator. "Coordinating the transition of a statewide law enforcement or fire interoperability channel with as many as 70,000 licensed mobile and portable radios is no easy task." Don went on to mention that San Diego had been preparing by replacing radio equipment, but was waiting on California's schedule for narrowbanding the interoperability channels and the State fire and forestry services. After finding out the State schedule, San Diego County will reprogram its mountain top base stations and subscriber radios.

In California's Central Valley, Fresno found a $30 million budget shortage to be a more daunting task than coordination. Mike Dottai, Communications Manager for the City of Fresno, explained: "It's pretty bleak – hundreds of positions are being cut as our organization contracts. We're using 1980's equipment for the police, and the fire department is even older. We've been searching for grants everywhere we can – stimulus funds, interoperability grants, trying to see if we can combine opportunities."

Fortunately, Fresno's mobile and portable radios are current, and all handhelds for the fire and police departments are modern enough to be narrowband-capable. Fresno avoided problems with radio support availability by ordering through the State and Federal contract systems. "In-house maintenance staff is reinforced by several local vendors," said Mike. "When the Fresno Fire Department (FD) contracted to provide fire protection services to the North Central Fire Protection District, they quickly trained firefighters in-house to clone the mobiles and portables. We are losing most of our radio technicians in budget cuts, so we're looking at something similar for the police department. I've been in the communications business for 40 years, and the current combination of fiscal austerity and the narrowbanding mandate presents an unprecedented challenge."

Challenge: Limited radio shop resources
Best Practice: Order through the State contract system
Challenge: Loss of agency technicians
Best Practice: Train staff to reprogram equipment in-house

Nevertheless, Mike sees the narrowbanding mandate as a chance to leap ahead, and Fresno is now taking the first steps toward narrowband compliance. The city is situated between two mountain ranges, so emergency responders use mountain top repeaters on each side of the valley. The Fresno Police

Department (PD) recently licensed and installed their first UHF narrowband repeater on a 1600' mountaintop. Mike said "Normally we wouldn't need something that big to give us coverage, but this will give us range and interoperability if the Fresno PD has to leave the city and assist the outlying areas"

Meanwhile, Fresno's FD has installed two narrowband analog VHF repeaters. Fresno has a professional FD and has contracts to provide service for three nearby districts as well as the Fresno/Yosemite International Airport. "We've had no failures and no loss of coverage with the narrowband repeaters," Mike said. "Our personal experience is that the new repeaters perform well."

Commonwealth of Massachusetts

Gerry Reardon, Chief of the Cambridge Fire Department and Chair of the Communications Interoperability Subcommittee for the Metro Boston Homeland Security Region offers valuable advice on narrowbanding gained from his experience in Massachusetts.

"Many in public safety have seen or been made aware of the narrowbanding issue, but this does not seem to be the case with non-public safety entities such as local government channels for public works, water districts, schools, emergency management, elder care, and other governmental run communications systems that fall under this mandate of frequencies in the VHF and UHF channels below 512 MHz."

--Chief Gerry Reardon, Cambridge Fire Department

For Boston, coordination and awareness is the key to planning a smooth narrowband transition. The Boston Urban Areas Security Initiative (UASI) is comprised of nine strongly independent cities and towns. In order to sustain their recent gains in interoperability, it is crucial that these communities narrowband in coordination with their neighbors.

Most of the UASI communities are assessing the scope of their transition and soliciting quotes. Budget planning is the most time-sensitive issue for Boston, since there are not many cycles left between now and the end of 2012.

Challenge: Finding the money to replace or retune equipment
Best Practice: Educate public officials on the importance of narrowbanding as a budget item

The nine communities have agreed that no one will narrowband until everyone knows each community's timeline. They are currently developing a migration plan, keeping in mind that any disparities between communities that narrowband and those that have not yet will need contingency plans and minimum levels of interoperability during the gap.

Chief Reardon provided some insight about items to consider when narrowbanding: "When is the funding available? When is the contractor available? When are your local adjacent communities going to switch? How many entities does your radio contractor have to narrowband? What are their capabilities? How many local and regional channels are in your radios that need to be changed? A critical question for everyone is how many times will my radios need to be re-programmed?"

He continued "It is realistically not feasible…to assume that everyone will magically swap at the same time. This will be a risk management decision that will affect virtually every jurisdiction's communications decision-maker. For this reason it may be necessary after careful consideration that your radios need to be re-programmed more than once. If you complete narrowbanding before all your neighbors, how does this affect your ability to communicate during mutual aid situations? When will your regional mutual aid networks change? When will your county or State change?"

"Many in public safety have seen or been made aware of the narrowbanding issue, but this does not seem to be the case with non-public safety entities such as local government channels for public works, water districts, schools, emergency management, elder care, and other governmental run communications systems that fall under this mandate of frequencies in the VHF and UHF channels below 512 MHz."

Challenge: Confusion or lack of awareness of the narrowbanding mandate
Best Practice: Reach out to local officials, both individually and at meetings or conferences. Consider sending an educational memo.

To combat this lack of awareness, Chief Reardon sent an educational memo to the regional chiefs and stakeholders, clarifying in particular that it is not limited to fire, law enforcement, and emergency medical services. A similar letter template is available in this document, in Appendix A: Customizable Letter to Local Officials with Budget Authority.

Chief Reardon also cautioned the emergency response community to be mindful of "the cost associated with this FCC mandate. Jurisdictions, whether large or small, must secure funding to accomplish the requirements of the switch…The costs will vary depending on equipment. Some equipment will need to be retuned if it is already capable of accepting a 12.5 kHz narrow channel, and some equipment will need replacement. It should be noted that the deadline is January 1, 2013, which means completion prior to midnight December 31, 2012."

State of Missouri

The Missouri Department of Transportation (MoDOT) is a good example of taking the opportunity to make a leap forward in interoperability while complying with the narrowbanding mandate.

> "We found narrowbanding daunting at first, but once we got the money secured, getting it done was really not near as bad as we thought it would be."
>
> --Rick Bennett, MoDOT Emergency Management Coordinator

MoDOT switched to narrowband in 2003. "We have an analog high band VHF system with about 5000 mobile radios, 60 repeaters, 10 dispatch base/control stations, a small number of portables and fixed base mobiles" explained Rick Bennett, MoDOT's Emergency Management Coordinator.

"Sometime prior to the MoDOT narrowbanding, we had updated many of our existing repeaters as a maintenance initiative, and that helped keep the cost of actual narrowbanding down to about $1.7 million for equipment costs only (all labor was performed in-house). It was a great help that our narrowband mobiles were able to operate on the wideband repeaters, so we didn't have any urgent time constraints. We got the bulk of the day-to-day radios narrowbanded over 4 to 6 months."

Rick estimates that MoDOT replaced about 3,000 mobile radios, six base stations, and five portable radios. "We've got about 5,000 radios, but only had to replace about half of them, because anything from the late 1990's was already narrowband compliant."

Challenge: Securing funds to replace or retune radios
Best Practice: Spread the transition across two fiscal years, if possible
Best Practice: Negotiate for bulk purchases or take advantage of prices available through State contract or Council of Government agreements

"We didn't have any grants, so we scrounged up the funds from across the operating funds of our 10 districts and the central office. Of course, we were in much better shape in 2003 than we are now, but we still spread the transition out over two fiscal years so as to soften the blow."

Rick said that MoDOT realized a lot of benefits. "We essentially had a new radio system after narrowbanding was complete, and we were able to replace a lot of old equipment with no change in system coverage. Plus, we got a great deal on our mobile radios when we put out a bid for 1,500 of them at once. We were able to achieve all of the same brand/model of control stations and repeaters, and all of our mobile radios are now capable of a statewide, standard channel load with alpha-numeric channel names."

"We've had no interference problems at all – in fact, we've reduced interference by going narrower, since the FCC hasn't refarmed those extra narrowband channels yet. We're essentially operating narrowband channels on a wideband license. We found narrowbanding daunting at first, but once we got the money secured, getting it done was really not near as bad as we thought it would be."

State of Nevada

"We can page individual cell phones, but have run into issues with that because phone text messages are often delayed for hours or even days! So we don't want to rely wholly on cell phones or text messaging."

--Jake Conely, Captain, City of Sparks Fire Department

Craig Harrison is the Washoe County Telecommunications Manager, and runs Washoe's three-tower paging system. The paging towers have a 300-mile range throughout rural Nevada and were built in the early 1990's. Since then, neighboring communities have gradually joined on to the system, using pagers to communicate with their volunteer fire departments.

"Volunteers are an integral part of the emergency response community around here, but you can't get a volunteer to pay for new pagers. And these rural counties with a lot of Federal land don't have the revenue to contribute to updating the paging system. They've been hit by the economy and layoffs, and they'd rather keep officers in the field than update the radio systems. Washoe County got an estimate of about $750,000 to narrowband everything – towers, repeaters, and pagers - but we have no money for it," said Craig. He has applied for a waiver from the FCC, but isn't sure about his chances. Unable to secure grant funding, he worries that many in rural Nevada may be worse off.

Challenge: Very few pagers are narrowband capable
Best Practice: Explore communication alternatives such as automated phone systems

Jake Conely, a captain in the City of Sparks Fire Department, has been using the Washoe County paging system for years. His department recently purchased a Telestaff automated phone program and, if the paging system is shut down, might explore using a phone tree to automatically dial designated groups with pre-recorded messages.

Jake explained, "We can page individual cell phones, but have run into issues with that because phone text messages are often delayed for hours or even days! So we don't want to rely wholly on cell phones or text messaging."

Washoe County's radio system, upgraded in 1999, is 800 MHz and exempt from the narrowbanding requirement, but doesn't have the same range as the pagers.

Challenge: Range of radios may be reduced
Best Practice: Test radios to verify narrowband performance

Craig had a word of caution for those that bought earlier radios labeled as narrowband compliant.

"Back when narrowbanding was first starting to become well-known, many radio manufacturers simply narrowbanded the filter at the front end, but not at the back end. That radio can filter on the front end to prevent interfering with other channels, but the signal is getting squashed, not amplified like it was before. So the radio will work on a narrowband repeater site, but will not be able to accept as weak a signal as before or have as much range. If you formerly had an 80-mile radius, it may get cut down to a 50-60 mile radius. The only solution is really to take them out and test them."

Commonwealth of Virginia

Tazewell County

Tazewell County, Virginia has done well thanks to early coordination and planning. Derrick Ruble, Director of Emergency Communications and 9-1-1, explains how he is coordinating over 31 different agencies in and around the county during their simultaneous narrowbanding transition.

"Lots of folks are concerned with being interoperable, but we weren't even operable! Some of our equipment is over 25 years old." Derrick said.

Challenge: Maintaining interoperability with neighbors and within multi-jurisdictional or multi-agency communications structures
Best Practice: Communicate and coordinate the narrowband transition with all neighbors and interoperability groups

"We sat down and planned [narrowbanding] from day one. We have a committee with representatives from every organization branch and county department, budgets, emergency services, every jurisdiction. Everyone's been involved and aware since day one." Derrick said. Tazewell County also sent out notices to the local public safety communities to create awareness of the switch to narrowband. A similar letter template is available in this document, in Appendix A: Customizable Letter to Local Officials with Budget Authority.

Derrick and his team researched and brought radio options to the committee. "We picked a communications system, bought 20 of the radios, and did a demo for the committee. We then field tested it and had 99 percent positive reviews from the end users. Of course, nothing's perfect, but considering the cost limitations, we're very happy with it."

Derrick has run into some stumbling blocks. Seventeen out of the 18 fire departments involved are volunteers, and it will take over $100,000 to outfit them with narrowband-capable pagers. There are limited models on the market, and each pager costs about $300-400. Tazewell County will pursue the two channel option so if one dispatch channel goes down, a backup is already online.

"We have also had great support from the former Commonwealth Interoperability Coordinator Constance McGeorge and the Virginia Department of Emergency Management, plus excellent coaching from (David Warner of the Virginia Information Technologies Agency [VITA]). We got an $872,000 Public Safety Interoperable Communications (PSIC) grant for Virginia operability/interoperability. We used the PSIC grant money to move onto one frequency band (VHF), replace all our outdated equipment, and go to a single brand, single source for all 31 agencies. Plus, it's digital ready and P25 upgradeable! We went with a system that had come up on the State contract. Now we can program in-house, everyone is on the same platform, and we can all maintain our own systems and frequency ranges. We're hoping at the end of this year we'll have 90 to 95 percent equipment installed, and just a little more time for the repeater equipment."

Derrick offered this word of advice: "Price is on everyone's mind, but please do not think that price should be your number one decision-maker."

Charlotte County, Virginia

Susan Adams, the Deputy County Administrator for Charlotte County, tells about the successes and

"We had one vendor for the portables and mobiles, and another vendor for the repeaters and the voter. The only problem identified with having two vendors was a disconnect in communication and coordination efforts. Therefore, during the conversion and transition period, we were faced with audio and transmission problems. Once we realized that both vendors had not yet narrowbanded their equipment, the issues were addressed and resolved."

--Susan Adams, Deputy County Administrator for Charlotte County

challenges of being an early narrowband adopter.

"When we first set out to narrowband, we were faced with identifying and locating our equipment to determine if it could be narrowbanded. If not, we had to identify resources for replacement and/or solutions which would enable the Emergency Services to maintain adequate communications," Susan said.

"We formed a regional group of five surrounding counties and called ourselves RIST – the Regional Interoperability Solutions Team. We met monthly leading up to our transition. RIST functions just like a round table for representatives from every county to talk about where we are with interoperability, what we want to do next, etc. There's always the concern of not being able to communicate with adjoining counties during an emergency or catastrophic event. I feel confident that the formation of this regional group and the continued discussions will enable us to remedy the existing problems and strategically focus on other areas for enhancing communications."

Challenge: Securing funds to replace or retune radios
Best Practice: Capitalize on State-provided resources and services to minimize local costs

Charlotte County and the other four counties serving on the RIST were able to use a Homeland Security grant to purchase new P25 upgradeable and narrowband-capable equipment. Susan said, "The Commonwealth came out in January to narrowband our frequencies at a minimal cost to the counties. This enabled us to use the grant funds for equipment and infrastructure needs. David Warner from VITA performed the FCC license amendment service to all of the surrounding counties. Since that time, we have programmed and re-programmed equipment and it has been pretty simple to get the equipment installed and flip the switch."

Challenge: Interference and low audio during the transition process.
Best Practice: Make sure communications are taking place to eliminate timing restraints
Best Practice: Narrowband subscribers and infrastructure at the same time

"We did run into one issue – we had one vendor for the portables and mobiles, and another vendor for the repeaters and the voter. We assumed they were communicating with each other and coordinating efforts, but they weren't, so we had about a week of disconnect when one vendor had performed narrowbanding tasks and the other had not," Susan said.

"But it turned out fine and the process was completed within two weeks. We realized that the locality should have intervened earlier to make sure efforts were being coordinated – you need to make the switch happen collaboratively and instantaneously."

Challenge: Lower margin for error when tuning
Best Practice: Continue adjusting equipment after the official transition
Challenge: Very few pagers are narrowband capable
Best Practice: Field test pagers to be sure about narrowband performance

Charlotte County's grant did not provide funding to replace all of their equipment needs so they had to prioritize. Their pagers are a mix of older and newer models. Even though their manufacturer said older models couldn't be narrowbanded, they found that many of those models are working on the narrowband signal, albeit with some audio issues.

Charlotte County did not experience any loss of coverage due to narrowbanding after retuning some of the repeaters and increasing the voter volume.

"We still have little tweaks, but overall narrowband has been a fairly simple conversion," Susan said.

David Warner added a closing thought: "The bottom line is that when you narrowband, you want to end up better than before."

Appendix A: Customizable Letter to Local Officials with Budget Authority

Please customize this letter to local officials with budget authority explaining the Federal Communications Commission's mandate and why it is critical that funds are allocated to local emergency response efforts to ensure compliance and continued emergency response service. Many thanks to the Communications Interoperability Subcommittee, whose narrowbanding memo to the Metro Boston Homeland Security Region served as the template for this letter.

TO: [**Public Officials]**

FROM: **[Insert name of agency]**

DATE: --------- --, 2011

SUBJECT: Federally Mandated Narrowband Migration

The purpose of this memo is to spread awareness of the Federal Communications Commission (FCC) mandate regarding radio communication system narrowband compliance, and to provide an overview of the mandate and impact on [insert local jurisdiction] emergency response agencies.

Overview of FCC Narrowband Mandate and Deadlines

The FCC has mandated that all non-Federal public safety licensees operating 25 kHz (wideband) radio systems in the VHF and UHF bands must migrate to more efficient 12.5 kHz (narrowband) channels on or before December 31, 2012. The result is a more efficient use of radio spectrum (or bandwidth), allowing the FCC to expand the number of available channels. Unfortunately, many critical public safety radio systems used locally still operate on 25 kHz-wide radio channels.

This upcoming deadline affects all FCC-licensed State and local public safety radio systems. Wideband radio operation will be a violation of FCC regulations beginning in 2013, and agencies not meeting that deadline face the loss of their communication capabilities and fines.

Understanding the Scope and Planning Needs of Narrowband Migration

Local officials should be aware that this mandate affects law enforcement, fire service, and emergency medical services, as well as other public agencies communicating on wideband licenses. This may include the Department of Public Works, Department of Public Health, and others. It is likely that [insert jurisdiction] equipment will need to be replaced to comply with the narrowband requirements; this includes [insert local requirements, e.g. repeaters, radios, and/or transmitters.] Preparing for narrowbanding will require a commitment of time, resources, and funding. Securing the funds to comply with the mandate is difficult, as narrowbanding grants are difficult to obtain and there are limited budget cycles remaining. With less than [insert timeframe] until the deadline, we must start planning now to support [insert local jurisdiction]

The FCC has stated that non-compliant licenses will be canceled after the 2012 deadline. In the opinion of the FCC, organizations have had sufficient time to prepare for this migration. Failure to address your community's narrowband migration requirements in advance of the deadline may result in service shop scheduling issues, limited availability of replacement equipment, communications interference, and loss of coverage. It is unlikely that the FCC will grant an extension of the **December 31, 2012 deadline**.

Please keep the operational needs of your local emergency response agencies in mind when allocating this year's budget funds. [Insert agency name] is currently facing a shortfall of [insert amount] needed to comply with the narrowbanding mandate and keep our emergency responders communicating.

Respectfully yours,

[Insert Name]

Appendix B: Narrowbanding Mandate Background

The 150-512 MHz frequency bands have been in use for several decades. Since these bands are shared (i.e., multiple licensees can be authorized on the same frequency in the same area with a "listen before talk" requirement), some frequencies are crowded while others are underused. The Federal Communications Committee (FCC), then known as the Private Radio Bureau, launched PR Docket No. 92-235 to make radio operations more efficient.

The Radio Bureau's decision in 1995 "refarmed" the Private Land Mobile Radio (PLMR) bands, creating narrower assignable channels between the existing 25 kHz center frequencies. The FCC expected licensees to migrate over time, first to 12.5 kHz operation, and eventually to 6.25 kHz systems. This would reduce congestion and enable more licensees to use the most popular PLMR bands. There was no mandate at that time; the FCC only required equipment manufacturers to make their devices narrowband-capable. They could still produce 25 kHz equipment and licensees could continue to use and expand their 25 kHz systems. In 1997 the FCC consolidated PLMR licensees into two pools: the Industrial/Business group and the Public Safety group.

However, it became obvious a few years later that voluntary refarming had not been widespread. While many new 12.5 kHz channels were licensed on the interstitial spaces, most incumbent licensees retained their 25 kHz operations. In a 2003 proceeding (WT Docket No. 99-87), the FCC mandated migration to more efficient operation. After slight revisions, the current framework was finalized in 2004. The final decision on narrowbanding came at the end of 2004, in the FCC's Third Memorandum Opinion and Order in Docket No. 99-87.[11]

In 2009, the National Public Safety Telecommunications Council filed a petition with the FCC seeking a stay of the 2011 deadlines for licensees and manufacturers, citing concerns about decreased interoperability between 2011 and the final 2013 deadline. In response, the FCC retained the 2011 deadline which restricts licensees from applying for or expanding 25 kHz operations, but granted a waiver to allow manufacturers to continue making wideband-capable equipment until 2013.

In December 2009, the FCC issued a Public Notice to remind PLMR licensees and equipment manufacturers of the narrowbanding mandate and answer FAQs.

Further Narrowbanding?

The FCC may continue to examine whether and how to mandate migration to the 6.25 kHz bandwidth. Whether through another narrowbanding mandate or stricter efficiency standards, the FCC is likely to consider these bands again in the future.

[11] Utilities Telecom Council Memorandum: *Licensee Obligations under FCC Narrowbanding Requirements*

Appendix C: How to Modify your FCC License for Narrowband

The information below has been adapted from the Vermont Communications publication "Narrowband License Instructions[12]."

For most users, the steps below will be sufficient to add narrowband emissions to their Federal Communications Commission (FCC) license. However, some irregular items to be aware of with the licensing process are as follows:

- "Quiet Zones", i.e. areas where certain levels of radio emissions are restricted. The most prominent example is the National Radio Quiet Zone in Virginia and West Virginia, listed at http://www.gb.nrao.edu/nrqz/
- International border issues (e.g. Canada and Mexico)
- Project 25 (P25) digital emissions, other proprietary digital emissions, or super-narrowband (6.25 kHz) emissions

If any of these apply to you, make sure to add the correct emissions or coordinate with the appropriate organizations, such as cross-border governance groups. Keep in mind that current holders of a 25 kHz channel do not receive two 12.5 kHz channels – you will simply narrow around the existing channel center.

STEP ONE: Gathering your license information

Before you begin you will need the following Information:

1. Your FCC Registration Number (FRN)
2. Your FCC Call Sign(s)
3. The password associated with your FRN

Don't Know Your FRN?

1. Click here to do an FRN Search: https://fjallfoss.fcc.gov/coresWeb/simpleSearch.do
   a. Alternatively, you can use OEC's Frequency Mapping Tool to find your FRN: http://www.publicsafetytools.info/start_fmt.php

2. Choose to search by EIN/TIN (Employer ID Number/Tax ID Number). Your Town Clerk or Treasurer will know your EIN or TIN. This search will display all FRNs for your organization. You can then enter the FRN(s) in the License Search section below to search for your call sign(s).

Don't Know Your Call Signs?

Click here to do a FCC License Search: http://wireless2.fcc.gov/UlsApp/UlsSearch/searchAdvanced.jsp

You can search by FRN or Licensee Name.

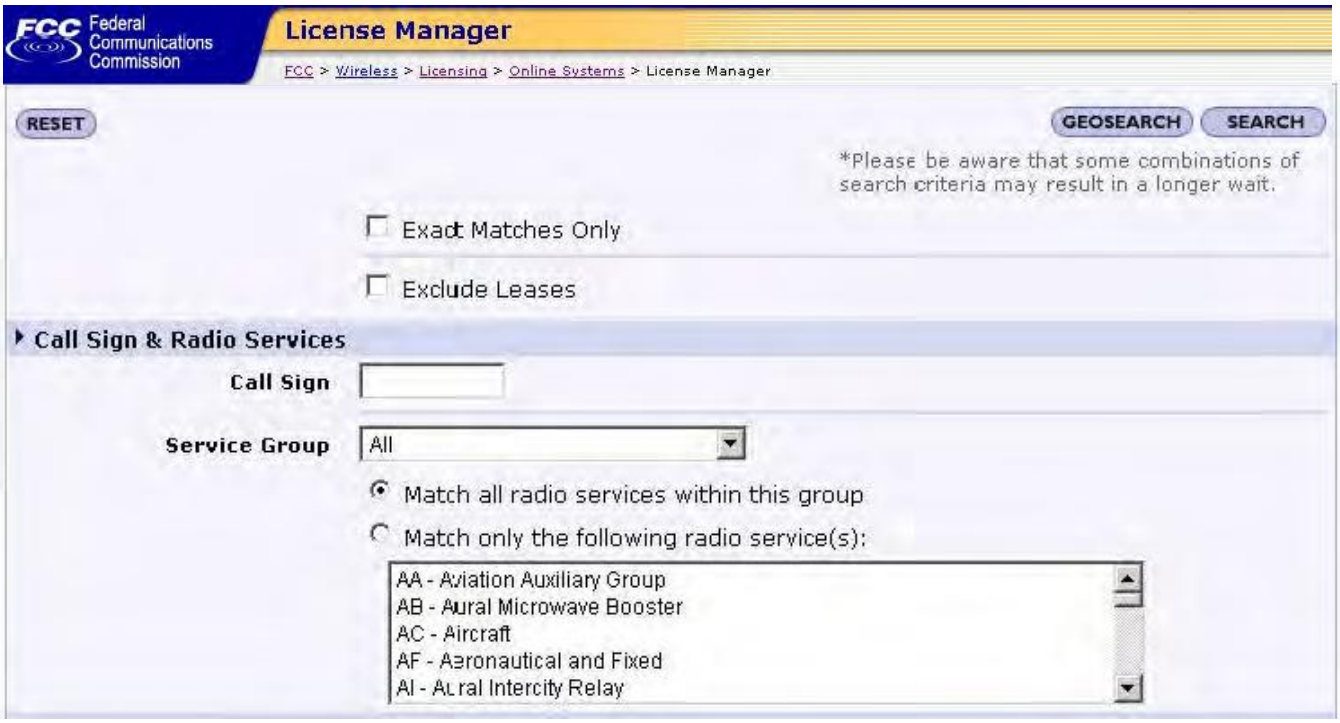
It is recommended that you search by FRN, but if your organization does not have an FRN, you can search by Licensee Name.

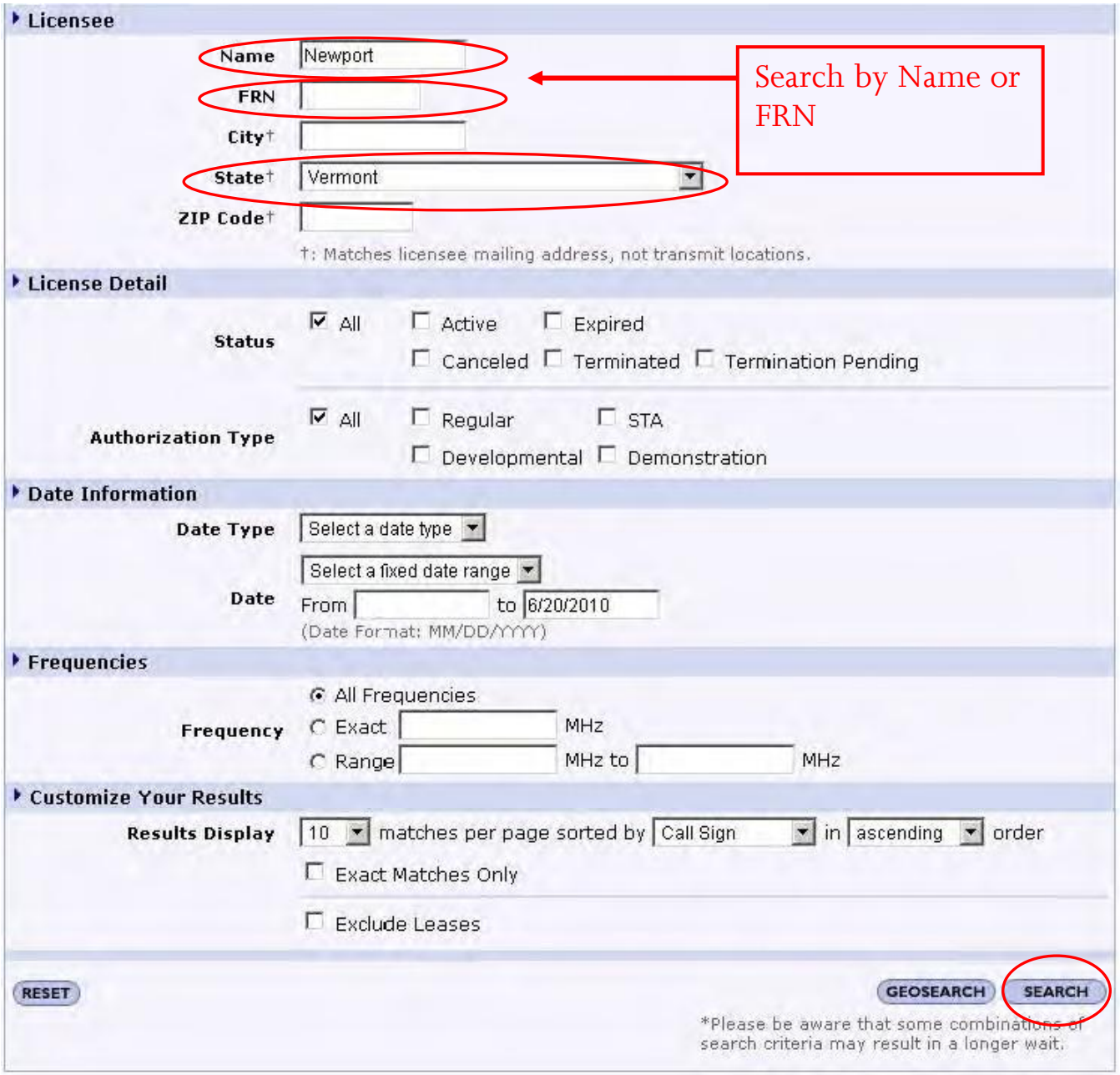
To search by name, keep the search words simple.

[12] "How to Modify Your License for Narrowband" http://vcomm.vermont.gov/narrowbanding

1. Enter the name that your agency begins with in the Licensee Field. In this example **Newport** is the search term. If you try to enter your full agency name and it is not exact, you may get no results.
2. Select your State from the drop-down list.
3. Click **Search**.

Warning! Some licenses begin with the word "Town" (Town of Bristol for example) and will not show up in a search for "Bristol."





After clicking **Search**, you should have a list of your Call Signs and FRN(s). The search defaults to only 10 licenses per page, so you may not see all the results on the first page.

Specified Search

Name like **Newport**
State = **Vermont**

Matches **11- 15** (of **15**)

PA= Pending Application(s)
TP= Termination Pending
L= Lease

PREVIOUS Page 1 2

	Call Sign/Lease ID	Name	FRN	Radio Service	Status	Expiration Date
11 PA	WPVX794	NEWPORT, CITY OF	0005085667	PW	Active	09/03/2012
12	WPZV304	NEWPORT, CITY OF	0005085667	PW	Active	03/22/2014
13	WQBB616	NEWPORT, CITY OF	0005085667	IG	Active	09/15/2014
14	WQBZ689	NEWPORT AMBULANCE SERVICE	0011405495	PW	Active	01/12/2015
15	WQCW432	NEWPORT, CITY OF	0012596649	PW	Active	06/09/2015
	Call Sign/Lease ID	Name	FRN	Radio Service	Status	Expiration Date

PREVIOUS Page 1 2

Some agencies may have more than one FRN. For example, your Police Department may have a different FRN than your Fire Department or the Town Highway crew. Click on the Call Signs that appear to be yours and verify that they require the narrowband modification by viewing the Emission section, under the Frequencies Tab. See Example below:

MAIN | ADMIN | LOCATIONS | FREQUENCIES

Call Sign WPVX794 | Radio Service PW - Public Safety Pool, Conventional

4 Frequencies for all locations
20 Frequencies per Summary Page

Filter Frequencies By Location: All Locations GO

SC = Special Condition TP = Termination Pending

Define View: General | Buildout | COSER | **Emission** | IRAC

Frequency	Loc#	Ant#	Freq ID	Station Class	Emission Designators
000460.25000000	1	1	1	FB2	20K0F3E
000460.25000000	2	1	1	MO	20K0F3E
000465.25000000	2	1	2	MO	20K0F3E
000465.25000000	3	1	1	FX1	20K0F3E

4 Frequencies for all locations
20 Frequencies per Summary Page

Filter Frequencies By Location: All Locations GO

Please check all frequencies. If you only see 20K0F3E (wideband) then you need to modify your license. If you have 11K2F3E or 11K0F3E or 11K3F3E (narrowband) on every frequency line then you do not need to modify this license. It is perfectly acceptable to have both wideband and narrowband emissions for the same frequency.

If you have a P25 Digital Radio system you may find an emission designator of 8K10F1E. If this is the case then you are all set because P25 Digital systems are narrowband compliant.

A list of the most common emission designators can be found at the bottom of the Association of Public-Safety Communications Officials (APCO) emissions page:
http://www.apco911.org/frequency/emission.html

If you have more than one FRN then you will need to log into each FCC account and make the narrowband changes to all of the licenses under each FRN.

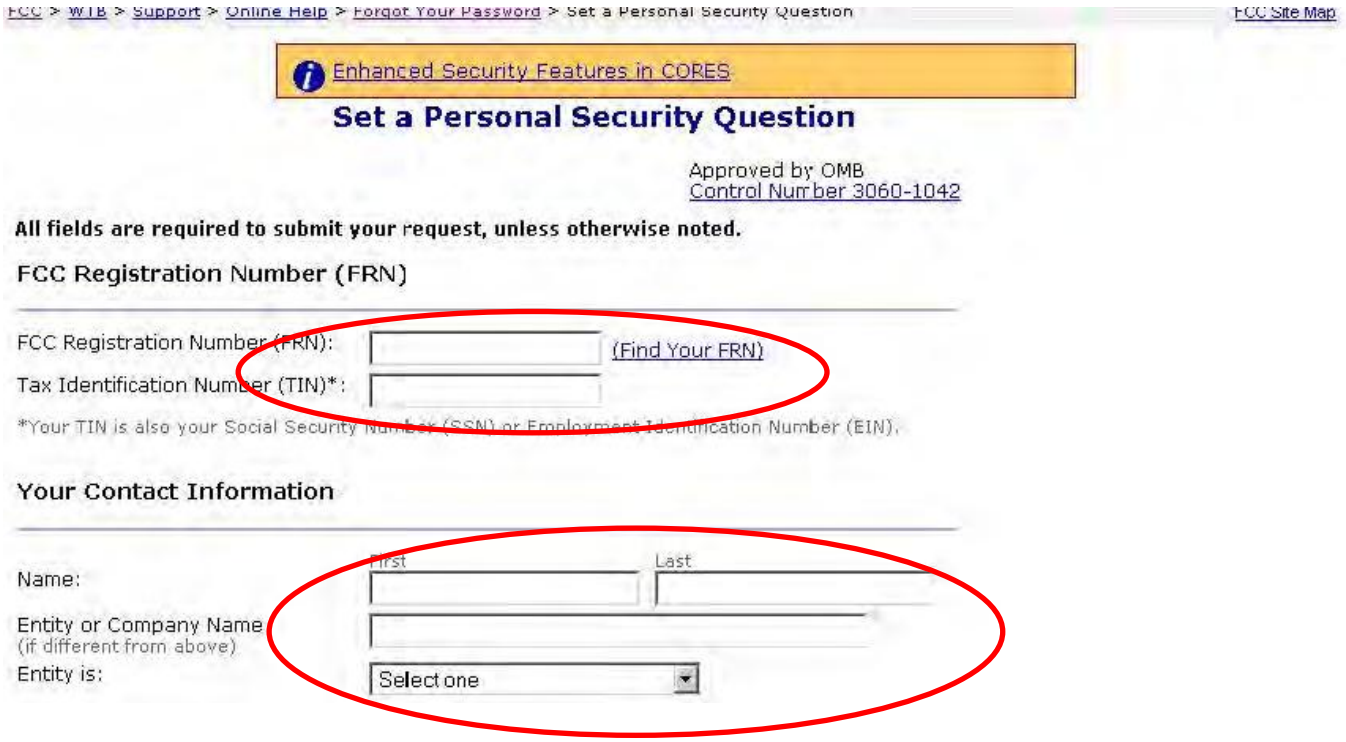
Don't Know your Password?
There are two methods of resetting your password:

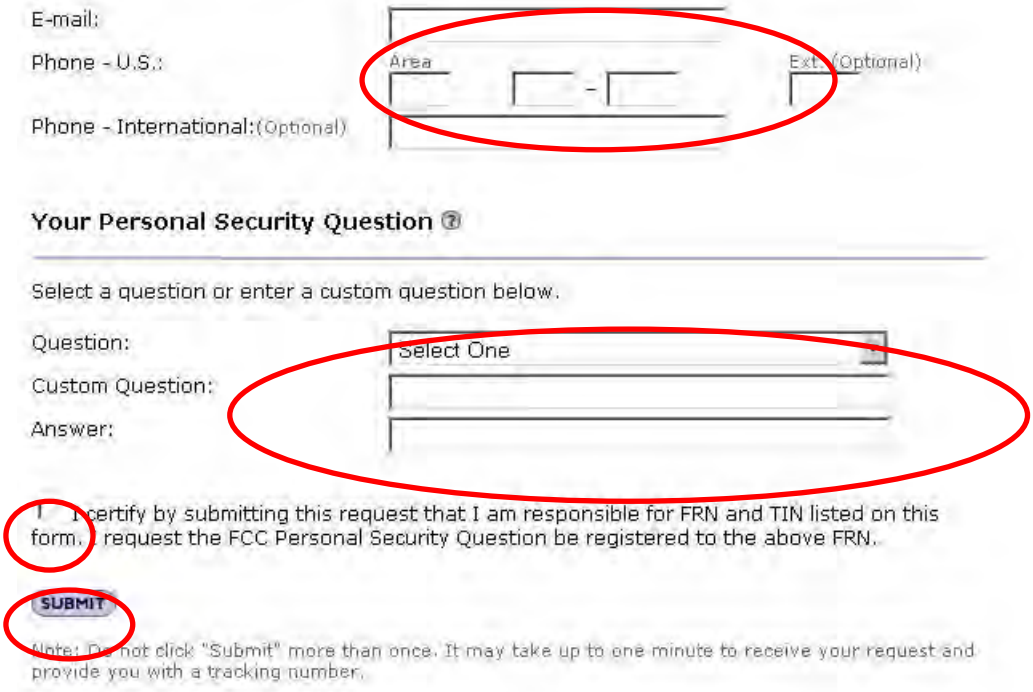
Option 1: Contact the FCC by Calling the FRN Help Line: (Have your FRN and EIN/TIN ready)
877-480-3201, option 2 (Mon.-Fri. 8 a.m.-6 p.m. ET)

Option 2: Request a Password Reset online here:
https://esupport.fcc.gov/password.htm

If you know your Personal Security Question, you can reset the password yourself by clicking on the **Reset Password** button. If not, then you will need your agency or town's Federal TIN. Your Town Clerk or Treasurer will typically have this information. The Personal Security Question will give you access to reset your password online.

How to Request a Personal Security Question

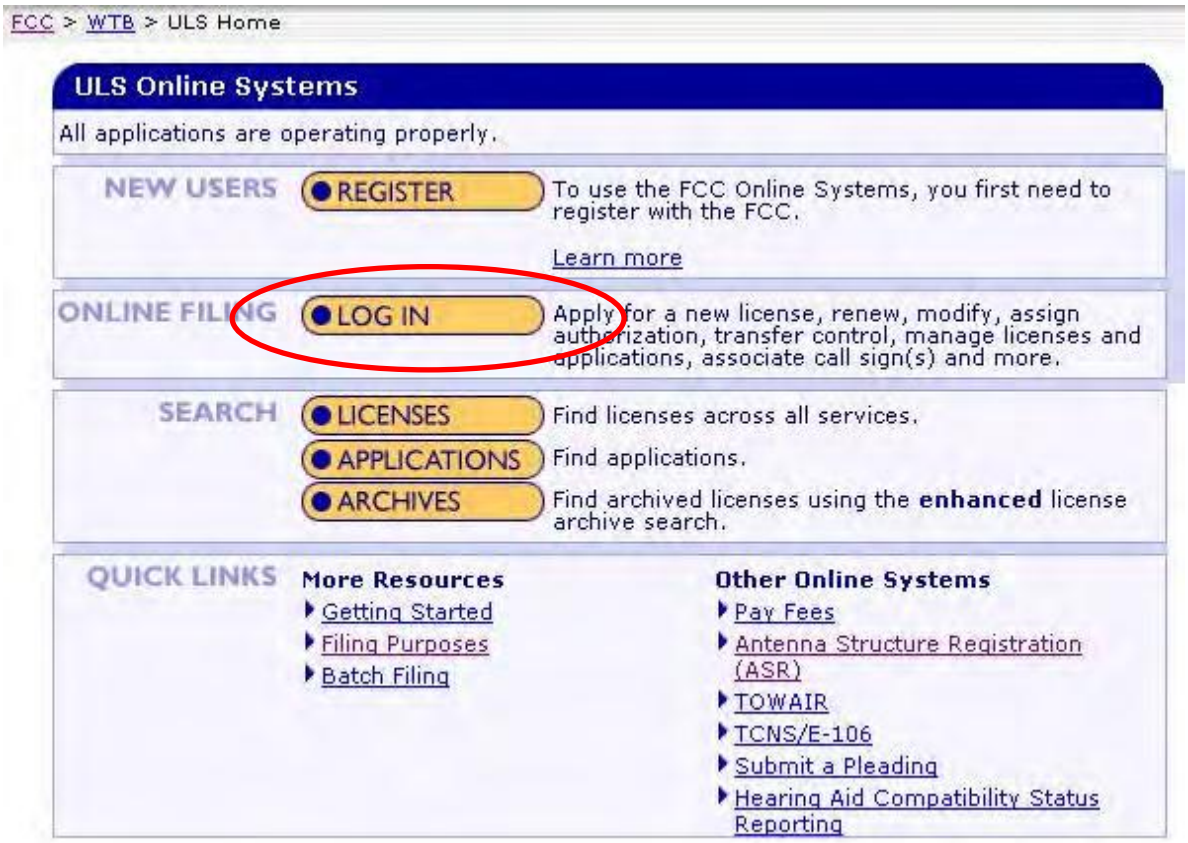




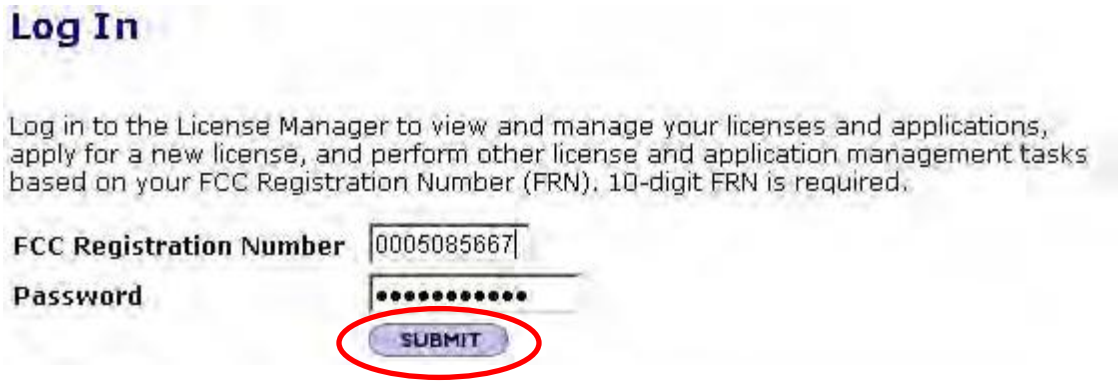
After clicking the **Submit** button, you will be assigned a tracking number. A representative from the FCC will then call the licensee point-of-contact to verify the EIN/TIN information. Once this verification is made, the Personal Security Question will be added to the FRN registration, and an e-mail will be sent to the requester with instructions on how to reset the password.

STEP TWO: Logging into your FCC Account
You should now have all of your account logon information. If not, go back to Step One.

1. Click here to go to the FCC's Universal Licensing website
http://wireless.fcc.gov/uls/index.htm?job=home

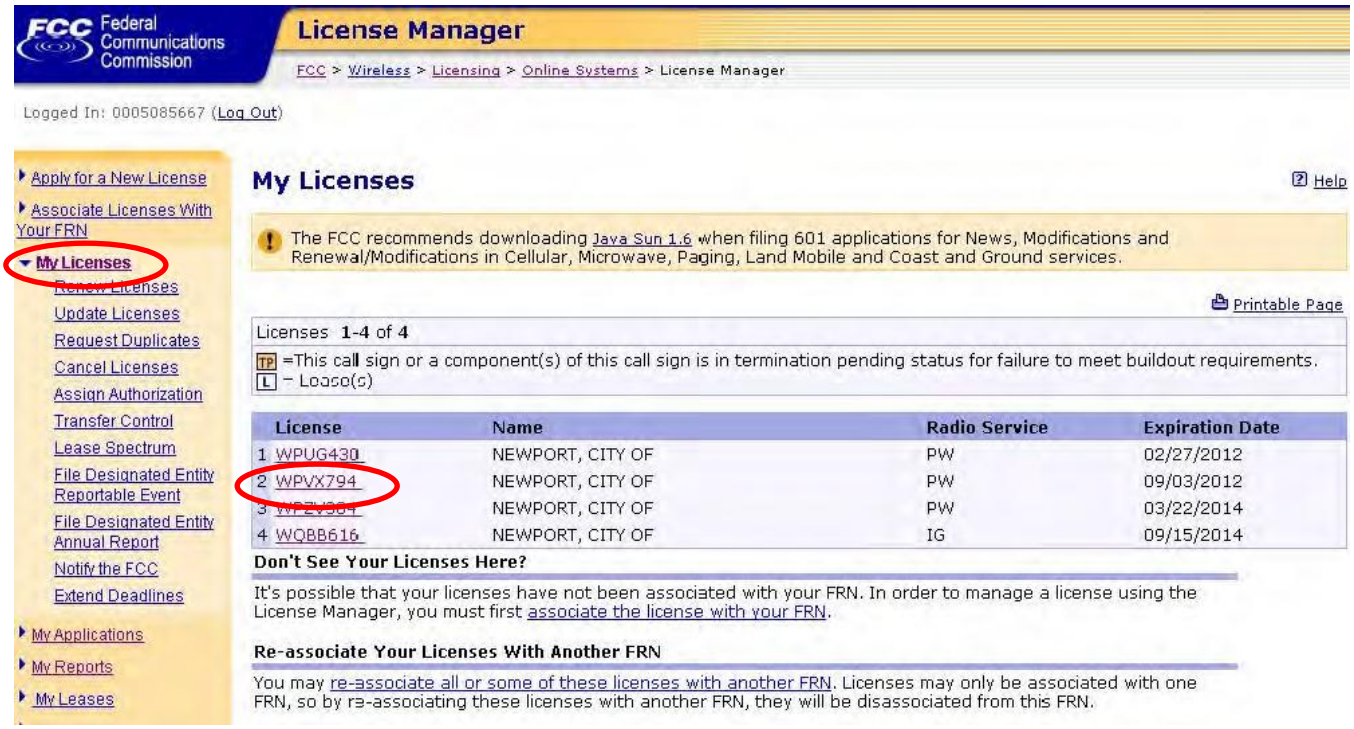


2. Click the **LOG IN** button and enter your FRN and Password and hit **SUBMIT** (see below)



STEP THREE: Modifying your licenses

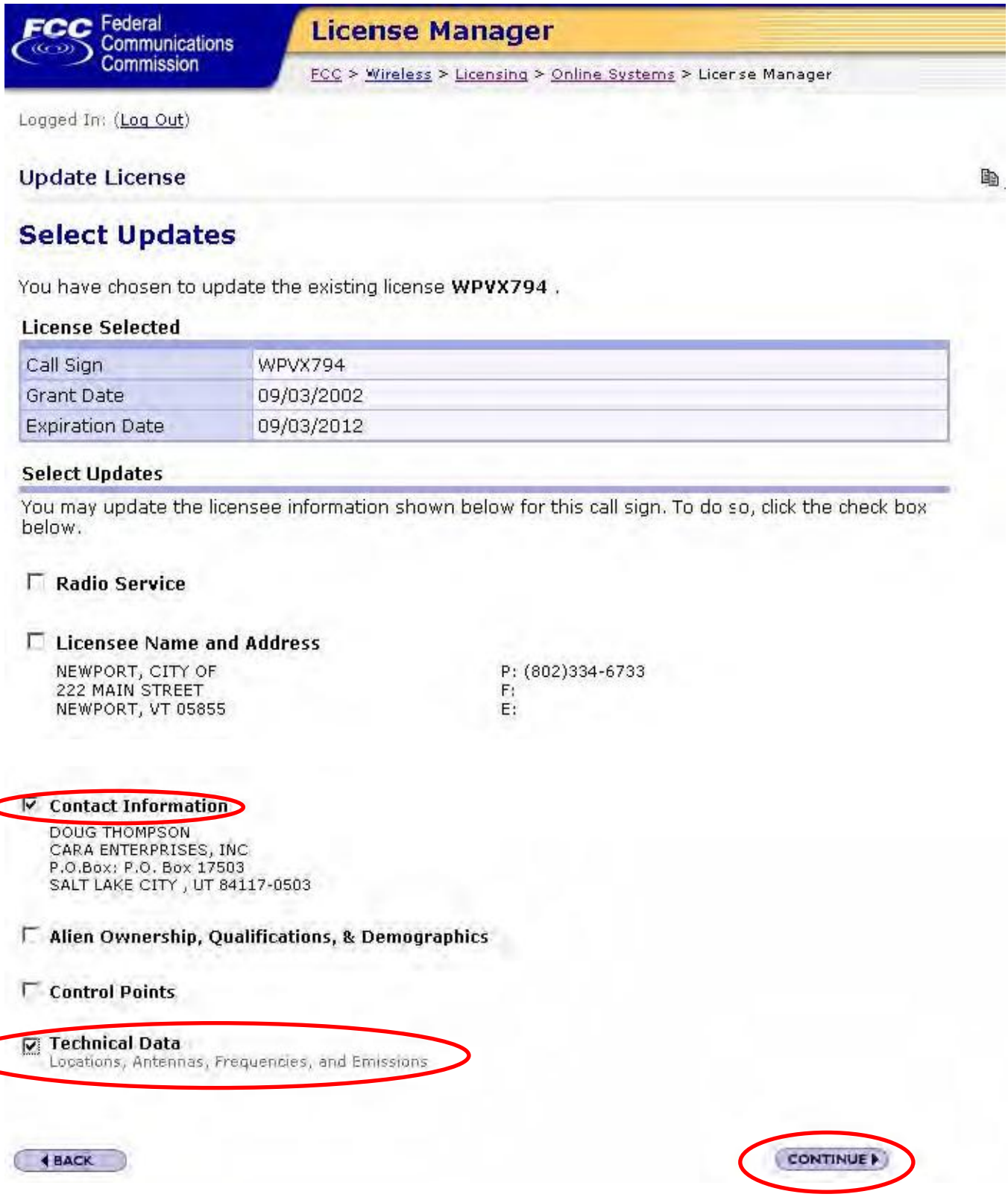
Click on **My Licenses** on the left side of the page and you will see the following screen:



2. Click on the call sign you want to modify and then click on the **Update** link on the right side of the page. For this example, we will modify WPVX794.

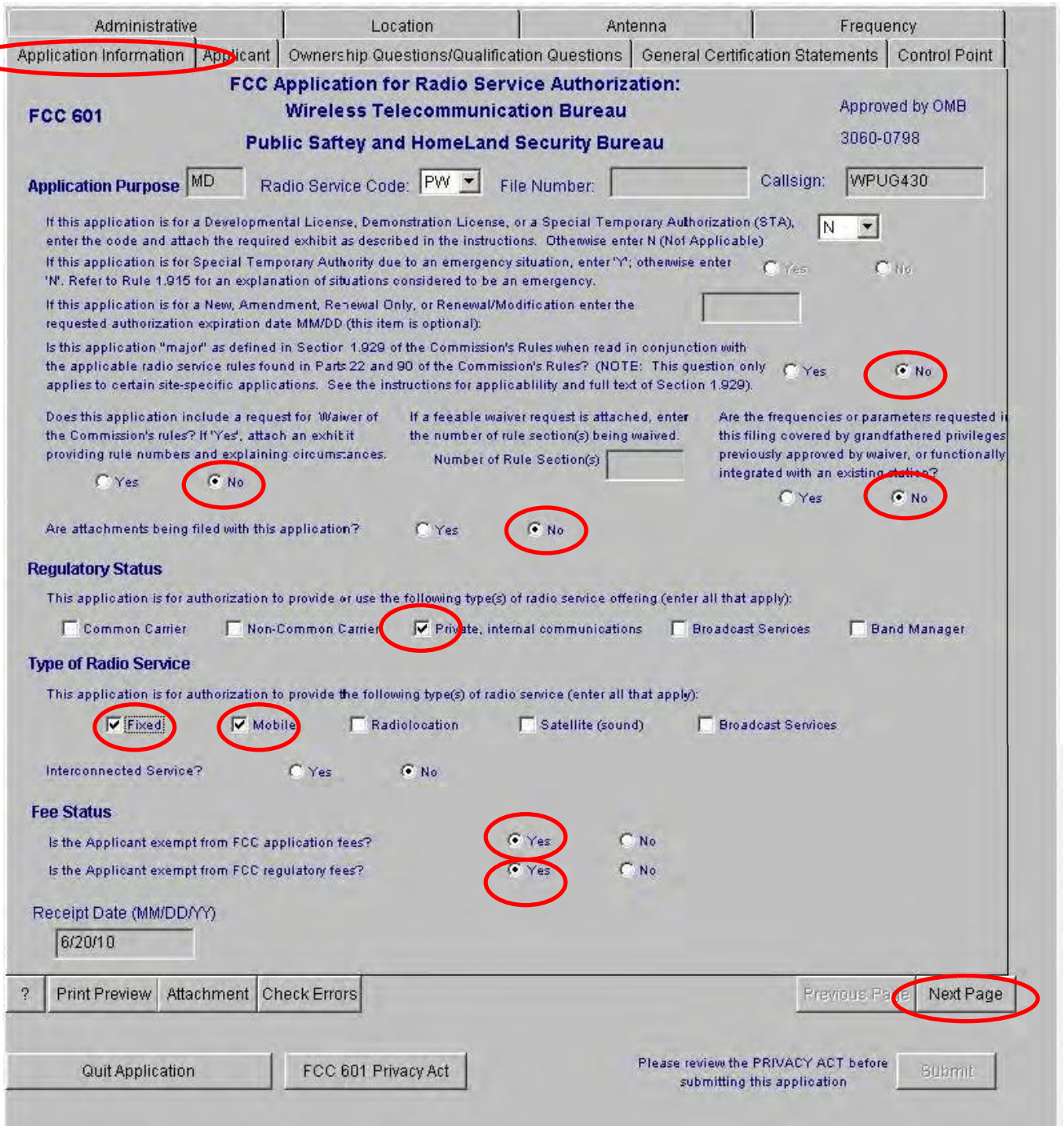
1. Select the items you want to correct. You must check **Technical Data** to add the Narrowband Emission Designators.

Note: After clicking the **Technical Data** box, all sections of the application will load for editing and data entry. Take this opportunity to update your contact information, address, phone numbers, etc.

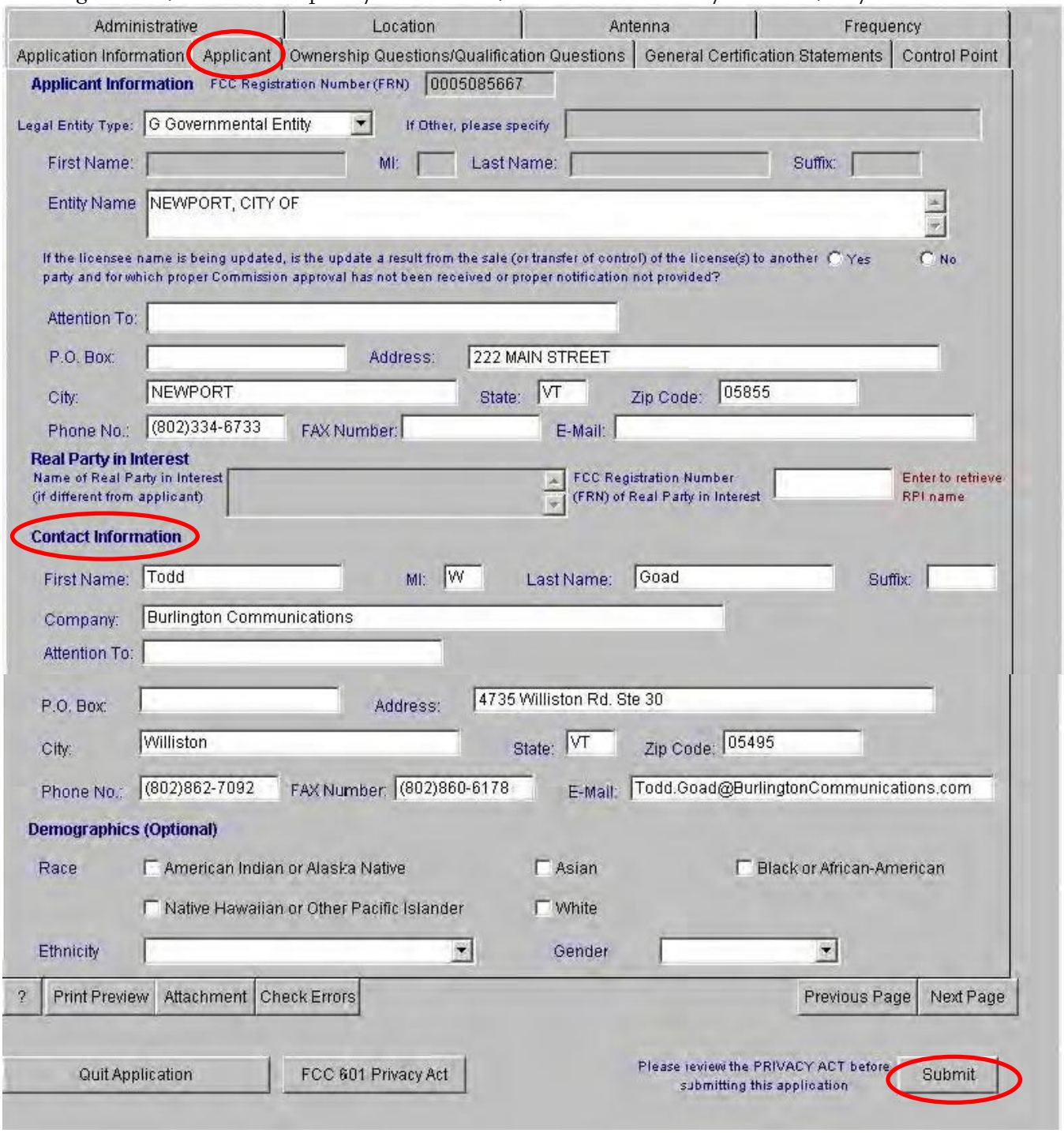


Note: Clicking **CONTINUE** will load the FCC Licensing Program. You may receive one or more Security Warnings. If you do, simply acknowledge them, let your web browser trust the FCC Web Site, and continue. If this page still does not load, it may indicate that you do not have a compatible version of Java on your PC. This program requires versions of Java of 1.5 or higher. See Getting Connected for more information on system requirements. http://esupport.fcc.gov/index.htm?job=getting_connected

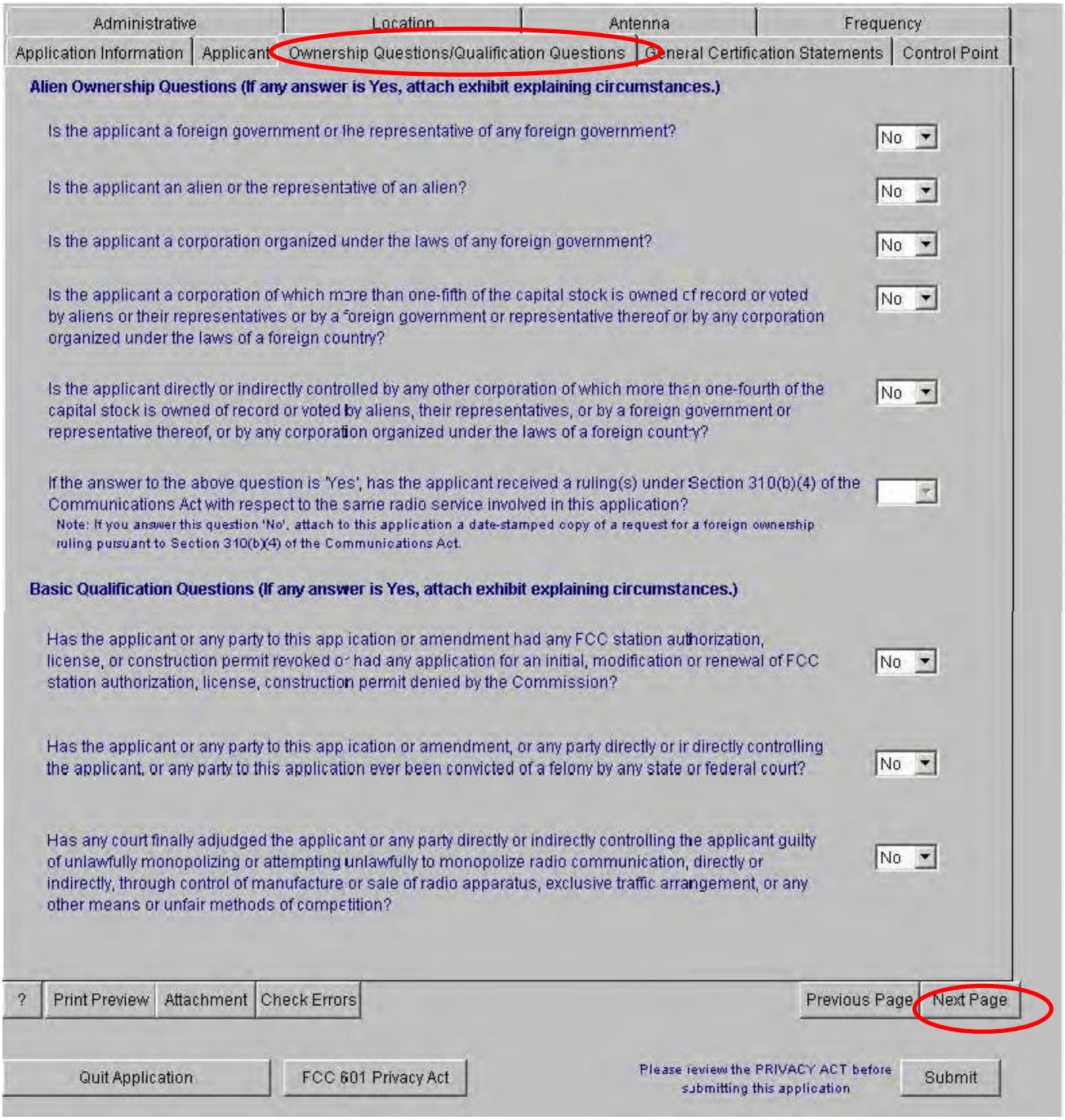
4. Application Information Page: The Application will not let you advance to the next page until all required fields are answered. The required fields are circled in red; please read each one and answer correctly. Observe the Fee Status questions. If you are a Government entity then you are exempt from FCC fees. If you are an incorporated agency but exempt from fees then you may be required to attach a copy of your IRS Tax Exempt letter by clicking on **Attachment** and following the instructions. Click **Next Page** to continue.



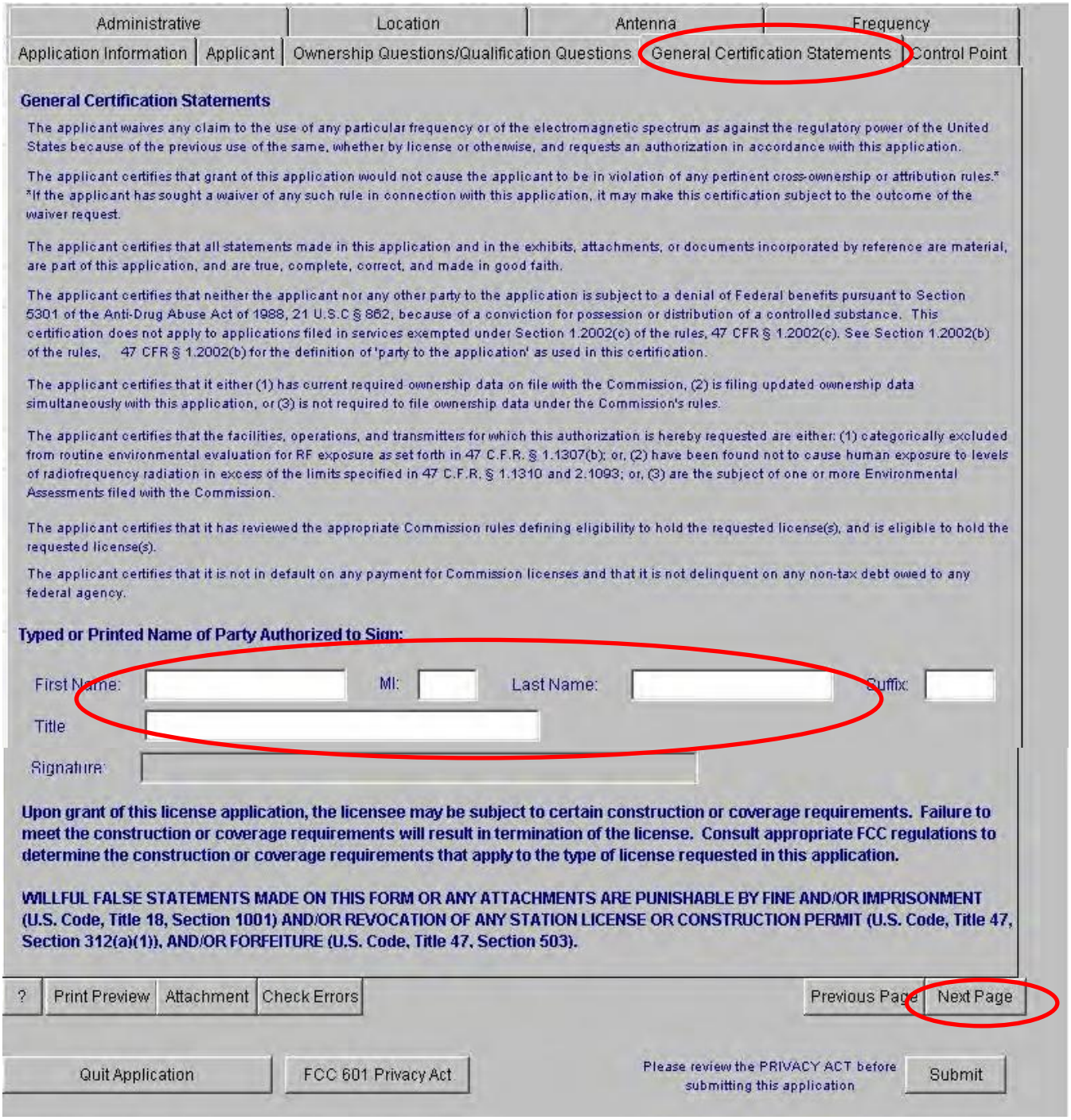
5. Applicant Information: Correct your Applicant Information and Contact Information if required and click **Next Page.** Note that the contact information can be a third party that typically helps you with your licensing matters, such as a frequency coordinator, another member of your town, or your radio vendor.



5. Ownership Information: Review and move to the **Next Page.**



7. General Certifications: This is where you digitally sign the application. At this point you can either continue by pressing **Next Page** until you get to the **Frequency Tab**, or simply select the **Frequency Tab** to go there directly.



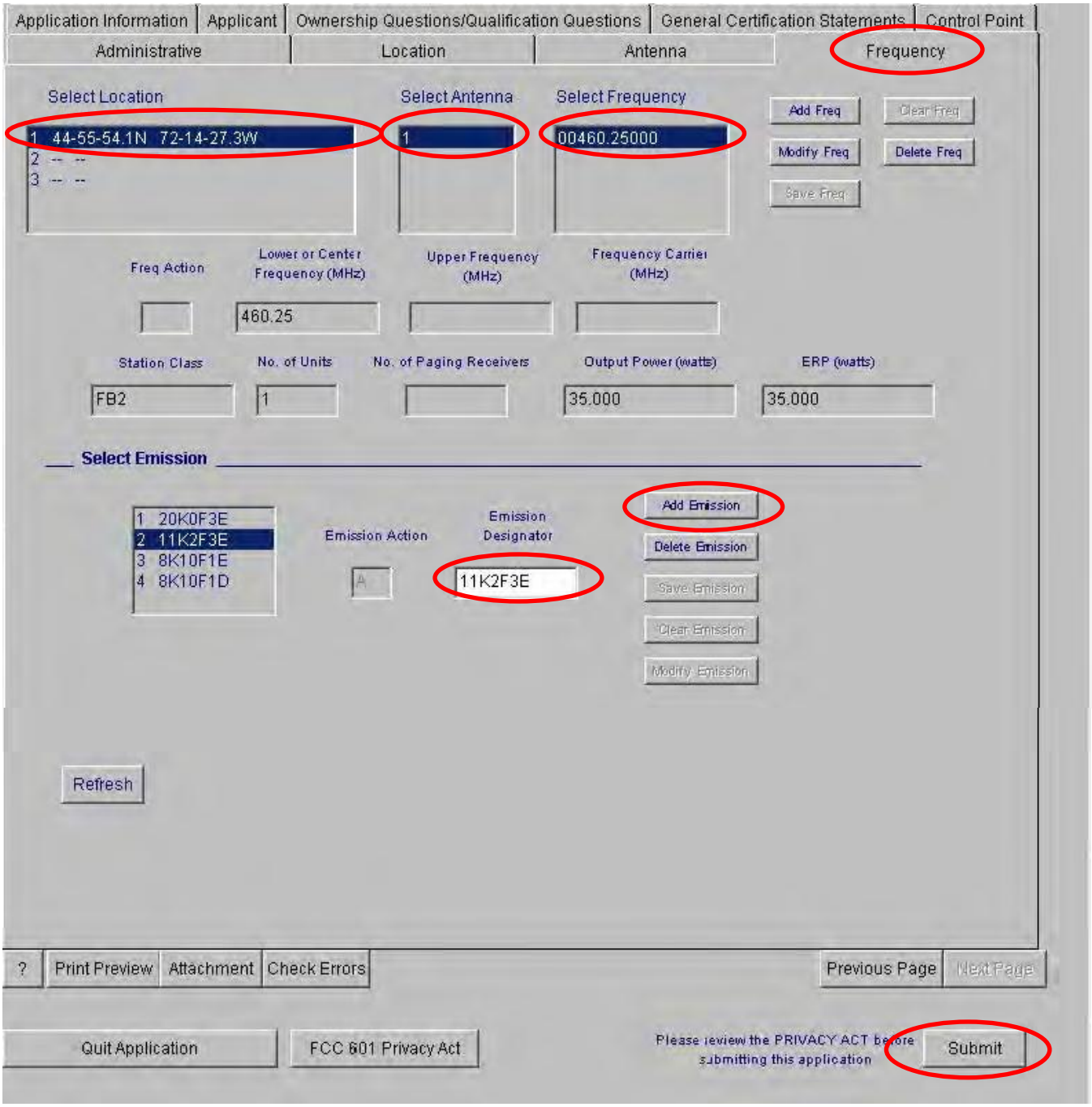
8. Frequency Tab: This is where you are going to Add or Modify your narrowband Emission Designators.

To Add an Emission Designator, follow these steps:

Select Each Location, Antenna, and Frequency to view the existing emissions. Click **Add Emission** and enter your narrowband emissions, typically 11K2F3E.

A list of the most common emission designators can be found at the bottom of the APCO emissions page: http://www.apco911.org/frequency/emission.html

Remember to do this for every frequency at every location!



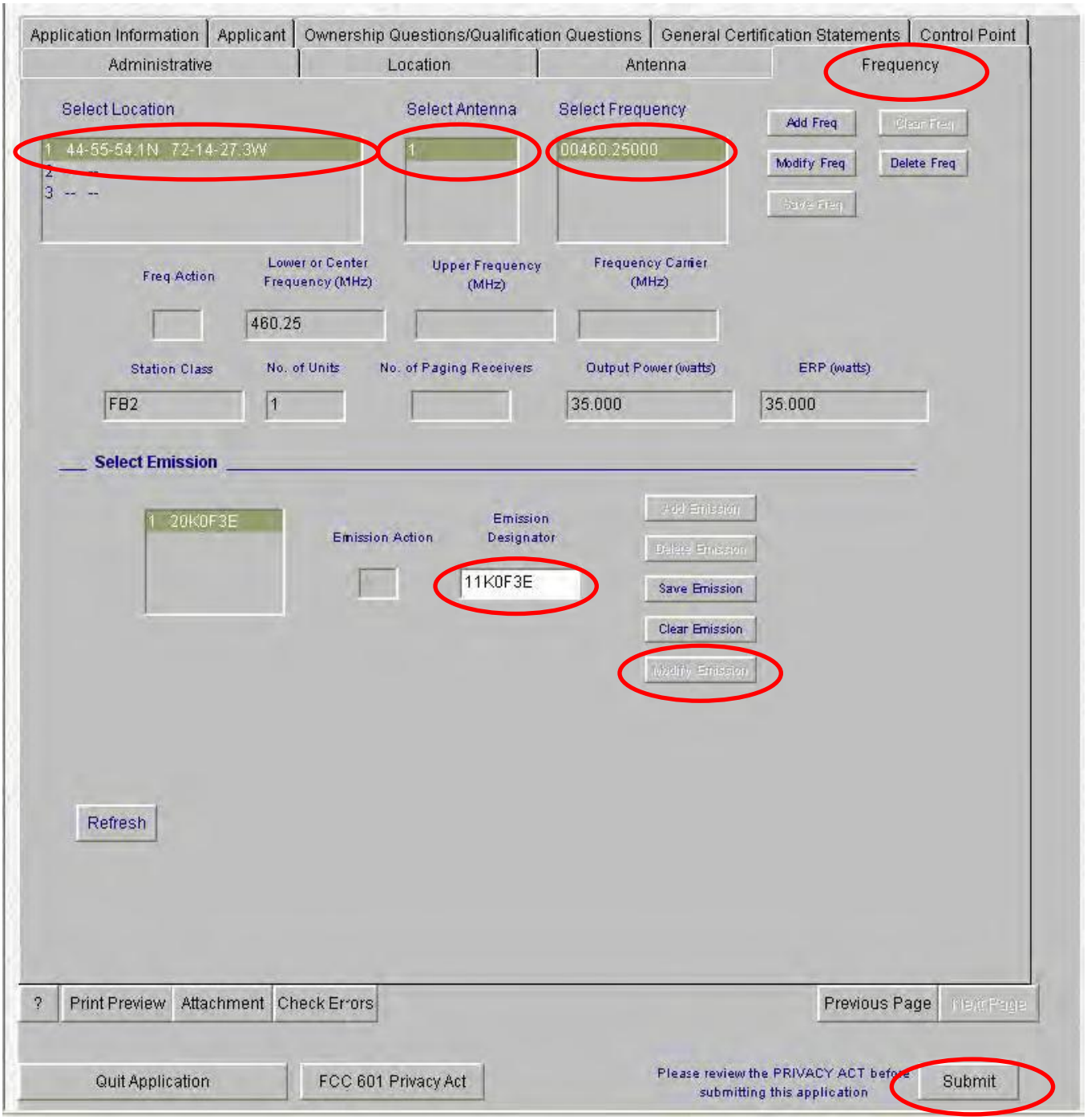
To Modify an Existing Emission Designator, follow these steps:

You only need to perform a modification if you are already operating in narrowband mode and want to remove the Wideband emission.

Select Each Location, Antenna, and Frequency to view the existing emissions. Select the emission, and then click the **Modify Emission** button and enter your narrowband emissions.

A list of the most common emission designators can be found at the bottom of the APCO emissions page: http://www.apco911.org/frequency/emission.html

Remember to do this for every frequency at every location!



Note: If you attempt to modify any technical parameters other than the emission designator, the FCC may return your application and request that you correct it or work through one of the Public Safety Frequency Coordinators, APCO or the International Municipal Signal Association.

9. Submitting the Application: Click **Submit**.
If you are missing any required information, you will be shown a list of errors to be corrected.

Note: Some older Licenses have missing Effective Radiated Power (ERP) Power Levels and the application may not let you proceed until you correct this. The FCC will not allow you to add an ERP that exceeds your output power as part of the narrowband modification. If you modify any technical parameters beyond what is permissible, the FCC will mail you a Return Notice that must be amended within 60 days.

If all went well you will be asked to confirm your submission and you will be notified if any FCC fees are required. If any fees are required you will be directed to the payment procedures. Now that you are familiar with the FCC Online Licensing System, you will be able to renew your own licenses and make administrative changes.

Helpful Links:

FCC ULS Customer Support:
http://esupport.fcc.gov
877-480-3201, option 2

FCC Narrowbanding Page:
http://www.fcc.gov/pshs/public-safety-spectrum/narrowbanding.html

Public Safety Frequency Coordinators:

The Association of Public-Safety Communications Officials International (APCO) (Typically for Law Enforcement applications)
http://www.apco911.org/frequency/

International Municipal Signal Association (IMSA) (Typically for Fire and Emergency Medical applications)
http://www.imsasafety.org/fc/frontpage.htm

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Email: narrowbanding@fcc.gov

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