

# Memorandum



DATE January 14, 2011

TO Honorable Mayor and Members of the Dallas City Council

SUBJECT Radio Technology Overview

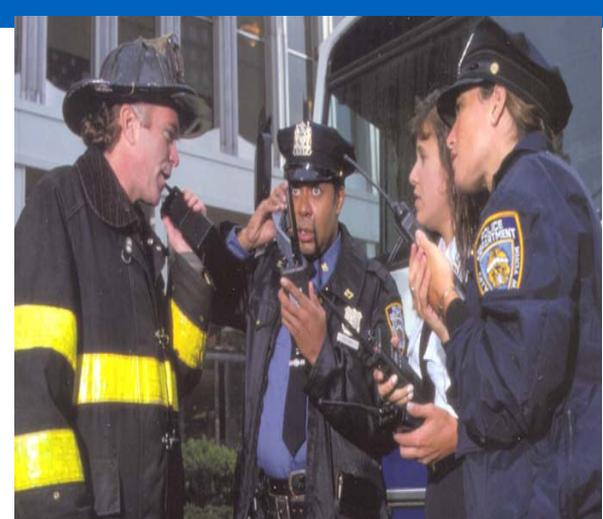
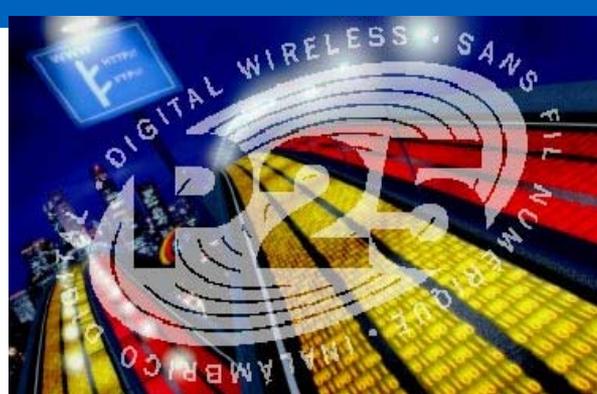
On January 19, 2011 staff will present an informational briefing on Radio Technology. Attached is a copy of the presentation for your review.

Please contact me if you have questions.



Jill A. Jordan, P.E.  
Assistant City Manager

c: Mary K. Suhm, City Manager  
Thomas P. Perkins, Jr., City Attorney  
Deborah Watkins, City Secretary  
Craig Kinton, City Auditor  
Judge C. Victor Lander, Administrative Judge  
Ryan S. Evans, First Assistant City Manager  
A.C. Gonzalez, Assistant City Manager  
Forest Turner, Assistant City Manager  
Worris Levine, Director, Communication & Information Services  
Jeanne Chipperfield, Chief Financial Officer  
Frank Libro, Public Information Officer  
Helena Stevens-Thompson, Assistant to the City Manager – Council Office



# Radio Technology Overview

January 2011



# Presentation Objectives

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- The objective of this presentation is to:
  - Review terms as related to radio technology
  - Review the challenges facing the City
    - FCC mandate to Narrowband by January 1, 2013
    - State's goal to achieve P25 compliancy by January 1, 2015
  - Explain the current state of the City's Radio Network
  - Review how the City will address the two challenges
    - FCC mandate to narrowband by January 1, 2013
    - State's goal to achieve P25 compliancy by January 1, 2015

# Terms and Definitions

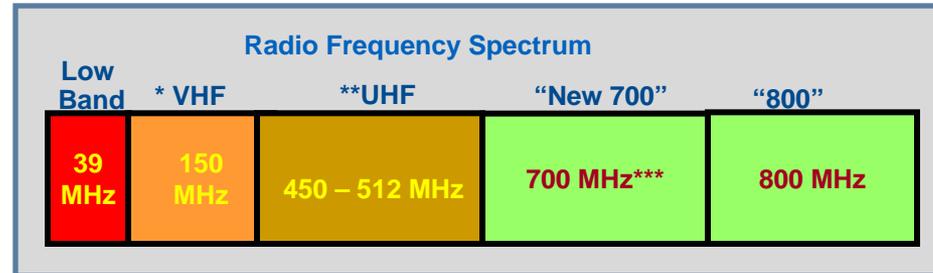
# Review of Terms as Related to Radio Technology

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- Frequency
- Analog vs. Digital
- Digital's Advantage
- Narrowbanding (UHF / VHF)
- P25 (Project 25)
- Patching

# Frequency

- Frequency – The location of a radio signal on the radio spectrum that contains desired information.



*Definitions:*

- Types of frequencies include:
  - AM/FM radio
  - Wireless broadband
  - Television broadcast
  - Government radio
- The current frequency spectrum is congested and new techniques are being developed to conserve it.

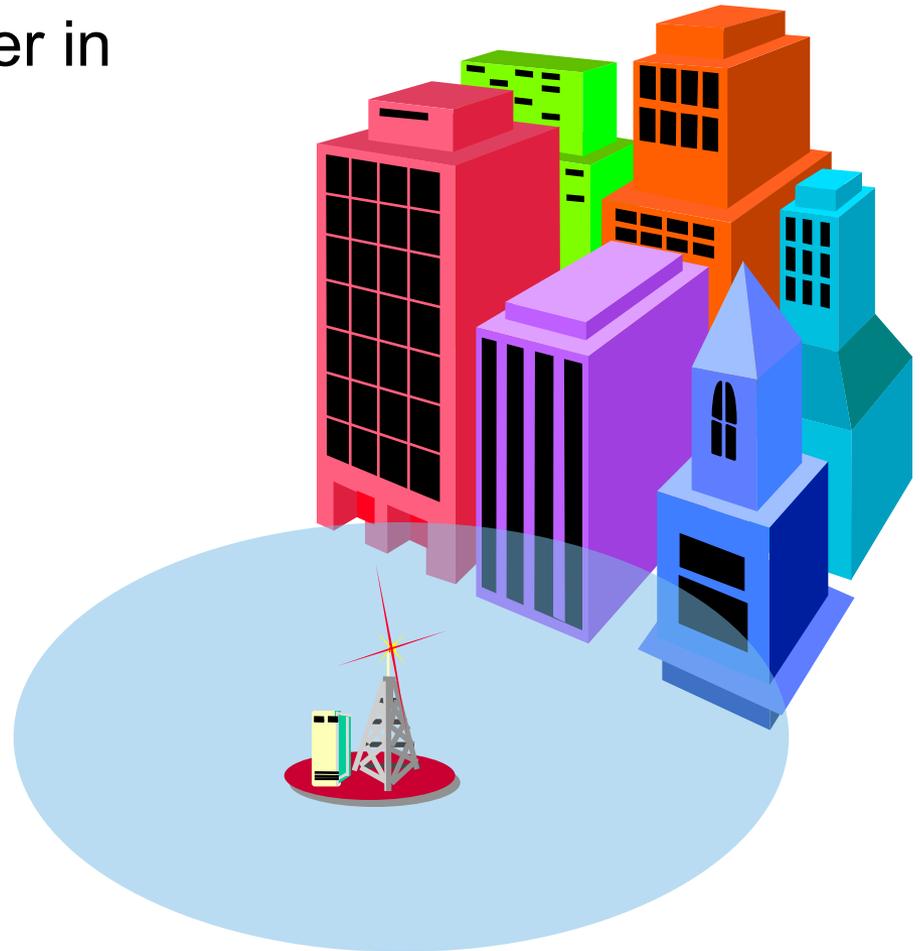
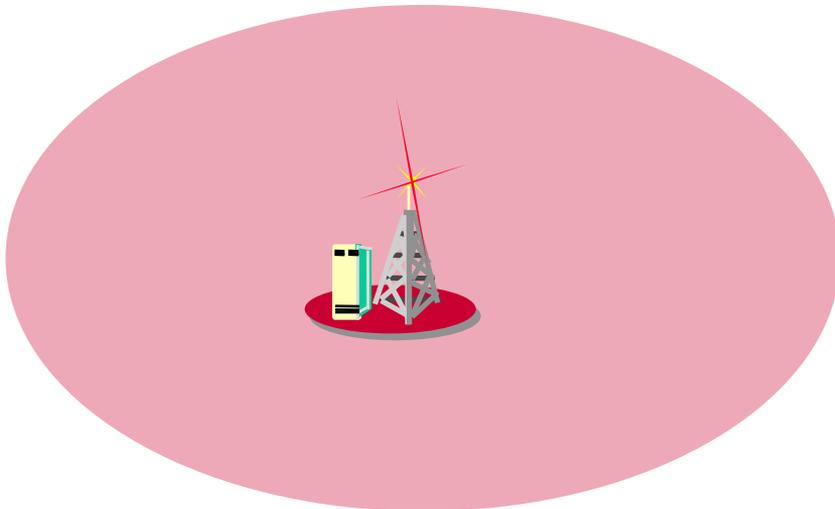
\* VHF – Ultra High Frequency (150 MHz)

\*\* UHF – Ultra High Frequency (450 - 512MHz)

\*\*\* MHz denotes a measure of frequency that equals one million cycles completed in one second.

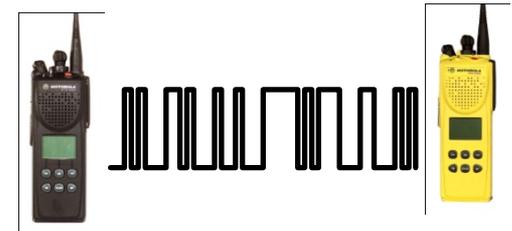
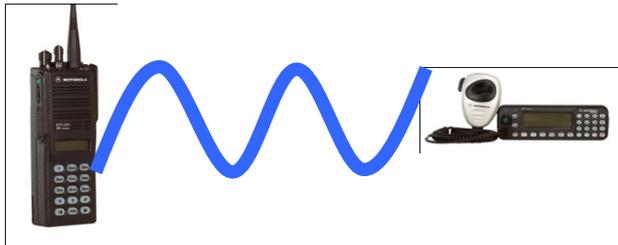
# Frequency Coverage

- VHF (150 MHz) carries further in Rural Areas
- UHF (450-512 MHz) works well in Suburban Areas
- 700 / 800 MHz works better in buildings



# Analog vs. Digital

- Analog
  - Is a process of taking audio (human voice) signals and translating them into electronic pulses called frequency modulation.
  - The frequency modulation produces a continuous wave with the audio signal.
- Digital
  - Is a process of taking an audio signal and breaking it up into a binary format represented as “1”s and “0”s.
    - For example, it’s similar to the recent change in televisions from the old “rabbit ear” (analog) antennas to the cable box (digital)



# Digital Advantage

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- Digital features include:
  - Enhanced Audio Quality
  - Integrated Voice & Data Capability
  - Better Coverage
  - Spectrum Efficiency
- Modifications / Changes can be made over the air through software updates
  - Easily
  - Inexpensively
  - Quickly
- Allows for Ongoing Use of Investment
  - Hardware (e.g., transmitters, receivers, etc.) upgrades are very infrequent
  - Software is updated
- Allows for GPS capability in the radios

# Narrowbanding

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- Taking the current “wideband” frequencies and creating new narrower frequencies in order to relieve congestion.
- Getting more capability out of the same space on the radio spectrum.
- For example, it’s taking one large highway (“wideband”) and utilizing the same space, dividing it into narrower lanes which eliminates the congestion of one large highway.

# Narrowbanding



**NEW**  
**Technology**

**Narrow Lanes**

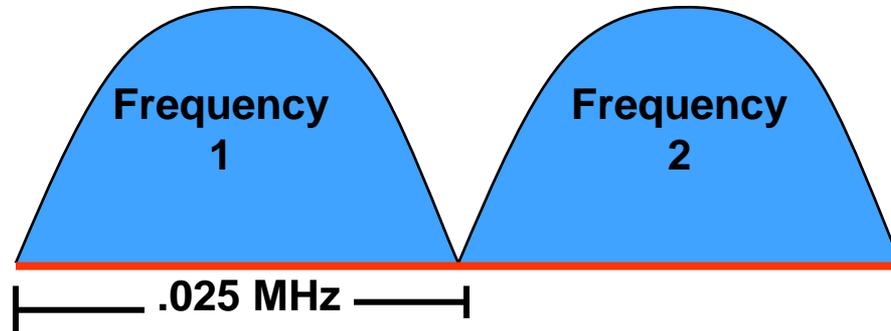
**=**

**MORE Lanes**  
**in the same**  
**space**

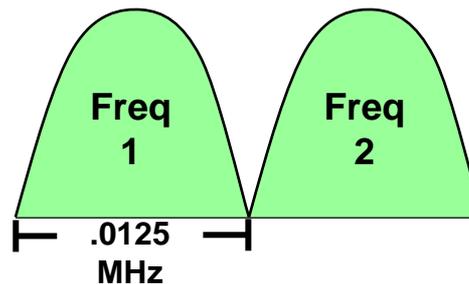
# Narrowbanding

## FCC “Squeeze In More Talkpaths” .....

All of the City’s radios utilize .025 MHz per frequency



FCC says: “2-to-1”



# Project 25 (P25)

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A digital industry standard developed by Homeland Security to ensure radios made by different manufacturers communicate with each other; these radios are interoperable.



# P25 (Cont.)

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## Current Standard...

- Developed between 1989 and 1995
- Government established requirements to:
  - Double the Talkpath capacity
  - Ensure interoperability among vendors...
    - so organizations can easily implement interoperable and seamless joint communication in both routine and emergency circumstances
  - Allow P25 systems to communicate with data terminals and the public telephone network
  - Provide common encryption technology

# P25 (Cont.)

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## Proposed Future Standard...

- Double channel efficiency over current P25 capabilities (4x's more efficient than the City's current radio system)
- Provide ability to perform Over the Air Programming (OTAP) while the radio unit is in the field
- Provide integrated GPS that will transmit location of radio unit

# Why P25?

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- Enables multiple vendors sourcing for cost effective and competitive procurements with no compromise in system capabilities.
- Enables Interoperability essential to multiple jurisdictions and joint operations.
- Enables ease of operation for more rapid adoption and training.
- Enables planned migration of systems and equipment from old to new.



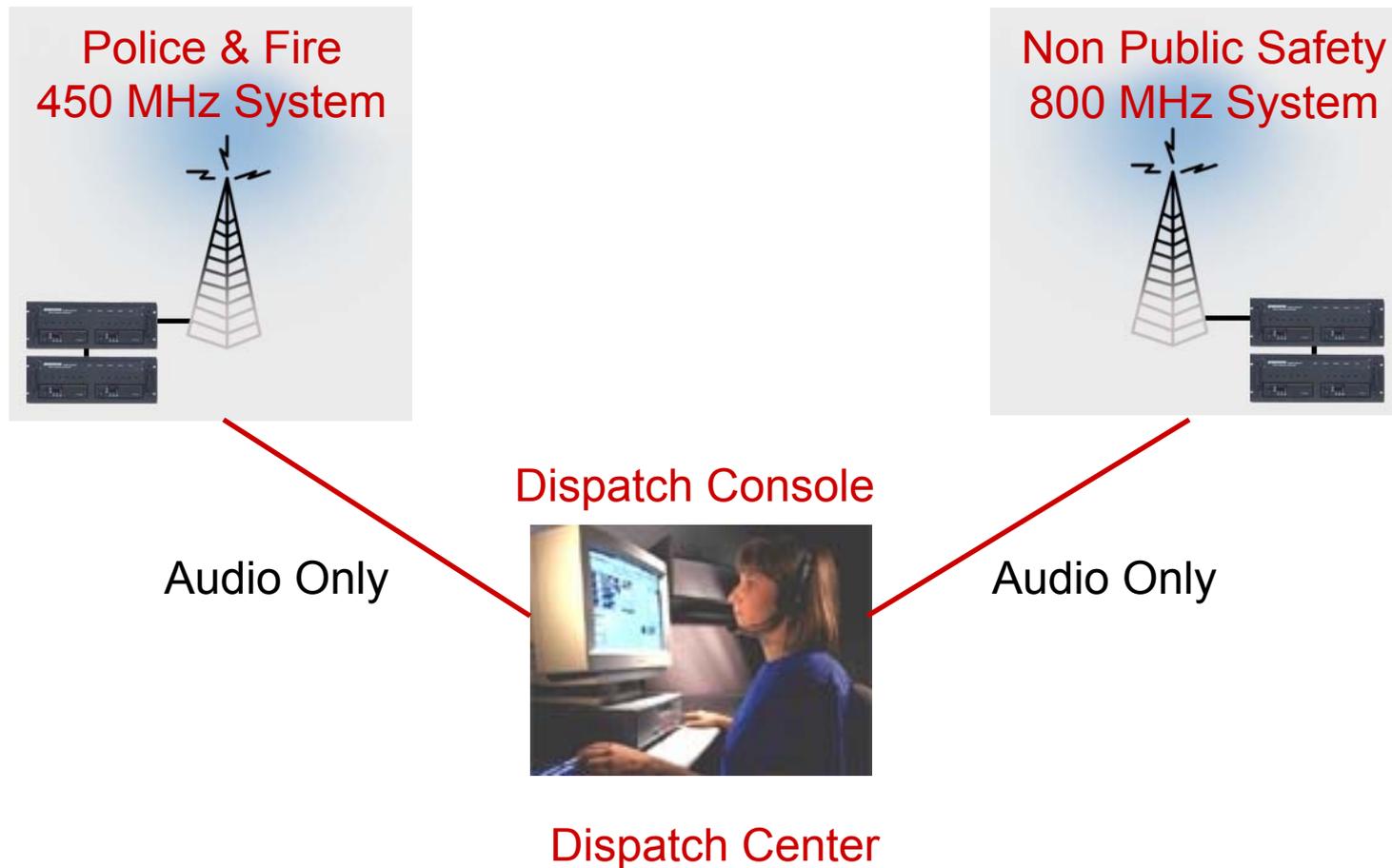
# Console Patching

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Console Patching is a manual connection from a computer which allows two different frequencies to communicate.

- Console Patching is inefficient because:
  - All communications must come back to the dispatch center
  - Requires operator intervention per incident
  - Delayed transmission
  - Degraded voice quality

# Console Patching



# Challenges

# The Challenges Facing the City

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- FCC Narrowbanding Mandate by 2013
- State of Texas P25 Goal by 2015
  - Cannot be achieved without modernizing the current radio network and replacing radios for non-public safety departments.

# FCC Narrowbanding Mandate

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- FCC mandates that all Public Safety radio systems be “narrowbanded” by January 1, 2013.
- Failure to comply with the narrowband mandate by the January 1, 2013 deadline may result in the following:
  - Substantial FCC fines
  - Revocation of FCC wideband licenses
  - May overload narrowband receivers in adjacent municipalities
- The City of Dallas will achieve the FCC narrowband requirements by:
  - Replacing handheld and mobile (in-vehicle) radios.
    - 6000 Public Safety radios (currently replacing 850 radios)
    - 1000 DWU radios
      - ⇒ *Note: DWU radios must be replaced because DWU is on the same segment of the radio network as DPD and DFR.*
  - Reprogramming the radio network receivers and transmitters.
- All replacement radios must work with the current network as well as the future P25 network, regardless of the manufacturer.

# State of Texas P25 Goal

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- The State of Texas has set the ***goal*** that radio communications of all first responders will be P25 compliant by January 1, 2015.
  - To achieve this goal, the City will need to completely modernize its entire radio system, including:
    - ✓ Adding new antennas and radio towers
    - ✓ Replacing transmitters, receivers, and radios for non-public safety operations.
- State of Texas has mandated that no federal funds will be made available for procuring radio equipment unless the technology is P25 compliant.

# City's Radio Network

# Current State of City's Radio Network

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- Is not narrowband compliant.
- Is not P25 compliant.
- Is over 40 years old.

The network consists of:

- 11,000 Radios
- 700 Receivers
- 400 Antennas
- 250 Transmitters
- 23 Towers

- Is divided into two segments:
  - Public Safety and DWU
  - Other Civilian departments

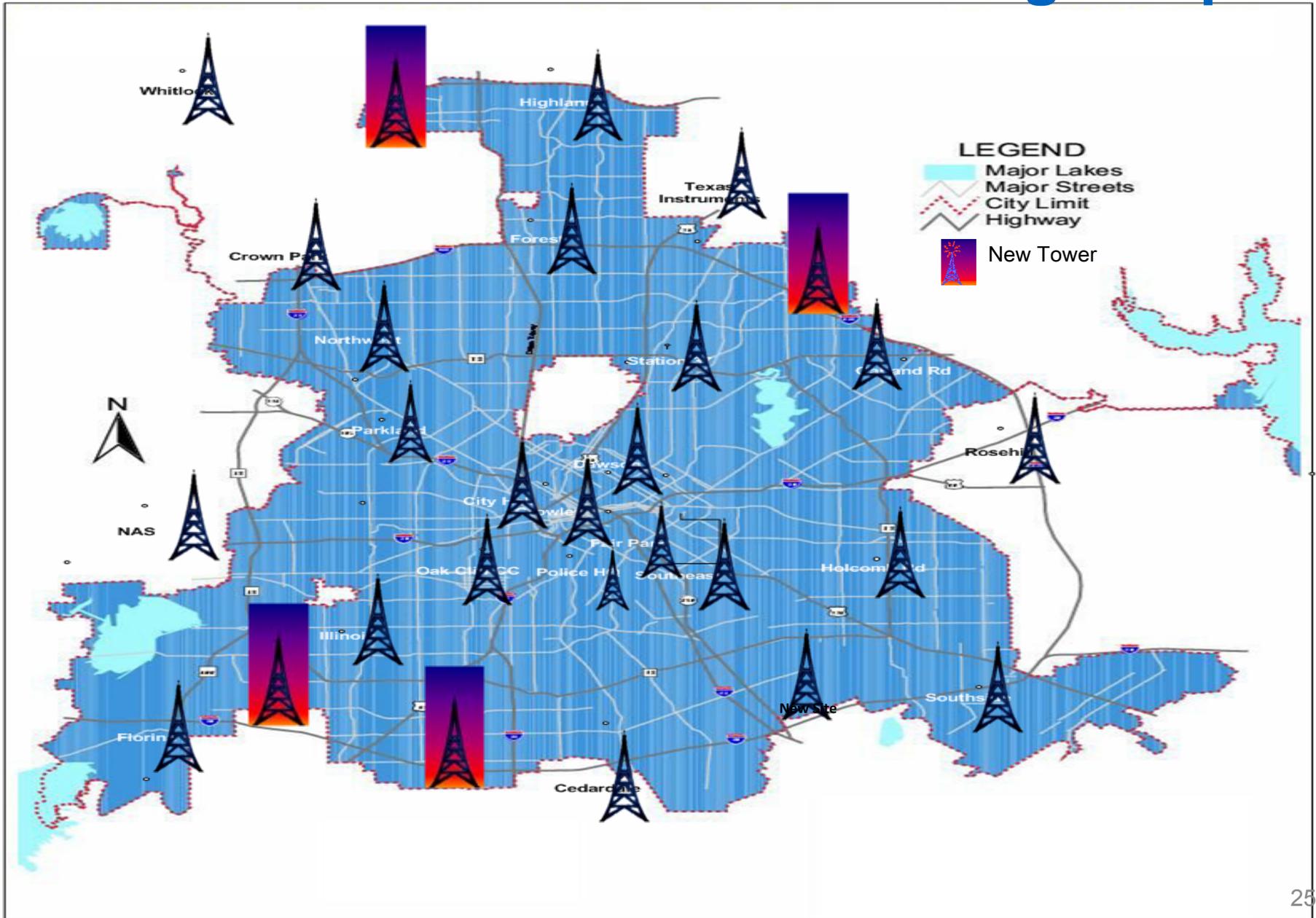
Note: The difference between these two segments is that they are on two different frequencies. i.e., they can't talk to each other without console patching.

# Why Does the City Need a New Radio Network?

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- Current Radio System is not P25 Compliant
- Current Radio Coverage is inadequate
  - Some areas have weak signal strength
  - Poor coverage inside buildings exists throughout the City
- Currently 70% of the radio equipment is not easily supported by the manufacturer while the other 30% will not be supported or easily acquired from third parties after 2012.
  - Non supported radio equipment means:
    - The manufacturer will not provide maintenance
    - No new replacement parts will be made
    - Search internet and/or barter to replace any broken parts
- To achieve the State of Texas P25 compliancy goal for 01/01/2015.

# State of Current Network Coverage Map



# Addressing the Challenges

# How the City Will Address the two Challenges

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To meet the challenges of the 2013 narrowbanding mandate and meeting the State's 2015 P25 goal, the following must occur:

- Purchase new radios for Public Safety and DWU
- Replace the outdated Radio Network

# Achieve the 2013 Narrowbanding Goal in 6 Steps

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Step 1



- **2000 P25 Public Safety radios**
    - December 2010 Council approved Master Agreement for 2000 Radios
      - 850 Radios for the Super Bowl
        - 772 portable radios (Complete)
        - 38 mobile motorcycle radios (Installation is in Progress)
        - 40 mobile radios (Complete)
    - January 2011
      - Committee and Full Council Briefings
      - Purchase 1150 mobile radios
    - January 2011 – July 2011
      - Install and configure 1150 Public safety mobile radios for narrowband
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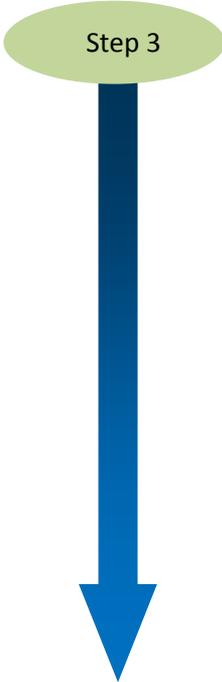
Step 2

- **Re-program Site Transmitters**
  - May 2011 – July 2011 re-program 23 site transmitters at the towers

# Achieve the 2013 Narrowbanding Goal in 6 Steps

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Step 3



- **Procure and Install the Remaining 5000 P25 compliant Radios for Public Safety & DWU**
    - June 2011, Issue RFCSP for bid
    - September 2011, Committee Briefings
    - November 2011, Council award contract for 5000 P25 compliant radios
  - December 2011 – June 2012
    - Install and configure 4000 Public Safety radios for narrowband
      - 772 mobile radios
      - 3228 portable radios
  - March 2012– June 2012
    - 1000 DWU radios
      - 600 mobile radios – Using Outside Contractors
      - 400 portable radios
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# Achieve the 2013 Narrowbanding Goal in 6 Steps

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Step 4

➤ **Re-program Site Receivers**

- June 2012 through November 2012 re-program 23 site receivers at the towers

Step 5

➤ **Re-program radios to match Receiver Configuration in Phase 4**

- July through November 2012
  - 1922 mobile radios
  - 772 portable radios used for Super Bowl
  - 38 mobile motorcycle radios used for Super bowl
  - 40 mobile radios used for Super Bowl

Step 6

➤ **Submit narrowband license to FCC**

- December 2012

# Funding Sources for Achieving Narrowbanding

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\$27,029,450 in Public Safety Grant funds over the next 3 years and \$4,000,000 in DWU funding.

- Grant funds will pay for all Public Safety handheld and mobile radios and the industry radio expert consulting firm.

# Achieve the 2013 Narrowbanding Goal in 6 Steps

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In summary,

•To achieve these 6 narrowbanding steps the following must occur:

- Procure the remaining 1150 radios off the current contract
  - Council awarded contract on December 10, 2010 for 2000 radios from Motorola.
  - 850 radios were purchased in December 2010 for the Super Bowl.
  
- Procure the remaining 5000 radios
  - Issues a bid (RFCSP)
  - The radios must work with the current system, and
  - Comply to the P25 standard
  
- Neither of these purchasing actions will preclude any manufacturer from bidding on the new radio network.

# Achieve the State's P25 Goal in 4 Steps

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- **Partnering with Dallas County and Adjacent Jurisdictions**
  - Dallas County is effected by the same challenges of upgrading their current radio network as the City. The City and County have the opportunity to partner in order to eliminate duplication and have a more robust system.
  - The City has been in consultation with Dallas County for two years working on a consolidated plan to upgrade the City and Dallas County Radio Networks.
  - Provide adjacent jurisdictions with subscriber access to the City and Dallas County consolidated Radio Network.
  - The City and Dallas County will continue to explore options for upgrading both radio networks jointly and will provide Council updates in the future.
  - The City and Dallas County are proposing to jointly hire an external radio consulting firm.

# Achieve the State's P25 Goal in 4 Steps

Step 1

➤ **Acquire Services of External Radio Consulting Firm**

- Issue RFCSP for bids – January, 2011
  - Conduct Panel interview – March, 2011
  - Public Safety briefing – May, 2011
  - Finalize contracts – June, 2011
- June 2011 – Council awards External Radio Consulting Firm contract

Step 2

➤ **Develop P25 Radio Network requirements document**

- June 2011- November 2011-- Industry Radio Expert
  - Gather P25 radio network requirements from City of Dallas and Dallas County
  - Development of RFCSP for P25 Radio network replacement

Step 3

➤ **Selection of P25 radio network provider**

- January 2012 -- Issue RFCSP for bids
- May 2012 -- Industry radio expert, City of Dallas and Dallas County review proposals
- July 2012 -- Committee selects P25 radio network provider
- September 2012 -- Industry radio expert assists in negotiating the P25 radio network system
- September 2012 – Committee and full Council briefings
- October 2012 – Council awards P25 radio network provider

# Achieve the State's P25 Goal in 4 Steps

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Step 4



- **Procure and Install P25 radio network system**
    - November 2012 – Bond election
    - March 2013 – December 2014: Project management and installation of the P25 radio system
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# External Radio Consulting Firm

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Why do we need a consulting firm:

- To write the radio network requirements, which will become a key part of the bid (RFCSP) document.
- To ensure the vendor proposed design is not proprietary.
- Establish appropriate evaluation criteria.
- Assist the City in conducting a thorough evaluation of the vendor proposals.

# External Radio Consulting Firm (Cont.)

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Lessons learned from other cities:

- Repeat the successes of other cities, such as Houston, which utilized the expertise of external radio consultants resulting in significant savings. This translates into added value that more than offsets the consulting expenses many times over.
- Risk reduction. For example, the City of Kansas City had to spend in excess of \$5 million dollars more to correct the deficiencies that would have been mitigated by a qualified radio consultants review of the specifications.

# Funding Sources for Achieving P25 Goal

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- The new P25 Radio Network cost approximately \$100,000,000, is a one time turnkey project which will require capital bonds or other funding sources.
- Dallas County will contribute the funds for equipment that is outside of the City.
- We will return at a later date with additional funding information as we continue to work with Dallas County on a consolidated radio network upgrade plan.

# Summary Funding Sources

## State of Texas P25

	Estimated Cost and Funding Source		
	Grants	Bonds/Other Sources	DWU
Step 1: Super Bowl and Narrow Banding			
▪ Radios	\$ 8,729,329		
Step 2: Continue Narrow Banding			
▪ Radios	\$17,000,000		\$4,000,000
▪ Consulting Services	\$ 1,300,000		
Step 3: P25			
▪ Public safety digital network		\$90,000,000	
▪ 4000 Non-public safety radios		\$ 7,000,000	
▪ Non-public safety digital network		\$ 3,000,000	
Total Estimated Cost	\$27,029,329	\$100,000,000	\$4,000,000

**QUESTIONS?**