

City of Fort Worth  
Information Technology Solutions Department

Public Safety Radio System  
Regional Radio Communications Master Plan



January 27, 2011

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## Acknowledgements

Buford Goff & Associates, Inc. would like to thank the following organizations who contributed information, participated in interview sessions, and offered the operational insight reflected in this report.

- City of Arlington, Texas
- City of Burleson, Texas
- City of Dallas, Texas
- City of Fort Worth Fire Department
- City of Fort Worth Fire Department - Emergency Management Division
- City of Fort Worth Information Technology Solutions Department
- City of Fort Worth Police Department
- City of Fort Worth Department of Transportation and Public Works
- City of Fort Worth Water Department
- City of Grand Prairie, Texas
- City of Haltom, Texas
- City of Irving, Texas
- City of Mansfield, Texas
- City of North Richland Hills, Texas
- City of White Settlement, Texas
- Dallas County, Texas
- MedStar
- Motorola Corporation
- North Central Texas Council of Governments
- Northeast Tarrant County Radio Consortium - NETCO
- Tarrant County, Texas
- Tarrant County 9-1-1 District
- Texas Department of Public Safety
- The Fort Worth Transportation Authority - The T

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## 1.0 Executive Summary

### 1.1. Introduction

Jurisdictions within Tarrant County are taking proactive step to improve public safety radio communications within the county. In May, 2010, the City of Worth retained Buford Goff & Associates, Inc. (BGA) to create a Regional Communications Master Plan to serve as the roadmap for the next generation radio system, for county wide public safety radio communications. The City requested that the master plan include the following:

- A design and technical architecture
- An interoperable concept of operations to connect the system with other systems, such as the North central Texas Council of Governments Regional P25 Overlay System
- A timeline with major milestones and a phased approach for system transition and operations, and a
- Budgetary estimate with funding requirements.

As part of the development process for the regional master plan, the City requested that BGA:

- Coordinate with all North Texas Interoperable Communications Coalition members and potential members to develop the plan.
- Recommend processes to procure, implement, control, and manage the regional radio system
- Recommend and develop a governance model that supports the master plan's technical architecture and meets the member jurisdictions needs.

During the course of the engagement, BGA worked closely with key stakeholders in the county from the following organizations:

- City of Fort Worth Police, Fire, Emergency Management and ITS
- Tarrant County
- City of Arlington
- City of Grand Prairie
- North Eastern Tarrant County Radio Coalition(NETCO)
- City of Dallas
- The North Central Texas Council of Governments
- The Texas Department of Public Safety (DPS)
- Burleson
- White Settlement

This widespread collaboration ensured that regional interoperability needs were well understood and properly addressed. BGA worked closely with these organizations to identify the appropriate trends in technology, potential transition strategies, and costs associated with the City's P25 Upgrade Project supporting a Tarrant County radio system.

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The purpose of this report is to clearly communicate to the City of Fort Worth and the potential participating organizations within the county the necessary strategies, technologies, activities, costs, and schedule required to successfully implement a county-wide system to meet the public safety communication and interoperability needs of Tarrant County both now and in the future.

## 1.2. Background

Public safety communication requirements in the post 9/11 era have changed significantly. Interoperability and standardization have become the mantra for police, fire, and EMS organizations across the country. The U.S. Department of Homeland Security has established the National Emergency Communications Plan (NECP) and has linked federal funding at the state and local level to compliance. The NECP has given rise to Statewide Interoperability Communication Plans (SCIPs) and, at the local level in the State of Texas, Regional Interoperability Communication Plans (RICPs). The common objective of these plans is to ensure that first responders across the country have the necessary communication capabilities to ensure the safety of the citizens within their jurisdictions and enable effective coordination/response among all first responders at the federal, state, and local level in the event of a multi-jurisdictional or regional event.

Texas has established a goal of December 31, 2015 for statewide interoperability. Several regions in Texas have made substantial progress toward interoperability. For example, the Houston-Galveston Area Council of Government (COG) has substantial interoperability in the urban areas and is in the process of upgrading radio system capabilities in the outlying counties. In addition, the regional leadership in South Texas has developed a plan that will provide interoperability from Brownsville to El Paso providing coverage along the entire Texas / Mexico border. This project leverages the existing public safety radio communications infrastructure, and will use 800 MHz systems in some of the urban areas along the border to address the long standing problems of VHF radio interference from Mexico. The Panhandle COG has completed a study that recommends the development of an IP-based network using commercial data circuits. This plan takes into account the existing communications infrastructure and the Panhandle topography. The South Texas solution is different from the Panhandle solution, yet they both achieve interoperability within their regions taking into account their existing infrastructures, regional needs and differences.

Municipalities in Tarrant County currently operate 27 different public safety radio communications systems. These systems have varying degrees of coverage, capacity and interoperability. The five largest radio systems in Tarrant County are operated by the City of Fort Worth, the City of Arlington, the Northeast Tarrant County Radio Consortium (NETCO), the City of Grand Prairie and the City of Mansfield. Collectively these cities are referred to as the County Partners. The radio systems operated by the County Partners are at the end of their useful life and are not capable of supporting the interoperable communication needs of Tarrant County. Figure 1.2 is a conceptual representation of these systems and is not intended to be a precise representation of system coverage areas.

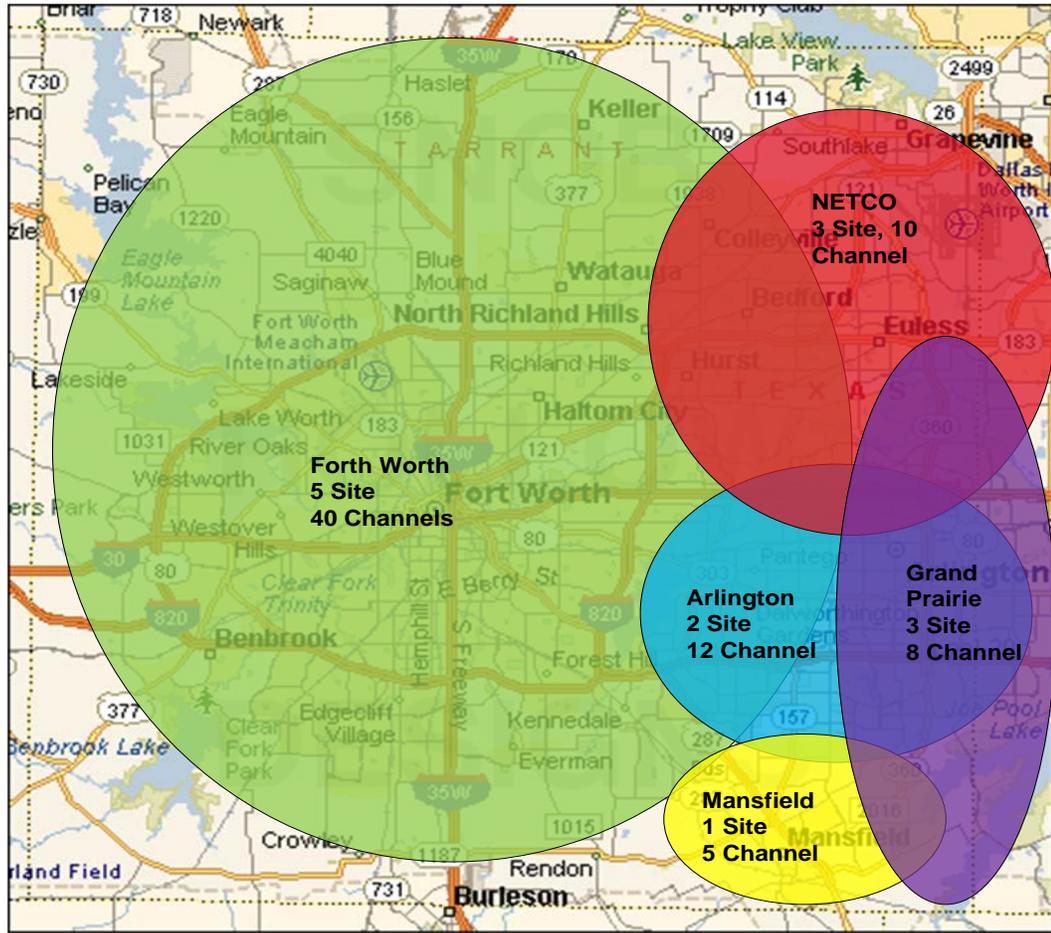


Figure 1.2 – Tarrant County Radio Systems

### 1.3 Description of the Regional Radio System

The convergence of increased requirements for public safety communications at the county level, the known deficiencies with the existing systems within Tarrant County, and the need for all jurisdictions to control capital and operations and maintenance (O&M) costs necessitate leveraging all available radio assets in the county for the build-out of a Regional Radio System (RRS). For purposes of this report, the RRS is defined as the county-wide radio system that will provide primary communications and direct interoperability for all jurisdictions based in Tarrant County.

Given that the City of Fort Worth has already made a substantial investment in the planning of a P25 system which can serve as the “core” for the RRS, and given that the communication and interoperability requirements for the four remaining large radio systems in the county can be met by this “core” system, the following high-level description of the RRS has been developed:

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Architecture – The RRS will be based on the APCO P25 Digital platform which is the industry standard for public safety interoperability. The system will leverage the P25 Master Switch purchased by the City of Fort Worth in 2010 and scheduled for operation in Q2, 2011. The system will also leverage 12 of the existing 14 tower sites that are in use by the County Partners, a new site at Aledo, and a small scale site for the Texas Motor Speedway, to provide coverage to the central and eastern parts of Tarrant County. BGA has estimated four additional sites will be required to provide coverage in the southwest and northwest parts of the county. Further engineering studies will need to be conducted to determine the optimal number and placement of sites to service these portions of the county.

The RRS will also leverage the investment, in digital capable subscriber radios, made by jurisdictions throughout Tarrant County.

Interoperability – The RRS will provide direct interoperability for public safety first responders operating in Tarrant County. The RRS will also provide direct interoperability to jurisdictions outside of Tarrant County in one of the following manners:

- The RRS will provide direct interoperability with the City of Dallas, DFW Airport, and the North Central Texas Council of Governments P25 overlay system.
- The RRS P25 Master Switch will have the capacity, and will be available to serve as the master switch for adjoining jurisdictions, such as Johnson County or the City of Irving, thereby providing direct interoperability for first responders operating in these jurisdictions with first responders operating on the RRS.
- The RRS P25 Master Switch will also have the capacity, and will be made available to serve as a backup master switch for other P25 systems such as the P25 system being implemented by the City of Houston.

All connections to systems outside Tarrant County will be standards based and will be consistent with the “system of systems” approach contained in the Texas SCIP and the North Central Texas RICP. Refer to Figure 2.3 for an illustration of these interfaces.

Governance – A seven member Governance Board (Board) will be established to provide a governing structure for solving interoperability issues, developing policies relative to the implementation and operation of the RRS, and establishing fee structures. Members of the Board will be representative of the subscriber base. The Governance Board will enhance communication, coordination, and cooperation among the membership and will provide a framework in which stakeholders can collaborate and make decisions that represent a common objective. Figure 6.3 shows the proposed organization chart for the Board.

System Monitoring – During the one year warranty period after final acceptance, the infrastructure of the RRS will be monitored 24X7X365 by Motorola. Motorola will be responsible for responding to system alarms, performing remote diagnostics, and dispatching field technicians as needed

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to resolve system problems. Motorola will also be responsible for producing management reports necessary for tracking system performance, availability, and capacity. After the warranty period the Board, or its designee, will enter into a service contract with a quality service provider (QSP) to provide System Monitoring and Dispatch Services for field technicians.

Maintenance and Support – The three primary areas for maintenance and support relative to the RRS are listed below along with the corresponding approach for service delivery:

- Sites and Facilities – Municipalities that own or lease tower sites or other facilities that are used by the RRS will be responsible for maintaining those sites and facilities to an agreed standard. Upkeep of the grounds, repairs to heating and air conditioning systems, electrical repairs, and maintenance of security fencing, gates, and doors will all be part of the sites and facilities maintenance agreement.
- Site Electronics – All site electronics will be maintained by Motorola under a warranty agreement through 2015 as part of the initial contract. After that time, the Board, or its designee, will enter into a service contract with a QSP to maintain the site electronics, perform software upgrades, and provide break/fix repairs to the site electronics.
- Subscriber Units – All P25 capable radios owned by the RRS members will be programmed to be operational on the RRS. Motorola will initially program subscriber radios as a part of system implementation. Subsequent reprogramming and maintenance of the subscriber units will be responsibility of the individual RRS members. RRS members may choose to perform these services in-house using their own staff or contract separately with a third party service provider.

Zones and Phases – For planning purposes, Tarrant County has been divided into five zones as follows:

- Zone 1, the Central Zone, is comprised of the existing and planned City of Fort Worth Sites.
- Zone 2, the Northeast Zone, is comprised of the existing NETCO system.
- Zone 3, the Southeast Zone, is comprised of the existing Arlington, Mansfield, and Grand Prairie systems.
- Zone 4, the Southwest Zone, has been established to service Benbrook and Burleson.
- Zone 5, the Northwest Zone, has been established to service the Northwestern portion of the county.

Planning and budgeting for each Zone can occur as separate, but coordinated activities. When the City of Fort Worth's P25 Master Switch becomes operational in Q2, 2011, the build-out and migration for each Zone can occur in parallel or in sequence as funding and/or other conditions dictate. This approach allows for a coordinated plan with maximum flexibility for the members. Refer to Figure 1.3 for a

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representation of the RRS zones. Figure 1.3 is a conceptual representation of these zones and is not intended to be a precise representation of system coverage areas.

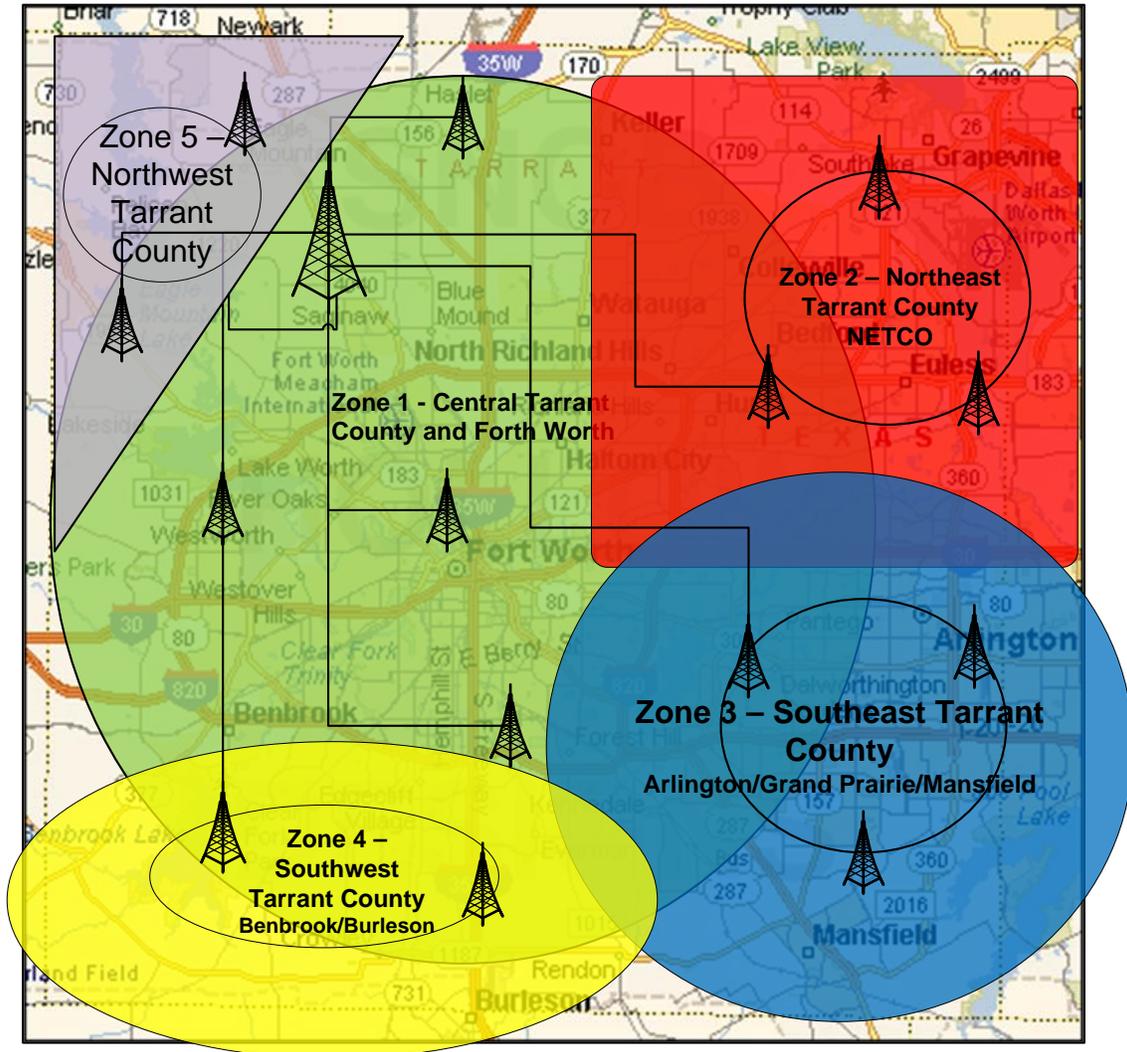


Figure 1.3 Regional Radio System Zones

## 1.4 Costs Estimates

During the five year period from 2005 thru 2010, Motorola provided individual jurisdictions in Tarrant County with multiple Rough Order of Magnitude (ROM) cost estimates for the upgrade of their respective systems to the P25 platform. These estimates were not consistent across jurisdictions in terms of architecture, number and type of subscriber radios, and warranty and maintenance support. These estimates also were not reflective of the total cost of the system upgrade because the estimates did not include civil engineering costs, upgrades to sites, towers, and facilities, project management costs, or quality assurance costs.

Table 1.4 contains BGA's estimates for the total cost of individual system upgrades to the five major systems within Tarrant County to the P25 platform. The Table contrasts those

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costs to a county wide effort leveraging the City of Fort Worth P25 Upgrade Project. Significant savings for a county wide approach are achieved by leveraging the City's purchased P25 Master Switch and negotiated discounts from Motorola for infrastructure, radios, and systems integration services that will apply to all entities in the county. Detailed costs are contained in Appendix C.

It is important to note that the discounts used in the calculation of savings are based on the current negotiated contract between the City of Fort Worth and Motorola and are subject to change if the terms of the contract between the City and Motorola are modified.

Radio System	Stand Alone ROM Estimate	Estimate Using Negotiated Pricing	Savings
Forth Worth	\$65.4M	\$43.8M	\$21.6M
Arlington	\$19.9M	\$12.2M	\$7.7M
NETCO	\$26.8M	\$19.5M	\$7.3M
Grand Prairie	\$14.4M	\$10.8M	\$3.6M
Mansfield	\$5.4M	\$4.0M	\$1.4M
P25 Master	\$5.2M	\$1.6M	\$3.6M
CFW Partners	\$14.9M	\$9.9M	\$5.0M

**Table 1.4 – Estimated Savings of County-Wide Approach**

**NOTE** - Estimated savings in Table 1.4 are for the five major radio systems in Tarrant County. Additional planning efforts need to be conducted to determine the total savings for all jurisdictions within the county.

### 1.5 Schedule

Table 1.5 contains a listing of the scheduled milestones in the Regional Radio System Project Schedule. A more detailed schedule is contained in Appendix B.

Regional Master Plan Milestones (FY11 – FY15)	Timeframe
P25 Master Switch Implementation	Q2,2011
CFW Upgrade Contract Signed	Q3,2011
Regional System Planning and Funding Complete	Q3,2011
Kickoff for Zone Projects	Q1,2012
Final Acceptance for Zone Projects	Q2,2014
Zone Migration Complete	Q4,2014
CFW Upgrade Complete	Q1,2015
Regional System Complete	Q1, 2015
Warranty Period Complete	Q1, 2016

**Table 1.5 - Master Plan Milestones**

## 2.0 Technical Design and Architecture

The RRS will be a Motorola ASTRO 25, digital IP-based, APCO Project 25 compliant, trunked radio system. The system will be designed to provide 95% portable on-street (POS) coverage for the majority of Tarrant County and will provide 97% POS coverage and 20DB in-building as required by the County Partners. The RRS will utilize Motorola's SmartX technology to stay connected to the existing analog systems in the county during transition and migration.

### 2.1 RRS Zones

For discussion and planning purposes, BGA has divided the RRS into five Zones. Final configuration of these Zones in terms of tower site and channels will depend on the detailed engineering studies that will be conducted in 2011.

Zone 1 City of Fort Worth - The RRS will organize the City of Fort Worth's 40, 800 MHz frequencies into dual simulcast layers each containing 20 channels. Refer to Figure 2.1 for an overview of the Zone 1 architecture. These dual layers will provide the City of Fort Worth with needed additional capacity and redundancy. The dual simulcast layers in Zone 1 will utilize the same 6 sites and, therefore, will have identical coverage footprints. The RRS will dynamically move subscribers between layers based on loading factors. There will be no operational impact to subscribers, dispatch operations or County Partners when personnel are automatically switched between layers. The dual layer architecture will provide added redundancy in the event of a failure of a component of the system, a site, or a layer. Prime sites for the dual layers will be located at Eagle Mountain and Rolling Hills to provide the City of Fort Worth with location diversity for the prime-sites.

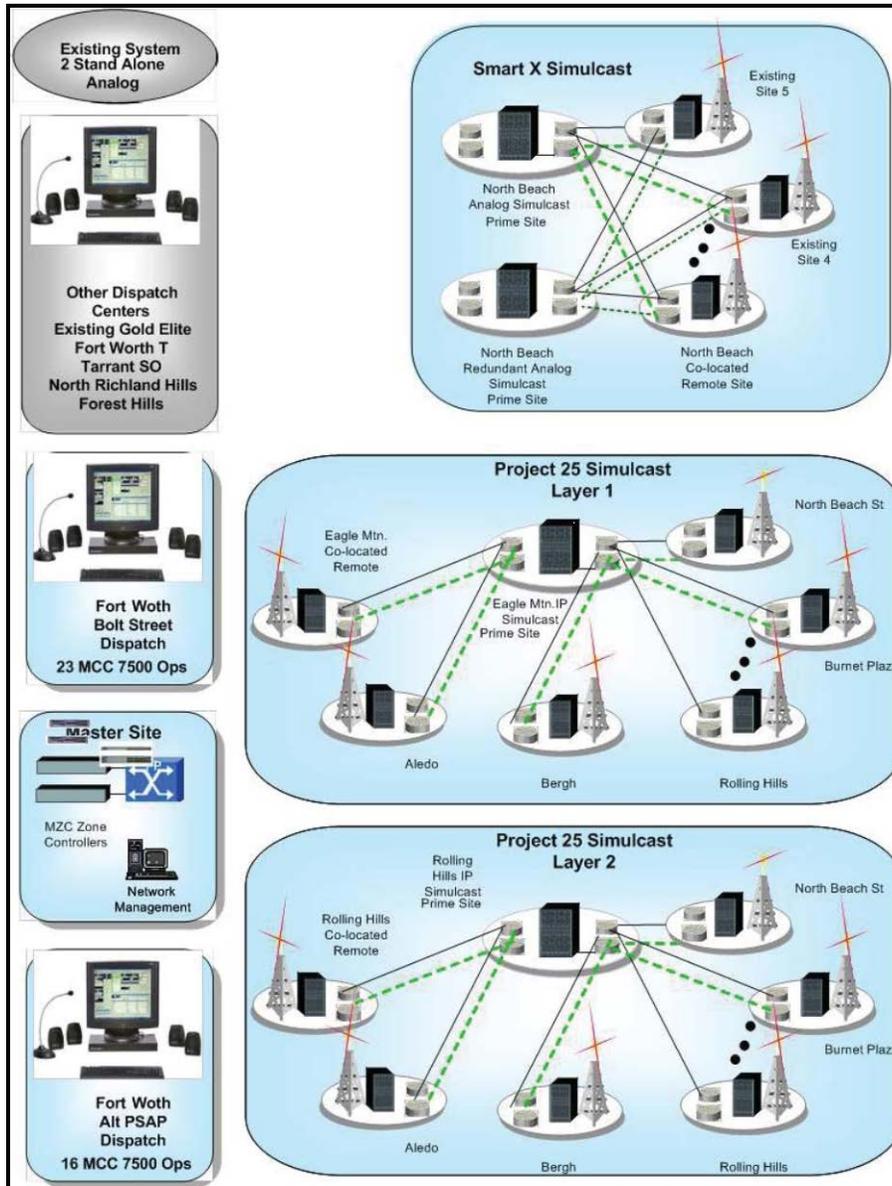
Zone 2 NETCO – Zone 2 of the RRS will be a single layer zone and will service the northeast section of the county currently serviced by the NETCO system and will provide coverage to the Cities of Bedford, Colleyville, Euless, Grapevine, Keller and Southlake. Zone 2 of the RRS will leverage the existing NETCO tower sites and frequencies. Due to the close proximity of a City of Fort Worth tower site and a NETCO tower site, the potential exists for the elimination of one site. Final determination on the tower site reduction will be made after a detailed engineering study has been conducted.

Zone 3 Arlington/Grand Prairie/Mansfield – Zone 3 of the RRS will be a single layer zone and will service the southeast section of the county that is currently serviced by the Arlington, Grand Prairie, and Mansfield systems. Zone 3 of the RRS will leverage the existing tower sites and frequencies in the area. Due to the known coverage requirements to the south of Mansfield and the potential coverage north of Mansfield that could be provided by the Arlington's south tower, a potential exists to relocate a tower site in the Mansfield area to optimize coverage. Final determination on the potential site relocations will be made after a detailed engineering study has been conducted.

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Zone 4 Benbrook and Burseson – Zone 4 will be a single layer zone and will provide coverage to the southwest portion of Tarrant County inclusive of Benbrook and Burseson. Final determination of site relocations and channel requirements will be made after a detailed engineering study has been conducted.

Zone 5 Northwestern Tarrant County – Zone 5 will be a single layer zone and will provide coverage to the northwest portion of Tarrant County. Final determination of site relocations and channel requirements will be made after a detailed engineering study has been conducted.



**Figure 2.2 - RRS Zone 1 Architecture**

## 2.2 Interoperability

Interoperability refers to the capability of public safety agencies, including law enforcement, firefighters, and emergency medical services (EMS), to talk to another via radio communication systems on demand, in real time, during an event. Interoperability is a primary consideration in the need to implement the RRS. The upgraded radio system will address the City's interoperability needs in the following manner:

*During Migration* – During implementation and migration to the RRS, first responders in Tarrant County will be operating on the existing analog systems as well the digital RRS. To manage these connections, or talk paths, between analog and digital systems the RRS will utilize Motorola's SmartX technology. SmartX will provide subscribers the ability to communicate with each other without impact to daily operations until all subscribers are transitioned to digital operation.

*Within Tarrant County* - The RRS design will support additional SmartX interfaces for surrounding analog systems as necessary. The use of SmartX technology to connect the RRS with other analog radio systems in Tarrant County will require that those systems be upgraded to SmartX operation and then reprogrammed with the RRS system ID. The RRS will also provide direct connectivity to other P25 systems in Tarrant County such as the City of Hurst and the City of White Settlement that are either operational or planned to be operational when the RRS is completed.

*Beyond Tarrant County* - The City also will also have interoperability to the City of Dallas and the P25 NCTCOG Overlay System through a P25 Inter RF Subsystem Interface (ISSI) gateway. The ISSI gateway is a non-proprietary interface that enables radio systems built by the same or different manufacturers to be connected together into a wide area network. The wide area network connection with the City of Dallas using ISSI will provide RRS subscribers with extended coverage while roaming. Figure 2.1 shows a high level diagram of the NCTCOG P25 Overlay System.

The RRS will also provide direct interoperability to jurisdictions outside of Tarrant County in one of the following manners:

- The RRS will provide direct interoperability with the City of Dallas, DFW Airport, and the North Central Texas Council of Governments P25 overlay system.
- The RRS P25 Master Switch will have the capacity, and will be available to serve as the master switch for adjoining jurisdictions, such as Johnson County or the City of Irving, thereby providing direct interoperability for first responders operating in these jurisdictions with first responders operating on the RRS.
- The RRS P25 Master Switch will also have the capacity, and will be made available to serve as a backup master switch for other P25 systems such as the P25 system being implemented by the City of Houston.

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All connections to systems outside Tarrant County will be standards based and will be consistent with the “system of systems” approach contained in the Texas SCIP and the North Central Texas RICP. Refer to Figure 2.3 for an illustration of these interfaces.

**Note** – When the P25 Master Site and the RF site at Burnette Plaza become operational in Q2, 2011, the City of Fort Worth will coordinate with the COG to expand the COG Overlay system by relocating the Harris site at Burnette Plaza to another location.

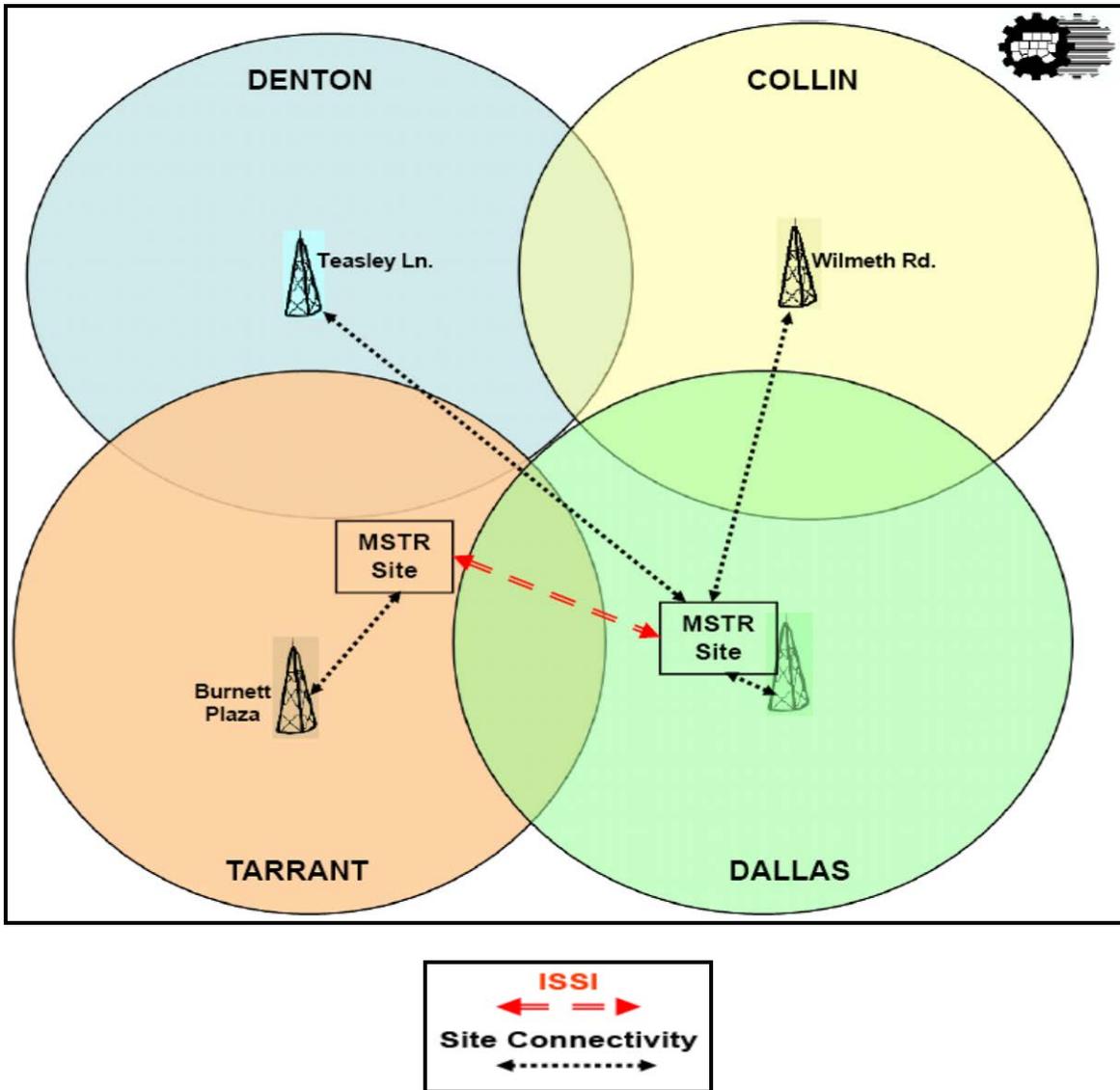


Figure 2.1 - NCTCOG P25 Overlay

**2.4 Expansion**

Tarrant County’s population has grown 23.8% from April 1, 2000 to July 1, 2009. Assuming this rate of growth continues, and assuming that the number of first responders in Tarrant County grows proportionately, the RRS will have adequate expansion capabilities to meet Tarrant County’s growth projections in terms of capacity and coverage through 2029. Table 2.4 shows a summary of the infrastructure capacity capabilities of the RRS.

Zones - A zone is a logical grouping of sites and dispatch resources. The RRS can accommodate both voice and data services using a single zone. The proposed initial deployment of the RRS will utilize four zones, however, the RRS can be expanded up to seven zones.

Subsystems/Sites – Zone 1 will consist of two simulcast subsystems, one for each layer. The remaining Zones will consist of one simulcast subsystem. Each RRS zone can be expanded to accommodate up to 15 simulcast remote sites.

Dispatch – The upgraded system will accommodate 55 different dispatch locations. The City of Fort Worth and its partners plan to use a total of 10 dispatch locations, leaving 45 additional locations to be used by the RRS.

Astro 25 System	Multi-Zone Capacity	Proposed Use
<b>Zones</b>	1-7	4
<b>RF Subsystems</b>	100/zone	1-2 per zone
<b>ID Database Range</b>	16M	X
<b>Unit IDs</b>	128,000/64000 per zone	32,000 Unit IDs licensed
<b>Talkgroup</b>	16,000	300-700
<b>Trunking/Conventional Channels</b>	700/zone	6-40 depending on zone configuration
<b>Simulcast Cells</b>	64/zone	1-2 depending on zone configuration
<b>Simulcast Sites per Cell</b>	15/subsystem	3-6 per cell
<b>Simulcast Channels per Cell</b>	30 per simulcast cell	6-20 depending on cell configuration
<b>Dispatch locations</b>	55	20 (estimated)

**Table 2.4 - Expansion Capabilities**

**2.5 County Partner Responsibilities**

Implementing the RRS will require significant effort and involvement on behalf of the County Partners. Over the 48 months planned duration of the project, the County Partners will be required to maintain an active project sponsor, provide project management services, legal support services, procurement support services, and technical support. The County Partners will be required to make personnel available from police, fire, emergency management, and public works, to support the project. Personnel will be required to participate in and provide input to activities such as project schedule development, site preparation, fleetmap

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development, radio template configuration, coverage testing, acceptance testing, training, transition planning, and system cutover.

Additionally, there are specific tasks that the County Partners must accomplish during specified timeframes to keep the RRS project on schedule.

- Appropriately re-licensing all frequencies as required for operation on the RRS.
- Replacing or strengthening towers that do not have sufficient capacity.
- Providing adequate building space for new equipment.
- Providing additional electrical service to the buildings and tower sites to provided electrical panels.
- Providing adequate HVAC capacity for additional equipment installed in the shelters.
- Ensuring the existing electrical circuits connected to the console systems at Bolt Street are backed up by adequate UPS and generator power.
- Ensuring the existing electrical circuits connected to the console systems at dispatch centers and alternate PSAPs are backed up by adequate UPS and generator power.
- Providing adequate space and capacity for new antenna networks to be installed.
- Providing adequate telecommunication backbone capacity for the additional load required for the P25 system.
- Upgrading computer hardware and software for partners retaining Gold Elite consoles.
- Providing a dedicated and secure delivery point for receipt, inventory, and storage of equipment.

### 3.0 Concept of Operations and Maintenance

Migration of the region’s public safety radio systems from analog technology to digital technology will require a restructuring of roles and responsibilities relative to the system’s operations and maintenance. This section of the RRS Communications Master Plan lists the major types of support activities that will occur on the system and describes how those activities will be performed. Table 3.1 contains a summary of the concept of operations and maintenance.

Maintenance Activity	Short Term	Long Term	Comment
Telecommunication Backbone Network (TBN)	County Partners	TBD	A TBN Standard for the RRS will have to be established and all site links made compliant. Monitoring and maintenance of the TBN is TBD.
Subscriber Units	Existing support structure	TBD	RRS Subscriber units will initially be programmed by Motorola as part of system implementation. Subsequent re-programming, installation, and maintenance of subscriber units will be the responsibility of the individual RRS members.
FNE	Motorola thru Q4, 2015	QSP	The Board, or its designee, will solicit pricing in 2015 for ongoing monitoring and maintenance of the upgraded system.
Sites and Facilities	County Partners	RRS Members	Maintenance of RRS sites and facilities will remain the responsibility of the owning/leasing party. Standards will be established to ensure consistency among RRS sites.
Environmental Alarms	QSP	QSP	Bundled with FNE

**Table 3.1 - Operations and Maintenance Activities**

#### 3.1 Telecommunication Backbone Network (TBN)

The County Partners currently use various microwave and T1 links for site connectivity. A standard will have to be established for RRS for site connectivity and individual systems/links will have to be brought into compliance with the standard. Final determination of how the RRS TBN is monitored and maintained will be the responsibility of the Board.

#### 3.2 Subscriber Units

The initial programming of subscriber units for operation on the RRS will be performed by Motorola. Subsequent installs, maintenance, and re-programming of subscriber units, and all associated costs, will be the responsibility of each RRS member.

### **3.3 FNE Monitoring and Maintenance**

Monitoring and maintenance of the RRS fixed network equipment (FNE) will be provided by Motorola through the end of the warranty period which is expected to be Q4, 2015. During this time Motorola will be responsible for:

- Monitoring of all FNE on a real-time 24x7x365 basis
- Remote identification of network alarms for response and reporting
- Case generation, tracking, and escalation for troubleshooting and repair
- Dispatch of field personnel to resolve identified problems

After the warranty and maintenance period (post Q1, 2015), the Board, or its designee, will solicit pricing from qualified service providers for ongoing monitoring and maintenance of the RRS.

### **3.4 Sites and Facilities**

Maintenance of RRS tower sites and other facilities will be the responsibility of the owning/leasing municipality. A maintenance standard for RRS sites will be established and all sites will be brought into compliance. Actual maintenance activities may be performed by the staff of the owning/leasing municipality or by their contracted service provider.

### **3.5 Environmental Alarms**

Monitoring of environmental alarms at all sites will be performed by Motorola. Typical alarms to be monitored include, but are not limited to:

- Site Controller Alarm.
- Fire/Smoke Detector.
- Intrusion Alarm (each door).
- High Temperature Alarm.
- Low Temperature Alarm.
- Power Failure Alarm.
- Generator run.
- Generator on-line.
- Generator Alarm.
- UPS alarm.
- Tower light failure.

#### 4.0 Regional Radio System Project Schedule

To facilitate planning efforts for the RRS, BGA has developed a high level project schedule that spans a 5 year period from FY2011 through FY2016. In developing the project schedule, which is shown in Appendix B, several factors had to be considered and provided for, by the plan. Those factors include but are not limited to the following:

- The State of Texas has established a goal of statewide interoperability by December 31, 2015. It is understood that this is a target date, and that there are no specific penalties associated with not implementing a system by this date. However, it is a goal that is attainable by the county and, in the absence of any other externally imposed target, is a logical objective for the beginning of the planning process.
- The City of Fort Worth has executed an agreement with Motorola to purchase and install a P25 master switch which will be operational in April, 2011. When operational, the master switch could provide interoperability for jurisdictions in the county regardless of whether or not the City's P25 Upgrade Project is funded.
- There are coordinated planning activities that need to occur between the cities in the county and Motorola to ensure that the RRS is properly designed to replace each of the five large systems in the county plus additional users in the county in terms of coverage and capacity. It is also important that these coordinated planning activities take place to ensure that the number of tower sites is minimized and that existing radio frequencies and other radio system assets are leveraged to the benefit of all jurisdictions involved.
- After the detailed county planning process is completed, the plan should allow the flexibility for each jurisdiction or groups of jurisdictions, in the county to plan for and transition to the county system as soon as possible.

#### 4.1. Zones and Phases

For project planning purposes, each Zone is assigned a project phase designator as follows:

Project Phase 1	Build-out of Zone 1 and migration of CFW subscribers
Project Phase 2	Build-out of Zone 2 and migration of NETCO subscribers
Project Phase 3	Build-out of Zone 3 and migration of Arlington/Grand Prairie/Mansfield subscribers
Project Phase 4	Build-out of Zone 4 and migration of Benbrook and Burleson, subscribers
Project Phase 5	Build-out of Zone 5.

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No firm requirements have been defined for providing coverage to the Northwest portion of the county. Accordingly, the build-out of Zone 5 has been planned for after 2014.

## 4.2. Timeline and Milestones

The timeline for the RRS project plan begins on October 1, 2010, which approximates the date work began on the City's P25 Master Switch, and concludes in March 2015 when the implementation of all zones of the RRS are complete and the RRS transitions to an operations and maintenance mode. Major milestones contained in the project schedule are shown in the table below.

Milestone	Target Date
Regional Plan Finalized	January 31, 2011
CFW P25 Master Site Operational	April 30, 2011
Funding for Zones/Phases Secured	September 30, 2011
Project Kickoff for Build-out of Zones	January 9, 2012
CFW Build-out Complete	September 15m 2014
Zone(s) Electronics Installed	January 10, 2014
Zone(s) Coverage Testing Complete	April 18, 2014
Zone(s) Final Acceptance Testing Complete	May 5, 2014
Zones(s) Subscriber Migration Complete	November 14, 2014
CFW Subscriber Migration Complete	March 4, 2015

## 5.0 Budgetary Estimates

Appendix C contains budgetary estimates associated with implementing the RRS. The estimated savings from a regional approach have been calculated by using rough order of magnitude (ROM) estimates for individual system upgrades provided to BGA by Motorola in October of 2010 and applying the discounts contained in the contract currently being negotiated between the City of Fort Worth and Motorola. BGA added estimated costs for site upgrades, project management, QA/QC support, and increased maintenance costs for sites and facilities. The budgetary estimates contained in Appendix C are for the five major radio systems in the county only. Additional discovery activities need to be conducted to determine the total savings for the county.

It is important to note that the discounts used in the calculation of savings are based on the current negotiated contract between the City of Fort Worth and Motorola and are subject to change if the terms of the contract between the City and Motorola are modified.

Appendix D contains budgetary estimates for FY11 through FY19. The estimates assume that site electronics, subscriber equipment, and system integration costs will be bundled into a 7 year lease agreement for each of the County Partners.

It is clear to the emergency response community within Tarrant County that communications interoperability cannot be solved by any one entity; achieving interoperability requires a partnership among emergency response organizations across all levels of government. A governance structure provides a framework in which stakeholders collaborate and make decisions that represent a common objective.

## 6.1. Governance Board

A Governance Board will be established for the RRS. The board will provide a common governing structure for solving interoperability issues relative to the RRS and protecting the financial interests of its membership. The board will establish guidelines and principles that drive the formation of policies, processes, and procedures. The board will also provide a framework to enhance communication, coordination, and cooperation and reduce any internal jurisdictional conflicts. Specific areas of focus for the governing board include, but are limited to:

- The establishment and maintenance of by-laws for the membership.
- The development and maintenance of a long-term strategic plan for the RRS.
- Formulation of policies relative to subscriber fees, capital investments, and ongoing operations and maintenance of the RRS.
- Membership guidelines and voting rights.
- Oversight of standing and ad-hoc committees

Participation in and the adherence to the RRS governance process will be strictly voluntary. The board will not be codified and will have no formal control or authority over the participating membership. Decisions by the board will be non binding. Figure 6.2 contains a proposed organization chart for the board.

## 6.2. Board Members

The RRS Governance Board will have seven voting members composed of the following:

- Two voting members from the City of Fort Worth to be chosen by the City;
- One voting member from the City of Arlington;
- One voting member from the Northeast Tarrant County Radio Consortium (NETCO);
- One voting member from the County of Tarrant;
- Two at-large voting members chosen by the membership.

The governance board shall:

- Conduct regularly scheduled meetings on a quarterly basis or more frequently as needed.
- Adopt rules pertaining to the conduct of their meetings.

## Regional Radio System Master Plan

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- Determine an appropriate term for board positions and a method of selection.
- Select a Chair from the membership.
- Establish Inter-local Agreements (ILAs) relative to:
  - Procurement and Build-out of the RRS
  - Operations and Maintenance
  - Use of the System
- Provide input and recommendations to the membership on matters regarding the design, engineering, implementation, and operations and maintenance of the RRS.
- Review requests for membership and make a determination, based upon an analysis of system impact, funding, operational issues, and sustainability.
- Make regular reports to the membership regarding the operational and financial status of the RRS,
- Assist the membership in coordinating a strategy for application of grant opportunities including those offered by the Regional Homeland Security Coordinating Committee and the Urban Areas Security Initiative program.
- Develop and maintain a cost-share formula for the membership.
- Seek revenue sources to fund improvements to and sustainment of the RRS.
- Participate in efforts to develop state-wide and regional interoperability.
- Establish, oversee and appoint Chairs of the following committees:
  - Users Committee
  - Technical Committee
  - Standard Operating Procedures (SOP) Committee.

These committees will make recommendations to the board on technical and operational aspects of the system.

- Establish guidelines for asset ownership and control of infrastructure equipment, wireless infrastructure, radio units, the telecommunications backbone, and sites and facilities.
- Define classes of membership such as RRS members, RRS partners, and RRS users.
- Review, advise, and make recommendations to the membership relative to establishment of a Systems Manager.

### **6.3. Committees**

A Users Committee will be formed to:

- Meet at least once quarterly or more frequently as needed.

## Regional Radio System Master Plan

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- Adopt rules for the conduct of meetings.
- Coordinate with the Technical Committee on technical issues and operating policies and procedures.
- Provide input to the board to ensure that the needs of system users are understood and addressed.
- Coordinate improvements and maintenance by the membership
- In cooperation with other jurisdictions operating in the region, develop regional training activities and conduct exercises.

A Technical Committee will be formed to provide advice to the board on technical aspects of the RRS involving the design, operation and maintenance. Local personnel from the membership, with an expertise in radio systems will be selected by the board to serve on the committee. Additional resources, such as consultants may be utilized to support the committee's technical analyses. The Technical Committee will:

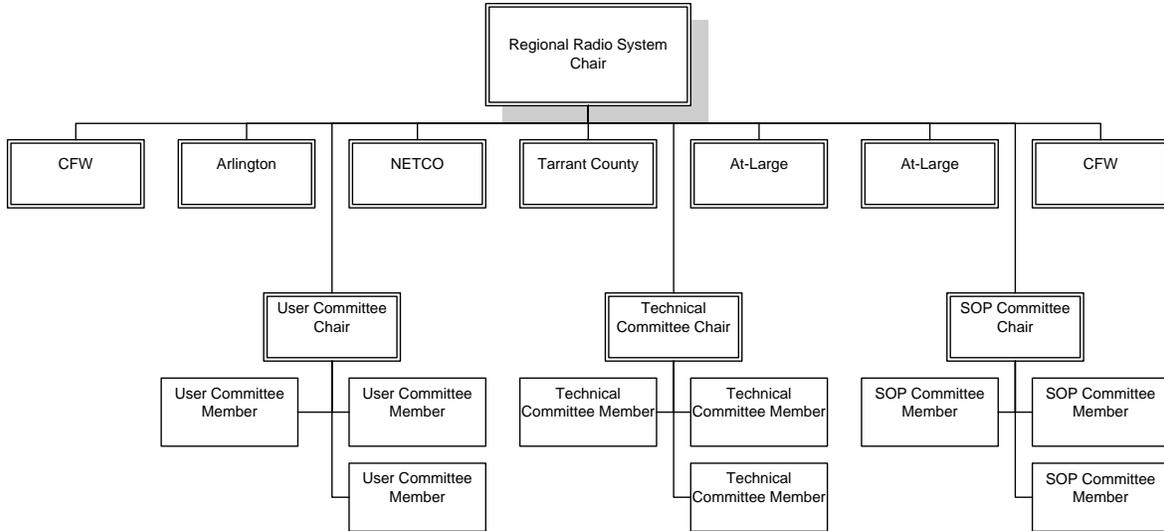
- Review all applications of entities seeking to become users of the RRS and make recommendations to the board.
- Determine the impact to the RRS regarding changes to channel loading, coverage, and maintenance.
- Recommend necessary upgrades to the RRS to maintain a high level of service and availability for the system users.
- Work with the SOP committee to develop practices and protocols.
- Develop an approved equipment list for user equipment that may operate on the RRS

A Standard Operating Procedures (SOP) committee will be formed to develop policies and procedures that should be followed by the membership. The SOP Committee shall be comprised of local personnel from the membership, with an expertise in radio systems operations will be selected by the board to serve on the committee. The SOP committee will coordinate its efforts with the Technical Committee and the User Committee. The SOP committee will:

- Recommend policies for talk group structures, ID structures, and procedures for regional/state interoperability.
- Develop requirements to ensure electronic security of the RRS.
- Assist the User Committee in the development of proposed policies for the training and exercising of interoperable components of the system.

# Regional Radio System Master Plan

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**Figure 6.3 – Governance Board Organizational Chart**

## 6.4 Governance Priorities

Upon formation of the Governance Board, there are several priorities that should be addressed. Those priorities are as follows:

1. Types of memberships, voting rights, and representation
2. Funding for the RRS
3. Ownership of radio system assets
4. Maintenance of sites and facilities
5. Fee structures and cost allocations for capital improvements and ongoing O&M expenses

## Regional Radio System Master Plan

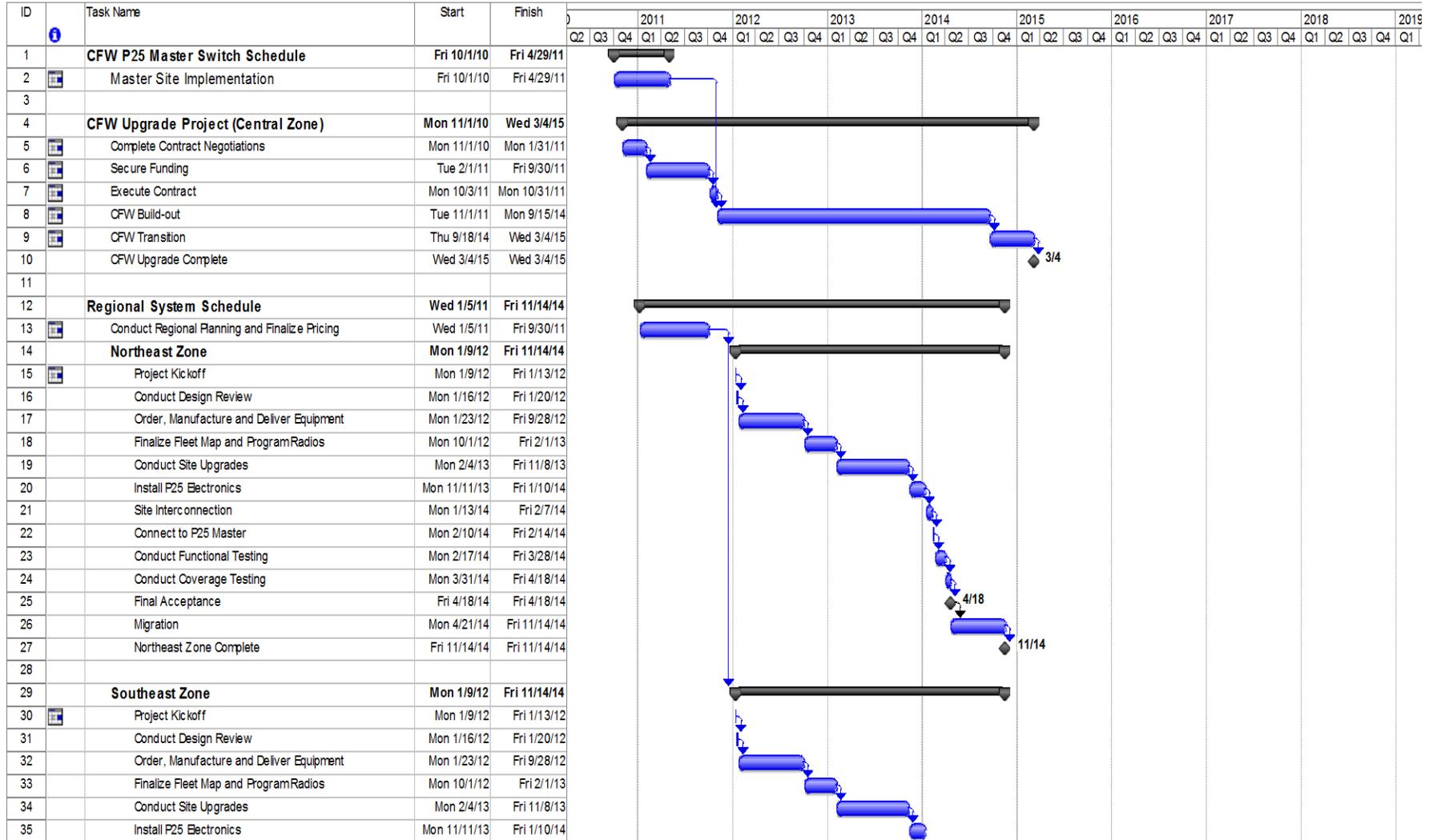
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### Appendix A – Tarrant County Trunked Radio Systems

System Name	Type	City
Alcon Laboratories	Motorola Type II	Ft Worth
ARINC (Dallas/Fort Worth International Airport)	Motorola Type II	DFW Airport
Arlington	Motorola Type II Smartnet	Arlington
Bass Enterprises	Motorola Type II Smartnet	Fort Worth
Baylor Hospital Networked	LTR Passport	Dallas
Breakthrough Communications	LTR Standard	Fort Worth
Burleson	LTR Standard	Burleson
Cowboys Stadium	LTR Standard	Arlington
DFW Airport P25 / NCTCOG	Project 25 Phase I (FDMA)	DFW Airport
DFW Airport Public Safety (EDACS)	EDACS Standard w/ESK	DFW Airport
DFW Airport Public Safety (OpenSky)	OpenSky Standard	DFW Airport
DFW Communications (Dallas/Fort Worth)	LTR Standard	Dallas/Fort Worth
DFW Communications (Fort Worth)	LTR Standard	Fort Worth
Everest Dallas Channels (Fort Worth)	Motorola Type II	Fort Worth
Federal Correctional Institution Fort Worth	Motorola Type II SmartZone	Fort Worth
Federal Medical Center Carswell	Motorola Type II SmartZone	Fort Worth
FleetTalk (Fort Worth)	LTR Standard	Fort Worth
Fort Worth / Tarrant County Public Safety	Motorola Type II Smartnet	Fort Worth
Fort Worth / Tarrant County Services	Motorola Type II Smartnet	Fort Worth
Fort Worth Joint Reserve Base	Motorola Type II SmartZone	Fort Worth
Gaylord Texan Hotel and Convention Center	LTR Standard	Grapevine
Great Wolf Lodge (Grapevine)	LTR Standard	Grapevine
John Peter Smith Hospital	LTR Standard	Fort Worth
Mansfield Public Safety	Motorola Type II SmartZone	Mansfield
Megahertz Technology (Fort Worth 480 MHz)	LTR Standard	Fort Worth
Northeast Tarrant County	Motorola Type II Smartnet	Bedford
Oncor Energy	EDACS Narrowband Networked	Various
ProTower Communication	LTR Standard	Arlington
Rangers Ballpark in Arlington	LTR Standard	Arlington
Self Radio (Fort Worth)	LTR Standard	Fort Worth
Self Radio (West Fort Worth)	LTR Standard	Fort Worth
Teletouch (Dallas-Fort Worth Passport)	LTR Passport	Dallas-Fort Worth Area
Teletouch (Fort Worth)	LTR Standard	Fort Worth
Teletouch (Lake Arlington)	LTR Standard	Lake Arlington
United Parcel Service (DFW Airport)	Motorola Type II Smartnet	DFW Airport
University of Texas at Arlington	LTR Standard	Arlington
White Settlement P25	Project 25 Phase I (FDMA)	White Settlement

# Regional Radio Communications Master Plan

## Appendix B – Regional Radio System Project Schedule





## Regional Radio Communications Master Plan

### Appendix C – Estimated Implementation Costs

Regional Radio System Costs	Category	Estimated Costs	Fort Worth	Arlington	NETCO	Grand Prairie	Mansfield	Region	Cities on Fort Worth
	<b>Individual Quotes (2005-2009)</b>	<b>\$104,900,000</b>	\$58,000,000	\$12,900,000	\$18,000,000	\$10,000,000	\$6,000,000		
	<b>Motorola Regional ROM Pricing 2010</b>								
	Fixed Network Equipment	\$90,340,147	\$58,031,694	\$8,025,957	\$13,486,040	\$8,710,489	\$2,085,967		
	P25 Master	\$5,251,557						\$5,251,557	
	Subscriber Units	\$29,595,200	Included	\$6,960,000	7526600	2640000	1815000		\$10,653,600
	Systems Integration	\$11,838,080	Included	\$2,784,000	\$3,010,640	\$1,056,000	\$726,000		\$4,261,440
	<b>Total</b>	<b>\$137,024,984</b>	<b>\$58,031,694</b>	<b>\$17,769,957</b>	<b>\$24,023,280</b>	<b>\$12,406,489</b>	<b>\$4,626,967</b>	<b>\$5,251,557</b>	<b>\$14,915,040</b>
	<b>CFW Negotiated Contract</b>								
	Fixed Network Equipment	\$40,607,908	\$17,113,201	\$5,836,476	\$9,807,048	\$6,334,268	\$1,516,915		
P25 Master	\$1,649,850						\$1,649,850		
Subscribers Units	\$26,425,179	\$9,706,651	\$2,232,000	\$4,817,024	\$1,689,600	\$1,161,600	\$0	\$6,818,304	
Systems Integration	\$17,761,280	\$9,152,628	\$2,024,525	\$2,189,337	\$767,923	\$527,947	\$0	\$3,098,919	
<b>Total</b>	<b>\$86,444,217</b>	<b>\$35,972,480</b>	<b>\$10,093,001</b>	<b>\$16,813,410</b>	<b>\$8,791,791</b>	<b>\$3,206,462</b>	<b>\$1,649,850</b>	<b>\$9,917,223</b>	
<b>Additional Project Costs</b>									
Civil Engineering and Site Upgrades	\$6,806,173	\$3,500,000	\$866,795	\$1,405,793	\$733,585	\$300,000			
Project Management	\$2,151,750	\$951,750	\$300,000	\$325,000	\$300,000	\$275,000			
QA/QC/Engineering Consulting	\$6,100,000	\$2,900,000	\$975,000	\$1,025,000	\$975,000	\$225,000			
Facility Maint., Leased Lines, Microwave, Utilities	\$158,000	\$60,000	\$30,000	\$30,000	\$30,000	\$8,000			
System Warranty and Maintenance of Site Electronics	\$0	Included	TBD	TBD	TBD	TBD	\$0	\$0	
<b>Total</b>	<b>\$15,215,923</b>	<b>\$7,411,750</b>	<b>\$2,171,795</b>	<b>\$2,785,793</b>	<b>\$2,038,585</b>	<b>\$808,000</b>	<b>\$0</b>	<b>\$0</b>	
<b>Estimated Individual Upgrade Costs</b>	<b>\$152,240,907</b>	<b>\$65,443,444</b>	<b>\$19,941,752</b>	<b>\$26,809,073</b>	<b>\$14,445,074</b>	<b>\$5,434,967</b>	<b>\$5,251,557</b>	<b>\$14,915,040</b>	
<b>Estimated Costs Using CFW Negotiated Contract</b>	<b>\$101,660,140</b>	<b>\$43,384,230</b>	<b>\$12,264,796</b>	<b>\$19,599,203</b>	<b>\$10,830,376</b>	<b>\$4,014,462</b>	<b>\$1,649,850</b>	<b>\$9,917,223</b>	
<b>Total Estimated Infrastructure Cost</b>	<b>\$72,136,042</b>	<b>\$33,677,579</b>	<b>\$10,032,796</b>	<b>\$14,782,179</b>	<b>\$9,140,776</b>	<b>\$2,852,862</b>	<b>\$1,649,850</b>		
<b>Total Estimated Subscriber Cost</b>	<b>\$29,524,098</b>	<b>\$9,706,651</b>	<b>\$2,232,000</b>	<b>\$4,817,024</b>	<b>\$1,689,600</b>	<b>\$1,161,600</b>	<b>\$0</b>	<b>\$9,917,223</b>	

# Regional Radio Communications Master Plan

## Appendix D – Budgetary Estimates for FY11-FY19

Category	Budgetary Estimate FY11 - FY19	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19
<b>City of Fort Worth</b>										
Equipment Lease-to-Own Price	\$29,325,798			\$4,189,400	\$4,189,400	\$4,189,400	\$4,189,400	\$4,189,400	\$4,189,400	\$4,189,400
Civil Engineering and Site Upgrades	\$3,500,000		\$500,000		\$2,250,000	\$750,000				
Project Management	\$951,750		\$253,800	\$253,800	\$253,800	\$190,350				
QA/QC/Engineering Consulting	\$2,900,000	\$150,000	\$846,154	\$846,154	\$846,154	\$211,538				
Facility Maint., Leased Lines, Microwave, Utilities	\$60,000	\$0	\$15,000	\$15,000	\$15,000	\$15,000				
System Monitoring and Maintenance of Site Electronics	\$10,733,396		Included	Included	Included	\$2,066,029	\$2,096,077	\$2,142,322	\$2,189,954	\$2,239,014
Other	\$0									
Estimated Infrastructure Costs	\$47,470,944	\$150,000	\$1,614,954	\$7,554,354	\$6,054,354	\$6,672,317	\$6,285,477	\$6,331,722	\$6,379,354	\$6,428,414
Subscriber Lease-to-Own Price	\$10,837,476			\$1,548,211	\$1,548,211	\$1,548,211	\$1,548,211	\$1,548,211	\$1,548,211	\$1,548,211
Total Estimated Costs for CFW	\$58,308,420	\$150,000	\$1,614,954	\$9,102,565	\$7,602,565	\$8,220,528	\$7,833,688	\$7,879,933	\$7,927,565	\$7,976,625
<b>CFW Customer Subscriber Units</b>										
	\$11,072,580	\$0	\$0	\$1,581,797	\$1,581,797	\$1,581,797	\$1,581,797	\$1,581,797	\$1,581,797	\$1,581,797
<b>Arlington</b>										
Equipment Lease-to-Own Price	\$8,776,807			\$1,253,830	\$1,253,830	\$1,253,830	\$1,253,830	\$1,253,830	\$1,253,830	\$1,253,830
Civil Engineering and Site Upgrades	\$866,795		\$350,000	\$350,000	\$166,795					
Project Management	\$300,000		\$90,000	\$90,000	\$90,000	\$30,000				
QA/QC/Engineering Consulting	\$975,000	\$75,000	\$275,000	\$275,000	\$275,000	\$75,000				
Facility Maint., Leased Lines, Microwave, Utilities	\$30,000		\$8,000	\$8,000	\$8,000	\$6,000				
System Monitoring and Maintenance of Site Electronics	\$3,660,636		Included	Included	Included	\$704,621	\$714,869	\$730,641	\$746,886	\$763,618
Other	\$0									
Estimated Infrastructure Costs	\$14,609,239	\$75,000	\$723,000	\$1,976,830	\$1,793,625	\$2,069,451	\$1,968,699	\$1,984,471	\$2,000,716	\$2,017,448
Subscriber Lease-to-Own Price	\$2,492,028			\$356,004	\$356,004	\$356,004	\$356,004	\$356,004	\$356,004	\$356,004
Total Estimated Costs for Arlington	\$17,101,267	\$75,000	\$723,000	\$2,332,834	\$2,149,629	\$2,425,455	\$2,324,703	\$2,340,475	\$2,356,720	\$2,373,452
<b>NETCO</b>										
Equipment Lease-to-Own Price	\$13,393,965			\$1,913,424	\$1,913,424	\$1,913,424	\$1,913,424	\$1,913,424	\$1,913,424	\$1,913,424
Civil Engineering and Site Upgrades	\$1,405,793		\$500,000	\$500,000	\$405,793					
Project Management	\$325,000		\$95,000	\$95,000	\$95,000	\$40,000				
QA/QC/Engineering Consulting	\$1,025,000	\$75,000	\$300,000	\$300,000	\$300,000	\$50,000				
Facility Maint., Leased Lines, Microwave, Utilities	\$30,000		\$8,000	\$8,000	\$8,000	\$6,000				
System Monitoring and Maintenance of Site Electronics	\$6,150,979		Included	Included	Included	\$1,183,978	\$1,201,197	\$1,227,699	\$1,254,995	\$1,283,110
Other	\$0									
Estimated Infrastructure Costs	\$22,330,726	\$75,000	\$903,000	\$2,816,424	\$2,722,217	\$3,193,401	\$3,114,621	\$3,141,122	\$3,168,419	\$3,196,533
Subscriber Lease-to-Own Price	\$5,378,207			\$768,315	\$768,315	\$768,315	\$768,315	\$768,315	\$768,315	\$768,315
Total Estimated Costs for NETCO	\$27,708,944	\$75,000	\$903,000	\$3,584,739	\$3,490,532	\$3,961,716	\$3,882,936	\$3,909,438	\$3,936,734	\$3,964,849
<b>Grand Prairie</b>										
Equipment Lease-to-Own Price	\$7,929,596			\$1,132,799	\$1,132,799	\$1,132,799	\$1,132,799	\$1,132,799	\$1,132,799	\$1,132,799
Civil Engineering and Site Upgrades	\$733,585		\$300,000	\$300,000	\$133,585					
Project Management	\$300,000		\$90,000	\$90,000	\$90,000	\$30,000				
QA/QC/Engineering Consulting	\$975,000	\$75,000	\$275,000	\$275,000	\$275,000	\$75,000				
Facility Maint., Leased Lines, Microwave, Utilities	\$30,000		\$8,000	\$8,000	\$8,000	\$6,000				
System Monitoring and Maintenance of Site Electronics	\$3,972,851		Included	Included	Included	\$764,718	\$775,840	\$792,957	\$810,588	\$828,747
Other	\$0									
Estimated Infrastructure Costs	\$13,941,032	\$75,000	\$673,000	\$1,805,799	\$1,639,384	\$2,008,518	\$1,908,640	\$1,925,757	\$1,943,387	\$1,961,546
Subscriber Lease-to-Own Price	\$1,886,438			\$269,491	\$269,491	\$269,491	\$269,491	\$269,491	\$269,491	\$269,491
Total Estimated Costs for Grand Prairie	\$15,827,471	\$75,000	\$673,000	\$2,075,291	\$1,908,876	\$2,278,009	\$2,178,131	\$2,195,248	\$2,212,879	\$2,231,038
<b>Mansfield</b>										
Equipment Lease-to-Own Price	\$2,283,089			\$326,156	\$326,156	\$326,156	\$326,156	\$326,156	\$326,156	\$326,156
Civil Engineering and Site Upgrades	\$300,000		\$100,000	\$100,000	\$100,000					
Project Management	\$275,000	\$50,000	\$75,000	\$75,000	\$75,000	\$75,000				
QA/QC/Engineering Consulting	\$225,000		\$65,000	\$65,000	\$65,000	\$30,000				
Facility Maint., Leased Lines, Microwave, Utilities	\$8,000		\$2,000	\$2,000	\$2,000	\$2,000				
System Monitoring and Maintenance of Site Electronics	\$951,409		Included	Included	Included	\$183,132.94	\$185,796.40	\$189,895.56	\$194,117.66	\$198,466.34
Other	\$0									
Estimated Infrastructure Costs	\$4,042,498	\$50,000	\$242,000	\$568,156	\$568,156	\$541,288	\$511,952	\$516,051	\$520,273	\$524,622
Subscriber Lease-to-Own Price	\$1,296,926			\$185,275	\$185,275	\$185,275	\$185,275	\$185,275	\$185,275	\$185,275
Total Estimated Costs for Mansfield	\$5,339,424	\$50,000	\$242,000	\$753,431	\$753,431	\$726,564	\$697,227	\$701,326	\$705,548	\$709,897
<b>Zone 4 - Southwest</b>										
Equipment Lease-to-Own Price	\$8,776,807			\$1,253,830	\$1,253,830	\$1,253,830	\$1,253,830	\$1,253,830	\$1,253,830	\$1,253,830
Civil Engineering and Site Upgrades	\$866,795		\$350,000	\$350,000	\$166,795					
Project Management	\$300,000		\$90,000	\$90,000	\$90,000	\$30,000				
QA/QC/Engineering Consulting	\$975,000	\$75,000	\$275,000	\$275,000	\$275,000	\$75,000				
Facility Maint., Leased Lines, Microwave, Utilities	\$30,000		\$8,000	\$8,000	\$8,000	\$6,000				
System Monitoring and Maintenance of Site Electronics	\$3,660,636		Included	Included	Included	\$704,621	\$714,869	\$730,641	\$746,886	\$763,618
Other	\$0									
Estimated Infrastructure Costs	\$10,948,602	\$75,000	\$723,000	\$1,976,830	\$1,793,625	\$1,364,830	\$1,253,830	\$1,253,830	\$1,253,830	\$1,253,830
Subscriber Lease-to-Own Price	\$2,492,028			\$356,004	\$356,004	\$356,004	\$356,004	\$356,004	\$356,004	\$356,004
Total Estimated Costs for Zone 4	\$13,440,630	\$75,000	\$723,000	\$2,332,834	\$2,149,629	\$1,720,834	\$1,609,834	\$1,609,834	\$1,609,834	\$1,609,834
<b>Zone 5 - Northwest</b>										
Equipment Lease-to-Own Price	\$8,776,807			\$1,253,830	\$1,253,830	\$1,253,830	\$1,253,830	\$1,253,830	\$1,253,830	\$1,253,830
Civil Engineering and Site Upgrades	\$866,795		\$350,000	\$350,000	\$166,795					
Project Management	\$300,000		\$90,000	\$90,000	\$90,000	\$30,000				
QA/QC/Engineering Consulting	\$975,000	\$75,000	\$275,000	\$275,000	\$275,000	\$75,000				
Facility Maint., Leased Lines, Microwave, Utilities	\$30,000		\$8,000	\$8,000	\$8,000	\$6,000				
System Monitoring and Maintenance of Site Electronics	\$3,660,636		Included	Included	Included	\$704,621	\$714,869	\$730,641	\$746,886	\$763,618
Other	\$0									
Estimated Infrastructure Costs	\$10,948,602	\$75,000	\$723,000	\$1,976,830	\$1,793,625	\$1,364,830	\$1,253,830	\$1,253,830	\$1,253,830	\$1,253,830
Subscriber Lease-to-Own Price	\$2,492,028			\$356,004	\$356,004	\$356,004	\$356,004	\$356,004	\$356,004	\$356,004
Total Estimated Costs for Zone 5	\$13,440,630	\$75,000	\$723,000	\$2,332,834	\$2,149,629	\$1,720,834	\$1,609,834	\$1,609,834	\$1,609,834	\$1,609,834
<b>Total Estimated Project Costs (Lease)</b>										
	\$162,239,366	\$575,000	\$5,601,954	\$24,096,323	\$21,786,086	\$22,635,736	\$21,718,149	\$21,827,884	\$21,940,910	\$22,057,324
<b>Total Estimated Equipment Costs (Lease)</b>										
	\$79,262,870	\$0	\$0	\$11,323,267	\$11,323,267	\$11,323,267	\$11,323,267	\$11,323,267	\$11,323,267	\$11,323,267
<b>Total Estimated Subscriber (Lease)</b>										
	\$37,947,712	\$0	\$0	\$5,421,102	\$5,421,102	\$5,421,102	\$5,421,102	\$5,421,102	\$5,421,102	\$5,421,102
<b>Total Estimated Monitoring and Maintenance</b>										
	\$32,790,544	\$0	Included	Included	Included	\$6,311,722	\$6,403,519	\$6,544,798	\$6,690,313	\$6,840,192