



Montague County VHF Simulcast Radio System

Prepared by
Self Radio, Inc.

Abstract

This proposal outlines the plan Self Radio, Inc. has prepared to install a VHF simulcast system for Montague County Sheriff Office, local fire departments, and emergency medical services. This document is structured to follow Section 3 of the Montague County VHF simulcast RFP. The attached appendices have supplemental information for the project.

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1 Proposed VHF Simulcast Radio System Overview

Self Radio, Incorporated, (henceforth Self Radio) has proposed the following to meet the requirements listed by Montague County (henceforth County) in the RFP listed in Section 3 of the County's document. All information contained in this document is confidential between Self Radio and the County. Self Radio can provide additional copies per request, and the County may reproduce this document by photocopy or other means if necessary.

1.1 General Specifications

The County's RFP outlined the need for a total of six (6) sites to serve Montague County Sheriff Office (henceforth Sheriff) and County Fire Departments and Emergency Medical Services (henceforth Fire/EMS). Hildreth Pool Tower will host the primary equipment and master system controller for both the Sheriff and Fire/EMS. Forestburg Tower will host the secondary equipment for Fire/EMS.

Self Radio proposes to use Tait TB9400 base station/repeater for radio communications at each site. These units can be configured to operate in both P25 digital and FM analog modes. Self-Radio has chosen to use a Mimomax 900 MHz narrowband radio link to use as the data backhaul for the system.

1.2 Simulcast System Overview

1.2.1 Sheriff Office

As described in Section 1.1 the master system controller will be at Hildreth Pool Tower. The County has requested that a second site be installed at the new Forestburg Tower with a voting receiver and simulcast radio repeater. The County has also requested that this radio system support both P25 and legacy analog radio formats.

1.2.2 Fire/EMS

The County has requested that the Fire/EMS simulcast system connect six (6) sites across the county. Also, as described in Section 1.1 the master controller will be at Hildreth Pool Tower. The following section (1.2.3) will address system redundancy.

1.2.3 Site Interconnect

David Parry of Mimomax Wireless provided a network configuration and radio path analysis for this project. This configuration is based around the Hildreth Pool site as the master site and the other sites communicating back to it, commonly called a star or spoke-hub network. The radio has sufficient data bandwidth for both the Sheriff and Fire/EMS to share a radio link. We have chosen to use the Tornado 1+1 System, which has built-in redundancy. For more detailed information, please see Appendix A.

1.3 Tower Sites

Here is the list of expected equipment to be deployed at each tower site.

1.3.1 Hildreth Pool Tower

Table 1: Hildreth Pool Tower interior equipment

Make	Model	Quantity
Tait	TB9400 VHF 100 W	2
Mimomax	Tornado 1+1 900 MHz	5: 1 remote link per tower

Table 2: Hildreth Pool Tower exterior/tower equipment

Make	Model	Quantity
CommScope	DB224 VHF Omni Antenna	1
Mimomax	High-Gain Panel Antenna - 16dBi	5
CommScope	AVA5-50	11 cable runs

1.3.2 Forestburg Tower

Table 3: Forestburg Tower interior equipment

Make	Model	Quantity
Tait	TB9400 VHF 100 W	2: Sheriff and Fire/EMS
Mimomax	Tornado 1+1 900 MHz	1

Table 4: Forestburg Tower exterior/tower equipment

Make	Model	Quantity
CommScope	DB224 VHF Omni Antenna	2
Mimomax	High-Gain Panel Antenna - 16dBi	1
CommScope	AVA5-50	4 cable runs

1.3.3 Barrel Springs Tower

Table 5: Barrel Springs Tower interior equipment

Make	Model	Quantity
Tait	TB9400 VHF 100 W	1: Fire/EMS only
Mimomax	Tornado 1+1 900 MHz	1

Table 6: Barrel Springs Tower exterior/tower equipment

Make	Model	Quantity
CommScope	DB224 VHF Omni Antenna	1
Mimomax	High-Gain Panel Antenna - 16dBi	1
CommScope	AVA5-50	3 cable runs

1.3.4 Big Tree Tower

Table 7: Big Tree Tower interior equipment

Make	Model	Quantity
Tait	TB9400 VHF 100 W	1: Fire/EMS only
Mimomax	Tornado 1+1 900 MHz	1

Table 8: Big Tree Tower exterior/tower equipment

Make	Model	Quantity
Mimomax	High-Gain Panel Antenna - 16dBi	1
CommScope	AVA5-50	2 cable runs

1.3.5 Bowie Tower

Table 9: Bowie Tower interior equipment

Make	Model	Quantity
Tait	TB9400 VHF 100 W	1: Fire/EMS only
Mimomax	Tornado 1+1 900 MHz	1

Table 10: Bowie Tower exterior/tower equipment

Make	Model	Quantity
CommScope	DB224 VHF Omni Antenna	1
Mimomax	High-Gain Panel Antenna - 16dBi	1
CommScope	AVA5-50	3 cable runs

1.3.6 Nocona Hills Tower

Table 11: Nocona Hills Tower interior equipment

Make	Model	Quantity
Tait	TB9400 VHF 100 W	1: Fire/EMS only
Mimomax	Tornado 1+1v900 MHz	1

Table 12: Nocona Hills Tower exterior/tower equipment

Make	Model	Quantity
CommScope	DB224 VHF Omni Antenna	1
Mimomax	High-Gain Panel Antenna - 16dBi	1
CommScope	AVA5-50	3 cable runs

1.4 Tower Availability

Per the County’s RFP in Sections 3.3 and 3.4 Hildreth Pool and Forestburg Tower are County owned property, and Forestburg is currently under construction and will be completed on May 1, 2023. The County assured Self Radio my work freely at their discretion.

The other four (4) towers (Barrel Springs, Big Tree, Bowie, and Nocona Hills) are owned by other entities. The County has assured Self Radio that any equipment change has already been negotiated, and that Self Radio is not expected to act as an intermediary on behalf of the County for any lease change negotiations. If any property owner objects to the equipment changes proposed by Self Radio, the County must inform Self Radio immediately to begin mitigation plans.

1.5 Tower Site Detailed Information

All the following equipment sizes are given in rack units (RU), which is a standard 19" rack size measuring approximately 1.75" in height. All the equipment will work on 12 V_{DC} power for battery back-up purposes.

1.5.1 Hildreth Pool Tower

Table 13: Hildreth Pool Tower interior space and power

Item	Qty	Size (RU)		Current draw at 12 VDC (A)			
		Each	Total	Idle	Total	Max	Total
TB9400 VHF 100 W	2	4	8	2.0	4.0	32.0	64.0
Tornado 1+1 900 MHz	5	1	5	1.0	5.0	3.5	17.5
<i>Total space and power</i>			13		9.0		81.5

Table 14: Hildreth Pool Tower antenna dimensions and weight

Type	Qty	Size (in)			Weight (lb)	
		Height	Width	Depth	Each	Total
DB224	1	255	n/a	n/a	35.1	35.1
MiMO High-Gain Panel	5	20	37	2	16.5	82.5
<i>Total weight</i>						117.6

1.5.2 Forestburg Tower

Table 15: Forestburg Tower interior space and power

Item	Qty	Size (RU)		Current draw at 12 VDC (A)			
		Each	Total	Idle	Total	Max	Total
TB9400 VHF 100 W	2	4	8	2.0	4.0	32.0	64.0
Tornado 1+1 900 MHz	1	1	1	1.0	1.0	3.5	3.5
<i>Total space and power</i>			9		5.0		67.5

Table 16: Forestburg Tower antenna dimensions and weight

Type	Qty	Size (in)			Weight (lb)	
		Height	Width	Depth	Each	Total
DB224	2	255	n/a	n/a	35.1	70.2
MiMO High-Gain Panel	1	20	37	2	16.5	16.5
<i>Total weight</i>						86.7

1.5.3 Barrel Springs Tower

Table 17: Barrel Springs Tower interior space and power

Item	Qty	Size (RU)		Current draw at 12 VDC (A)			
		Each	Total	Idle	Total	Max	Total
TB9400 VHF 100 W	1	4	4	2.0	2.0	32.0	32.0
Tornado 1+1 900 MHz	1	1	1	1.0	1.0	3.5	3.5
<i>Total space and power</i>			5		3.0		35.5

Table 18: Barrel Springs Tower antenna dimensions and weight

Type	Qty	Size (in)			Weight (lb)	
		Height	Width	Depth	Each	Total
DB224	1	255	n/a	n/a	35.1	35.1
MiMO High-Gain Panel	1	20	37	2	16.5	16.5
<i>Total weight</i>						51.6

1.5.4 Big Tree Tower

Table 19: Big Tree Tower interior space and power

Item	Qty	Size (RU)		Current draw at 12 VDC (A)			
		Each	Total	Idle	Total	Max	Total
TB9400 VHF 100 W	1	4	4	2.0	2.0	32.0	32.0
Tornado 1+1 900 MHz	1	1	1	1.0	1.0	3.5	3.5
<i>Total space and power</i>			5		3.0		35.5

Table 20: Big Tree Tower antenna dimensions and weight

Type	Qty	Size (in)			Weight (lb)	
		Height	Width	Depth	Each	Total
MiMO High-Gain Panel	1	20	37	2	16.5	16.5
<i>Total weight</i>						16.5

1.5.5 Bowie Tower

Table 21: Bowie Tower interior space and power

Item	Qty	Size (RU)		Current draw at 12 VDC (A)			
		Each	Total	Idle	Total	Max	Total
TB9400 VHF 100 W	1	4	4	2.0	2.0	32.0	32.0
Tornado 1+1 900 MHz	1	1	1	1.0	1.0	3.5	3.5
<i>Total space and power</i>			5		3.0		35.5

Table 22: Bowie Tower antenna dimensions and weight

Type	Qty	Size (in)			Weight (lb)	
		Height	Width	Depth	Each	Total
DB224	1	255	n/a	n/a	35.1	35.1
MiMO High-Gain Panel	1	20	37	2	16.5	16.5
<i>Total weight</i>						51.6

1.5.6 Nocona Hills Tower

Table 23: Nocona Hills Tower interior space and power

Item	Qty	Size (RU)		Current draw at 12 VDC (A)			
		Each	Total	Idle	Total	Max	Total
TB9400 VHF 100 W	1	4	4	2.0	2.0	32.0	32.0
Tornado 1+1 900 MHz	1	1	1	1.0	1.0	3.5	3.5
<i>Total space and power</i>			5		3.0		35.5

Table 24: Nocona Hills Tower antenna dimensions and weight

Type	Qty	Size (in)			Weight (lb)	
		Height	Width	Depth	Each	Total
DB224	1	255	n/a	n/a	35.1	35.1
MIMO High-Gain Panel	1	20	37	2	16.5	16.5
<i>Total weight</i>						51.6

1.6 Simulcast Site Configuration

As stated in Sections 1.2.1 and 1.2.2, Hildreth Pool Tower Site will be the primary site for both Sheriff and Fire/EMS. As stated in Section 1.2.2, Forestburg will be a receiver voting and simulcast site for both Sheriff and Fire/EMS. The other four (4) sites are receiver voting and simulcast for Fire/EMS only.

1.7 Connectivity Between 911 Center and Prime Simulcast Site

The 911 Center currently uses a Motorola console with radios to dispatch, they do not use any network or remote lines to access repeaters directly. If required, radio or console reprogramming would be the only changes that would fall within the scope of this project.

1.8 Connectivity Between the Primary, Backup, and Remote Simulcast Sites

The Mimomax Tornado will provide data, including voice, communications between the sites.

1.9 Deployment of the VHF Simulcast System

The deployment of equipment in this project should not require a phased rollout, which the County wanted to avoid.

1.10 Equipment Deliverables

See Appendix B for estimated project schedule and Appendix C for a list of estimated equipment pricing. The distributor estimates eight (8) weeks for equipment delivery from order placement.

1.11 Redundancy of the Prime Site

The Mimomax Tornado radio comes in a one-plus-one configuration, there are two radios inside of the unit. Per the manufacturer's specifications, these units can be in either a hot or warm standby configuration.

1.12 VHF Analog Interface to Data System

Self Radio will follow the recommended procedures provided by Tait and Mimomax to connect the repeaters to the data link radios.

1.13 Radio System Requirements

The project specifies that all radio communications are in the VHF band. Sheriff uses P25 conventional, while Fire/EMS uses analog conventional. The Tait repeaters can operate in both conventional P25 and analog modes and will repeat in the format it receives. The Tait

repeater will not convert between the modes i.e., if it receives in analog it will transmit in analog.

1.13.1 Hildreth Pool Tower, Prime Simulcast Site

This site will receive a repeater for Sheriff and Fire/EMS. This will also be the hub of the network. Self Radio will test any existing antenna to be reused on site before and after installing the new equipment.

1.13.2 Remote Simulcast Sites

All remote sites will receive one repeater for Fire/EMS, except Forestburg that will receive both Sheriff and Fire/EMS. These sites will be the spokes of the network. Self Radio will test any existing antenna to be reused on site before and after.

1.13.3 911 Center

No changes to this equipment are anticipated. Self Radio may need to adjust the console or radios the 911 center uses for dispatch.

1.14 VHF Antenna Mounting brackets on Towers

All towers already have VHF antennas mounted for the existing County radio repeater network, except for Forestburg at the writing of this document is still under construction.

1.15 FCC License for Simulcast

The County RFP document does not include any instructions for Self Radio to submit any license changes on the County's behalf for two-way radio communications. Mimomax will apply for licenses on the 900 MHz radio links as part of the equipment order.

1.16 Minimize Service Interruption

Self Radio will coordinate any service disruptions with the Sheriff Office, Emergency Management Coordinator, and/or 911 center dispatch as necessary. Self Radio will also avoid disruptions during usual peak radio traffic hours whenever possible.

1.17 Existing Network Remains in Place

All legacy equipment will remain in place as backup, whenever feasible. This project will also use all existing radio antennas and transmission lines as applicable. Self Radio will work with the County to remove old equipment if required.

1.18 Technical Overview

Self Radio will provide any additional technical details for this equipment per County request.

1.19 VHF Simulcast Staging and Integration Testing

Self Radio will assemble the equipment to test proper operation and setup to installation at the tower sites. If a representative from the County would like to be present for testing Self Radio will notify them when the test takes place.

1.20 Power for Equipment at the Repeater Sites

The County RFP states that all sites have battery backup. The Hildreth Pool and Forestburg sites have the highest estimated current draw at 67.5 A, assuming all repeaters and data links are transmitting, totaling 810 W.

1.21 Power for Equipment at 911 Center

This project will not change equipment at 911 dispatch center. Self Radio expects all power consumption to remain unchanged, or any changes would be negligible considering the 911 center has battery and generator backup.

1.22 Space for Equipment at Repeater Sites

The County RFP indicates that Hildreth Pool, Forestburg, and Big Tree tower sites all have equipment shelters. Since Big Tree Tower is a leased space, Self Radio will work to ensure that the equipment will not change any space required from the current equipment in place.

Barrel Springs, Bowie, and Nocona Hills tower sites have equipment installed in outdoor rated cabinets. Self Radio chose 5G-LTE-SMACS4 outdoor climate-controlled cabinets manufactured by DDB Unlimited. All the equipment will fit within these enclosures.

1.23 Product Lifecycle

Tait and Mimomax have not issued an end-of-life (EOL) notification for the equipment Self Radio included in this proposal.

1.24 Turnkey Solution

All equipment Self Radio has proposed is readily available and not modified from manufacturer's specifications.

1.25 Avoiding Obsolescence

See Section 1.23.

1.26 Spares Kit

Self-Radio has included at least one spare for each piece of equipment considered a lowest replaceable unit i.e., Tait TB9400, Mimomax Tornado, etc. The repeaters will be programmed and tuned to the frequencies for Sheriff and Fire/EMS. Self Radio will leave the spares in the care of the County for proper storage and recommends allowing the equipment to conduct a power on self-test (POST) at least annually.

1.27 Project Plan

See Appendix B for the estimated project schedule and Gantt Chart.

1.28 Vendor Project Manager

Self Radio does not employ anyone certified by the Project Management Institute. Richard Self will be the primary point of contact at Self Radio and will act in the capacity of project lead and primary point of contact.

1.29 Documentation

Self Radio will redline all existing engineering drawings the County possesses for their radio system. If the County wants to have engineering drawings made for the system, Self Radio will work with an engineering firm professionally licensed in the State of Texas to issue a drawing package at the completion of the project. A drawing package is not included in the costs of this project.

Self Radio will supply at least two (2) copies of all equipment operations and maintenance manuals to the County Emergency Management Coordinator.

1.30 Training

This project will only change equipment that end users will not typically operate. Self Radio can give an orientation on the new equipment to teach site custodians how to read equipment status codes and indicators and perform noninvasive equipment restoral e.g., power failure, clear network buffer, etc. If desired, Self Radio will provide a status code table, and equipment startup and shutdown procedures at each site.

1.31 Thirty (30) Day Acceptance Period

Self Radio will coordinate with the County after all the equipment has been installed to start testing. Self Radio recommends that the County have end users help conduct the trials to ensure that the new equipment gives them similar if not better performance than the current system.

1.32 References from Owners of Similar Projects

Self Radio has been providing radio service to Hood County Sheriff Office and Fire Marshal since 2013. Self Radio has assisted Hood County with deploying their conventional 700 MHz P25 system.

Self Radio also deployed a conventional Kenwood NXDN 450 MHz system for the City of Wichita Falls City Services in 2012.

1.33 Experience and Qualifications in Public Safety

Richard Self has worked at Self Radio, Inc. since 1978. He has maintained radio equipment for both commercial and public safety sectors. In particular, he has maintained radio equipment for the local police and fire departments in Montague County, Gainesville State School, and Hood County Sheriff and Fire Marshal.

Lee Self worked for the Federal Aviation Administration between 2005 and 2011. While there he maintained air-to-ground radio equipment, navigation aids, and environmental systems. He worked for Lockheed-Martin Information Systems and Global Solutions from 2011 to 2016, which was acquired by Leidos, and he remained there until 2018. He joined Self Radio in 2018.

Steve Maddox joined Self Radio in 2019. He has thirty years of experience with two-way radio in the Dallas/Fort Worth metroplex. He has integrated the City of Roanoke Police Department into the Denton County P25 trunking system. He also maintains radios for CareFlite.

Both Richard and Lee Self have a General Radiotelephone Operator's License issued by the Federal Communications Commission. Steve Maddox is also an Amateur Radio Operator.

1.34 Similar VHF Simulcast Installations

Self Radio has not deployed a VHF simulcast system. However, Tait Communications North America have referred AMP Global Strategies in Pennsylvania for project advisement. AMP has deployed multiple simulcast systems.

1.35 Warranty Period

Tait offers a standard two-year warranty on equipment.

Mimomax has a standard fifteen-month equipment warranty beginning at the date of shipment, not from the commissioning date.

Warranties do not include time and labor charges for Self Radio.

1.36 Post Warranty Maintenance Support

Tait has optional extended warranty for 1% hardware price per year up to five additional years. Buying all warranty extensions would be seven years total.

Mimomax extended hardware warranty is \$3,200 per year and subject to annual increases but will offer up to four additional years for this price if purchased at delivery. The software support plan is currently \$6,750, and subject to annual increases, but they will offer up to five years for the current price if purchased at once. The total coverage for five years is \$46,550.

Again, these charges do not include time and labor for Self Radio.

1.36.1 Support Organization

Racom Corporation in Marshalltown, Iowa, is distributor for both Tait and Mimomax. They will be processing all the orders placed by Self Radio and offer configuration support.

Tait North America has offices in Houston, Texas. They are the primary point of contact for all second level technical assistance for the repeaters in this project.

Mimomax Wireless North America has offices in Phoenix, AZ. They are the primary point of contact for the simulcast network.

1.36.2 Contacts

For any other questions, you may contact Self Radio at the following:

Self Radio, Inc.
PO Box 76
Montague, TX 76251
(940) 894-2181

1.36.3 Response Time

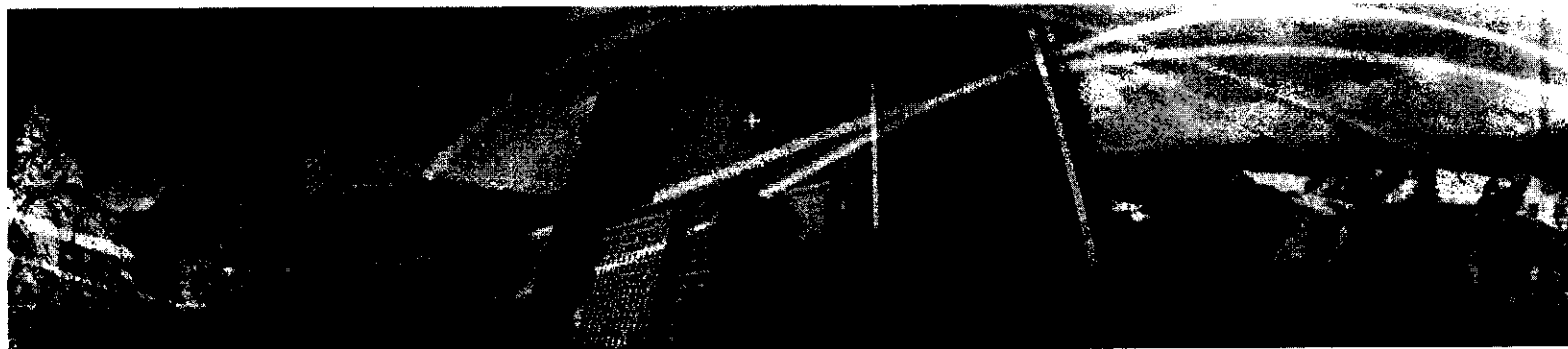
Self Radio is composed of three owners with three employees and has a current service area of about 40,000 square miles. After an internal review of current roles and responsibilities, one of the owners and two employees will be available for callback support. The individuals are listed in Section 1.33. We estimate we could respond during normal business hours within the current or following business day.

Outside of business hours we estimate a response time in approximately twelve hours, which includes weekends and holidays.

2 Terms and Conditions

Self Radio agrees to all terms and conditions outlined in Section 4 of the RFP. See Appendix C for equipment pricing, and Appendix D for Self Radio's current proof of insurance.

Appendix A
Mimomax Radio Path Analysis



DESK-TOP RADIO PATH ANALYSIS
FOR SELF RADIO
900MHZ NETWORK LINKS
MONTAGUE CO., TEXAS

Report #3824

David Parry, Support Engineer, Mimomax Wireless Ltd, New Zealand.
4 February 2022

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Introduction

This analysis is a preliminary desktop site survey for the feasibility of establishing five dedicated high performance Mimomax 900MHz narrow band radio links in Montague County, Texas to provide digital backhaul for DMR voice communications. This analysis has been carried out using Radio Mobile and Google Earth software.

Complete physical inspections of all sites and full visual site surveys of existing buildings, towers, cabling and any obstructing objects such as trees will need to be surveyed by others.

- There are five point-to-point radio links surveyed in this report, all radiating outward from the County Tower.
- All antenna heights have been set the maximum heights provided, but it is most likely antennas will be placed lower. Link-1 at Saint Jo is positioned on the building at 20ft AGL rather than the mast.
- As the antennas have been placed at maximum tower heights, it can be estimated how low the antennas can be lowered
- All five radio links have good line of site.
- A minimum receiver signal sensitivity level of -105Bm has been selected to support a modulation rate of 16QAM in a 25kHz channel.
- A minimum fade margin of 20dB has been selected to determine link reliability.
- Please see the radio link list and performance analysis chart below.
- An average frequency of 930MHz (frequency range 900-960MHz) has been used in this analysis.
- All radio transmitters have been set to their nominal maximum power level of +24dBm.
- Radio antenna heights at the sites are in feet above ground level (AGL).
- A nominal 16dBi phased array dual polarity panel antenna is used on each link end.
- Site elevations have been obtained from online terrain data and may not be entirely accurate.
- Minor adjustments in repeater high site terrain ground values have been made to the Radio Mobile tower positions to allow the antenna heights displayed in the Google earth site view images to sit on the surface of the ground imagery. Radio path calculation data has been obtained from the Radio Mobile SRTM online data. Ground height differences are typically within 1m to 5m.

Radio Mobile Network Design Parameters

Radio Links	
Radio Band:	900-960MHz
Channel Bandwidth	25kHz
Digital Modulation:	16QAM
Fade Margin:	20dB
Antenna Gain:	16dBi
Antenna Type Intended:	Dual polarity flat panel
Antenna Height Used:	Various
System and Feeder Loss Used:	0.6dB + 0.03767dB/m
Feeder Type:	AVA5-50

Radio Link Summary

1	County Tower - St Jo Building	18.52	11.5	RF Path is clear with line of site. There may be foliage near St Jo.
2	County Tower - Barell Springs	12.45	7.7	RF Path is clear with line of site.
3	County Tower - Nocona Hills	27.69	17.2	RF Path is clear with line of site.
4	County Tower - Forestburg	27.65	17.2	RF Path is clear with line of site.
5	County Tower - Bowie	9.79	6.1	RF Path is clear with line of site.

Limitations of Desktop RF Network Design, Path Studies and Performance Predictions

The network design, path studies and performance predictions presented in this report are based on the information provided to Mimomax, plus the best geographic data and desk top design tools available at the time.

Differences between predicted and actual performance can occur due to unknown terrain and path obstructions, abnormal path propagation conditions, site or path interference sources and unforeseen variations in implementation of the radio solution. If performance issues occur, Mimomax will work with the end user to address these issues in the most cost-effective manner available.

A higher level of certainty in the network or link performance could be obtained by carrying out detailed site/path surveys and implementing temporary radio sites. Mimomax can assist with this work, however, the end user would need to determine if this additional pre-deployment cost and work is warranted based on their local knowledge and the results presented in this report.

Mimomax is therefore not able to guarantee the viability or performance of the network based solely on the results outlined in this report.

Radio Link List and Performance Analysis

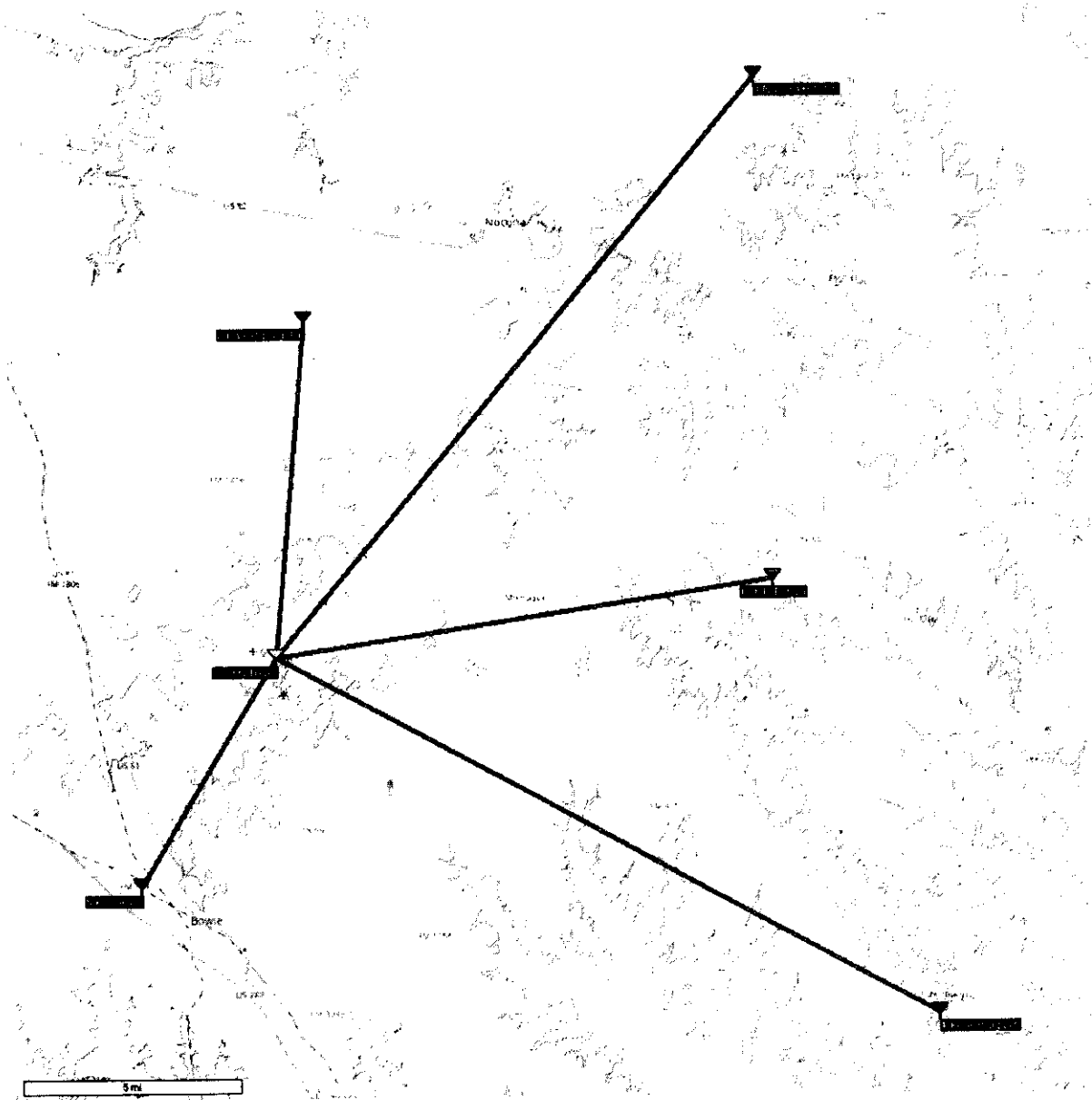
Radio Link No.	Name	WGS84 Coordinates		Elevations		Antenna			Dish/Coax Feeder		
		Latitude (Dec)	Longitude (Dec)	Site Elevation (m)	Site Elevation (ft)	Antenna Height (ft)	Planned Height (ft)	Gain (dBi)	Type	Length (ft)	Length (m)
1	County Tower	33.645477	-97.62171	396	1300	261.3' ±00.1"	20	6.1	16	40	12
2	County Tower	33.645477	-97.607605	284	933	261.3' ±00.2"	180	55.0	15	200	61
3	County Tower	33.645477	-97.637477	304	1000	219.9' ±00.2"	180	55.0	16	200	61
4	County Tower	33.645477	-97.537083	355	1165	298.5' ±00.2"	275	83.8	16	295	90
5	County Tower	33.645477	-97.61974	357	1171	211.0' ±00.1"	296	90.0	16	316	96
6	County Tower	33.645477	-97.61974	357	1171	211.0' ±00.1"	296	90.0	16	316	96

Radio Link No.	Name	WGS84 Coordinates		Elevations		Antenna			Dish/Coax Feeder		
		Latitude (Dec)	Longitude (Dec)	Site Elevation (m)	Site Elevation (ft)	Antenna Height (ft)	Planned Height (ft)	Gain (dBi)	Type	Length (ft)	Length (m)
1	St Jo Building	33.67069	-97.62171	396	1300	261.3' ±00.1"	20	6.1	16	40	12
2	Barrell Springs	33.757004	-97.607605	284	933	261.3' ±00.2"	180	55.0	15	200	61
3	Nicoana Hills	33.896537	-97.637477	304	1000	219.9' ±00.2"	180	55.0	16	200	61
4	Forestburg	33.526973	-97.537083	355	1165	298.5' ±00.2"	275	83.8	16	295	90
5	Bowle	33.570019	-97.67395	324	1063	091.0' ±00.0"	296	90.0	16	316	96
6											

Radio Link No.	Link Names	Link Distances		16dBi Panel Antenna		Feeder Losses		Obstructions			
		Calculated Link Distance (mi)	RM Calculated Link Distance (km)	Calc. RSSI (-dBm)	Calc. Fade Margin (dB)	Line Loss (dB)	Feeder Loss Site-1 (dB)	Obstruct. TR (dB)	Urban (dB)	Forest (dB)	Stats (dB)
1	County Tower - St Jo Building	11.5	18.52	-64.80	40.20	0.60	3.371	0.211	1.5	0.0	0.5
2	County Tower - Barrell Springs	7.7	12.45	-62.00	43.00	0.60	3.371	2.053	5.7	0.0	3.4
3	County Tower - Nicoana Hills	17.2	27.69	-75.40	29.60	0.60	3.371	2.053	4.2	0.0	0.1
4	County Tower - Forestburg	17.2	27.65	-72.30	32.70	0.60	3.371	3.138	0.0	0.0	0.0
5	County Tower - Bowle	6.1	9.79	-61.90	43.10	0.60	3.371	3.371	3.3	0.0	1.6
6											

Radio Link No.	Link Names	Link Distances		16dBi Panel Antenna		Obstructions		Tx Power (+dBm)	Min. Fade Margin (dB)	Min. RSSI (-dBm)	Chan. BW (kHz)	Mod. Rate (QAM) (QPSK)	No. of Trunked Digital Chan.
		Calculated Link Distance (mi)	RM Calculated Link Distance (km)	Calc. RSSI (-dBm)	Calc. Fade Margin (dB)	Obstruct. TR (dB)	Urban (dB)						
1	County Tower - St Jo Building	11.5	18.52	-64.80	40.20	1.5	0.0	0.0	0.5				
2	County Tower - Barrell Springs	7.7	12.45	-62.00	43.00	5.7	0.0	0.0	3.4				
3	County Tower - Nicoana Hills	17.2	27.69	-75.40	29.60	4.2	0.0	0.0	0.1	900	25	16	7
4	County Tower - Forestburg	17.2	27.65	-72.30	32.70	0.0	0.0	0.0	0.0	960			
5	County Tower - Bowle	6.1	9.79	-61.90	43.10	3.3	0.0	0.0	1.6				
6													

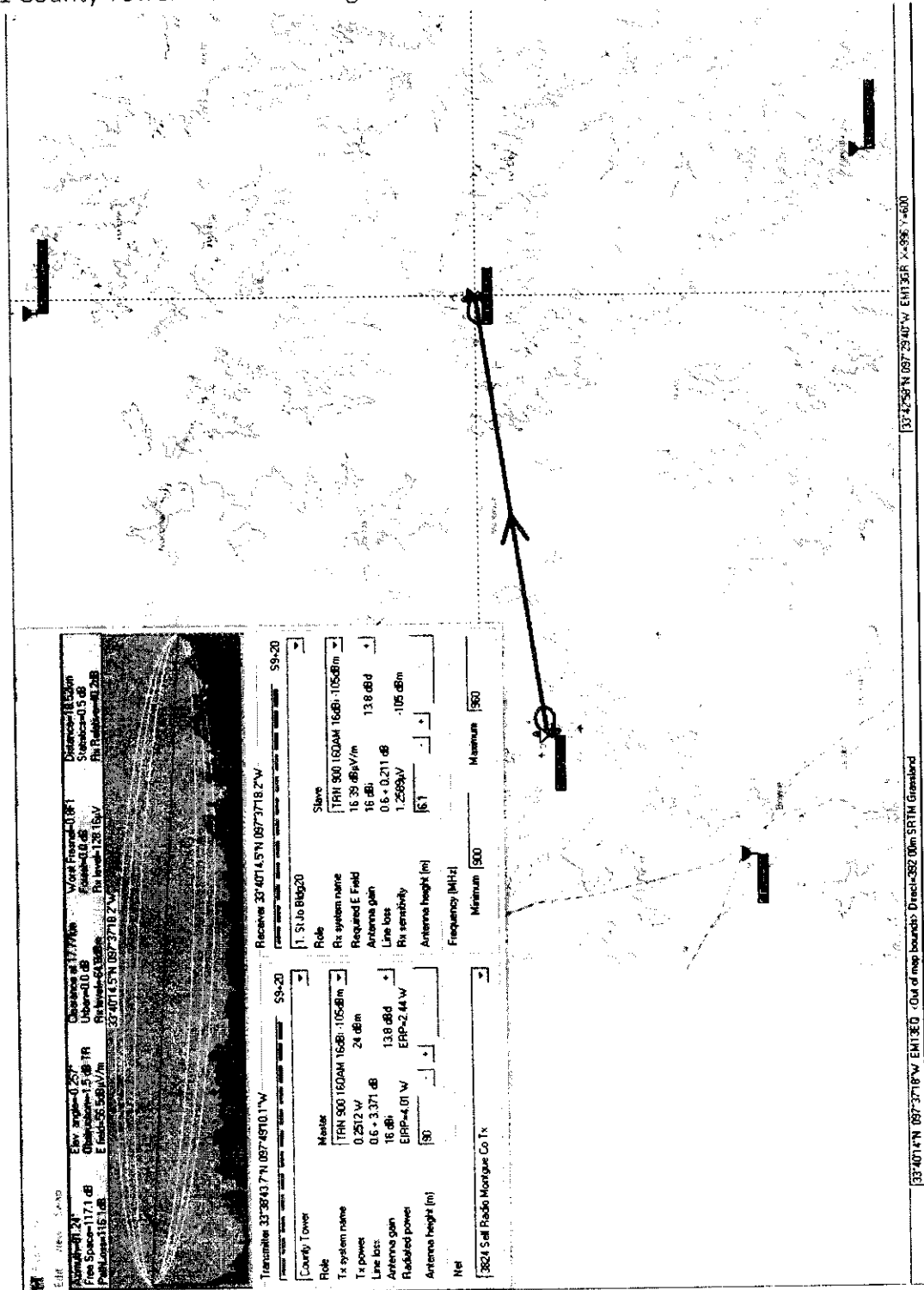
Radio Links Area Map



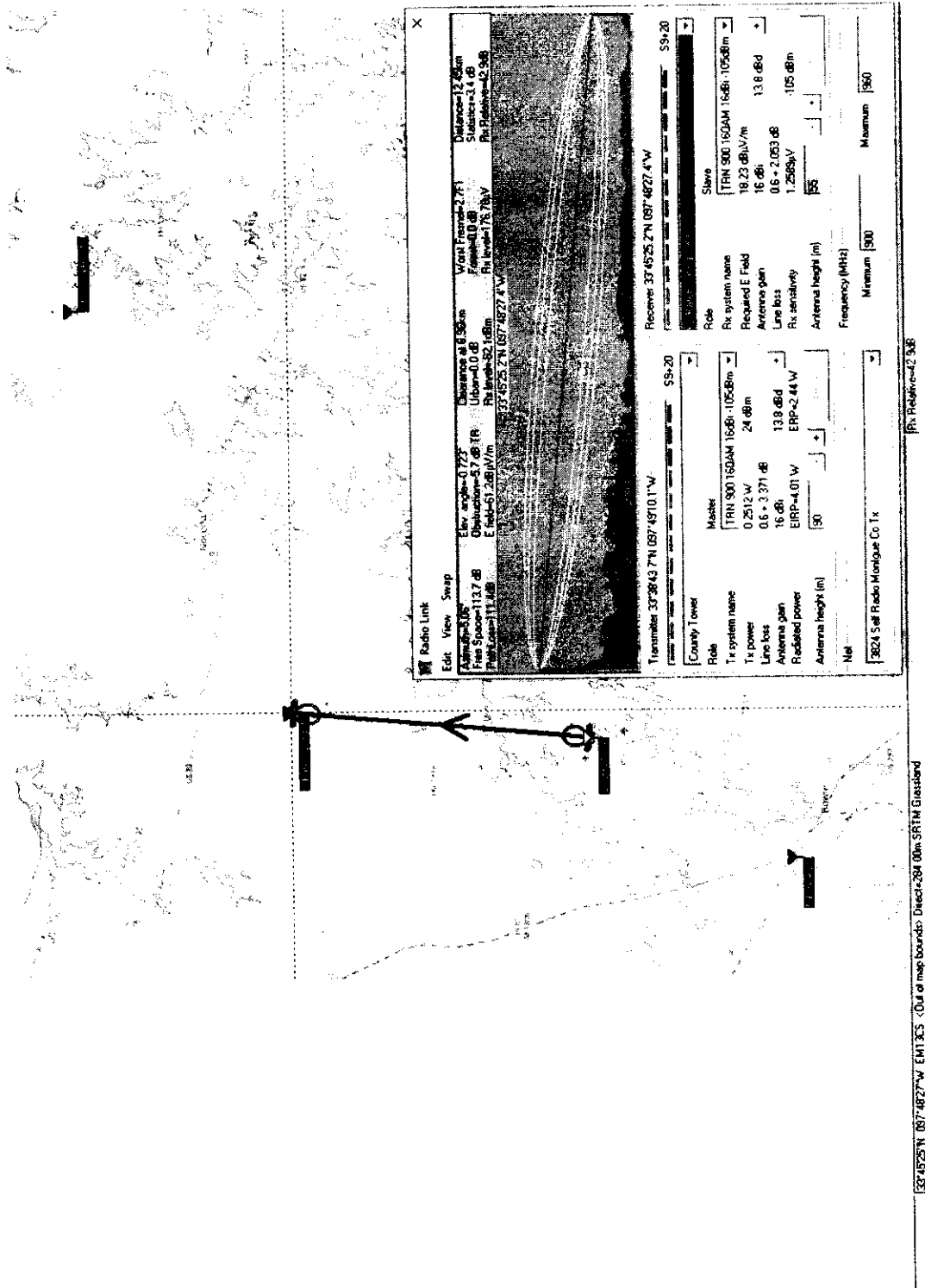
Proposed network radio layout with link numbering as depicted.

Radio Link Path Profile Maps

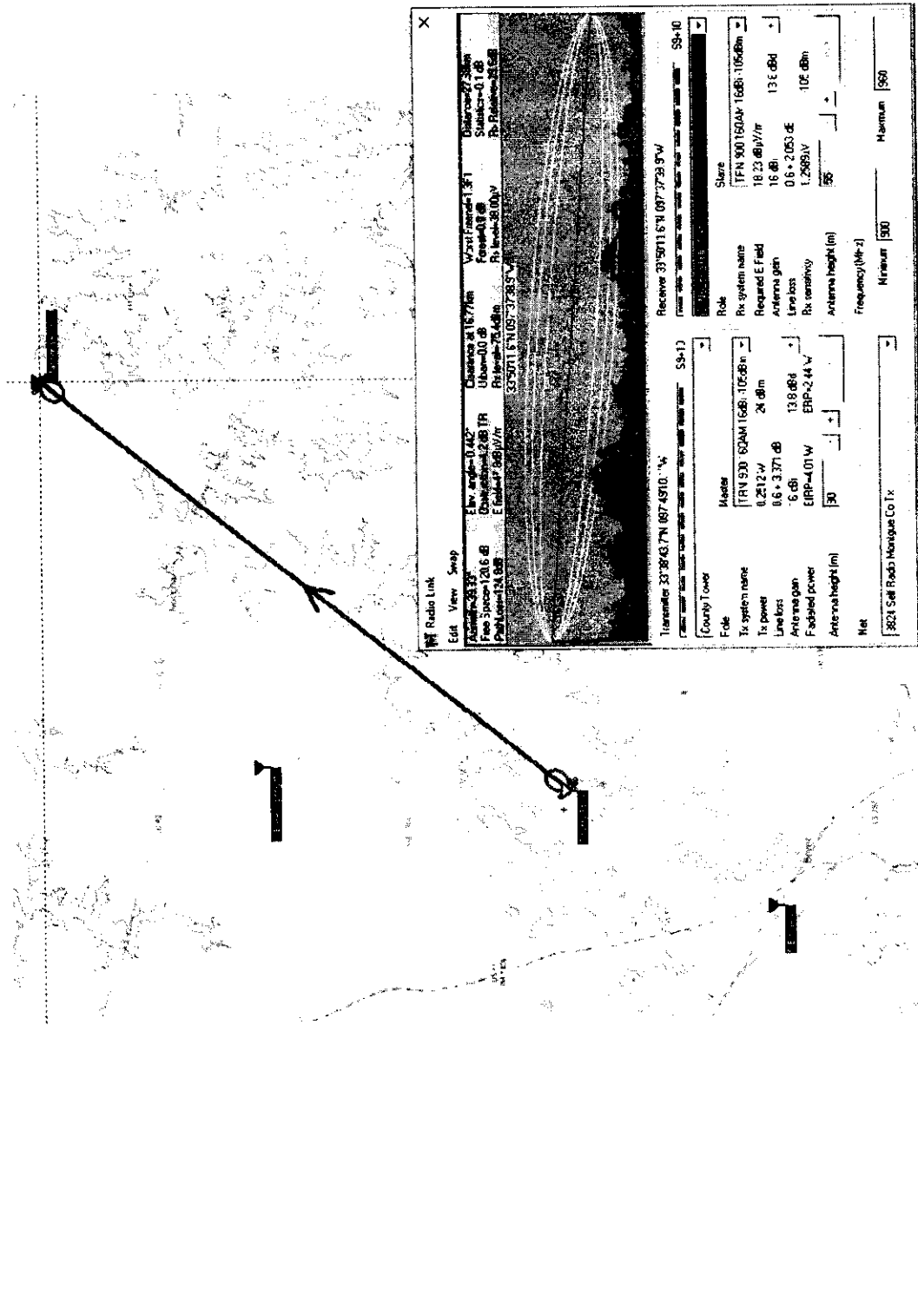
Link-1 County Tower – St Jo Building Path Profile Map



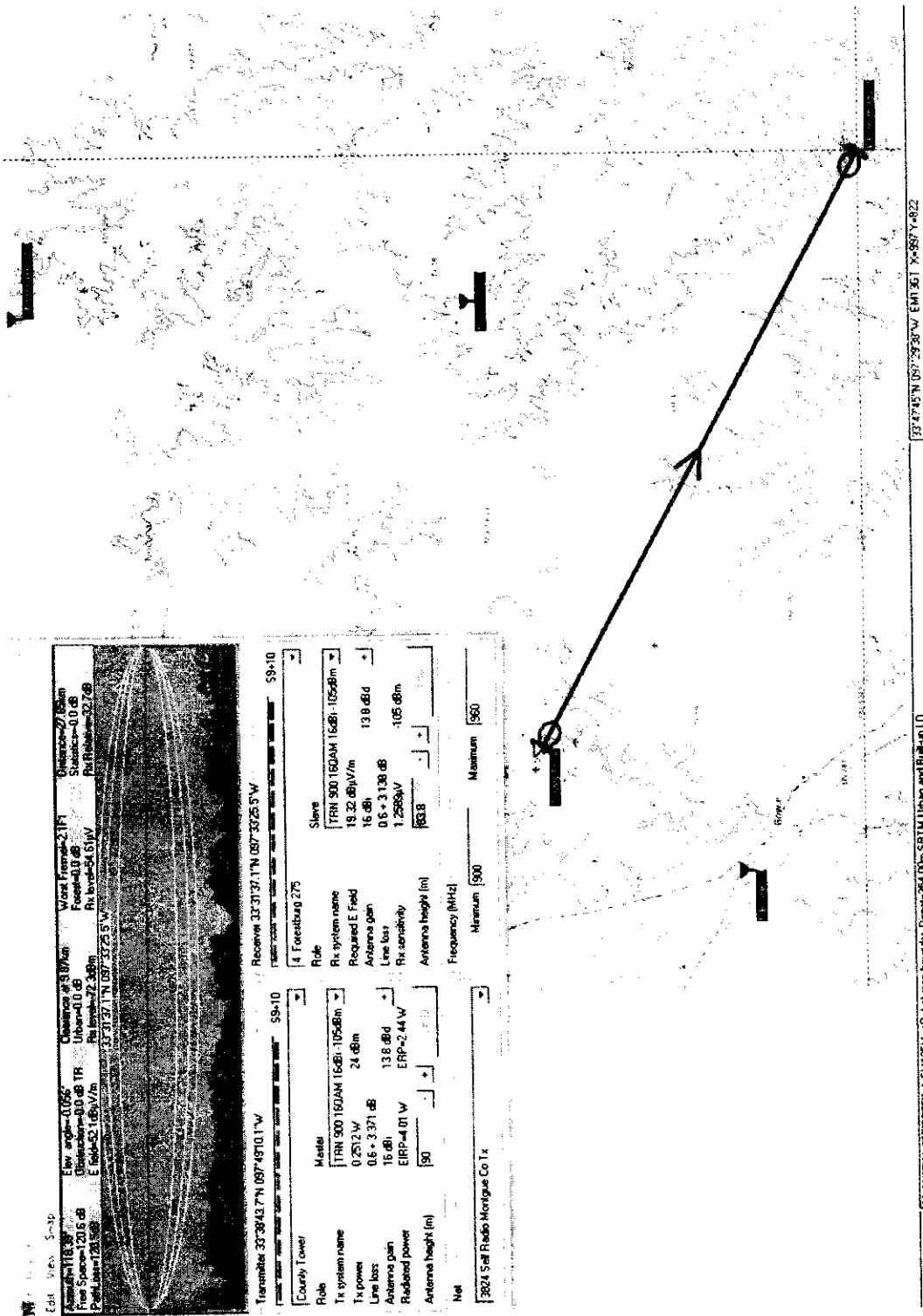
Link-2 County Tower – Barell Springs Path Profile Map



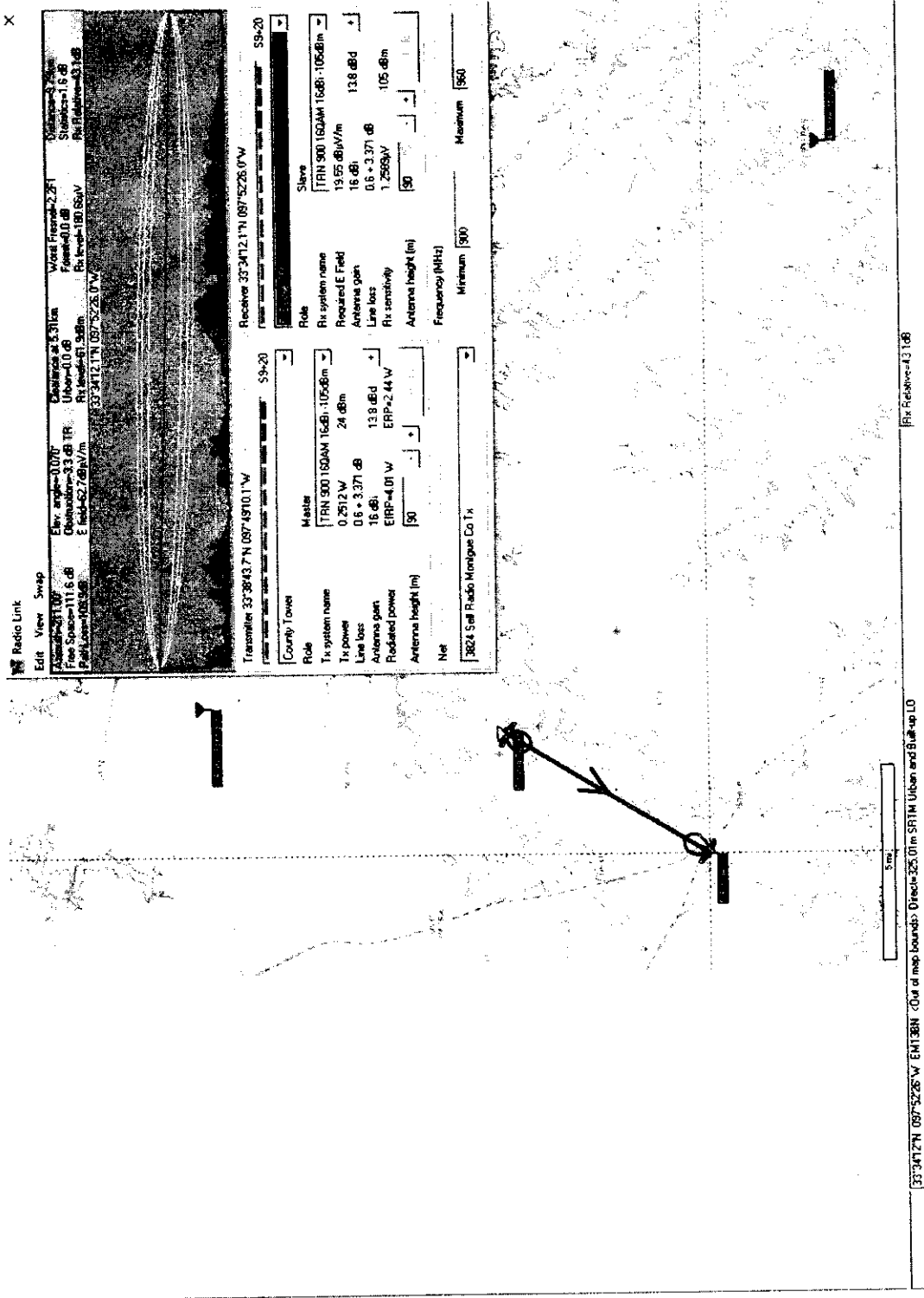
Link-3 County Tower – Nocona Hills Path Profile Map



Link-4 County Tower – Forestburg Path Profile Map

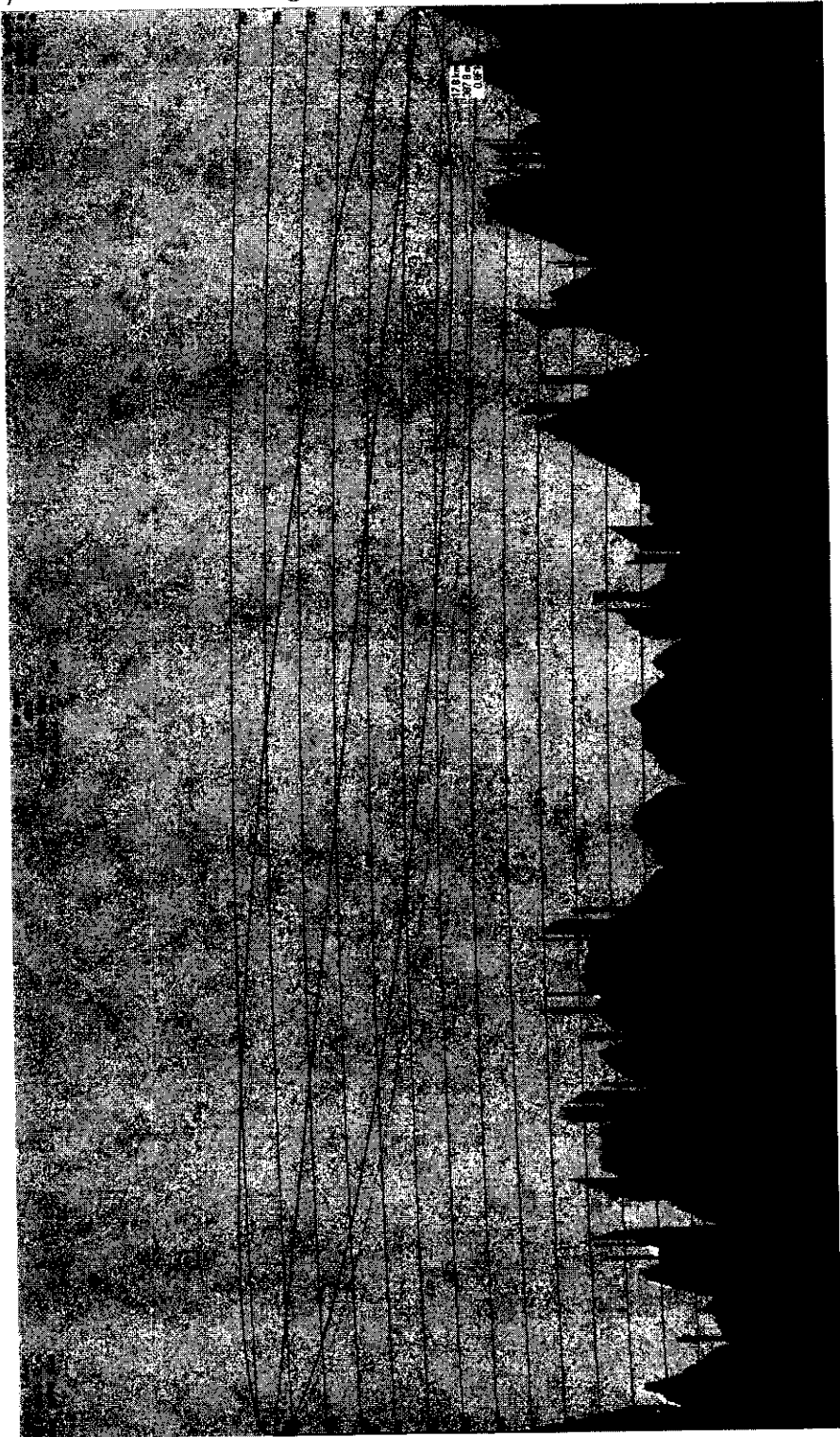


Link-5 County Tower – Bowie Path Profile Map

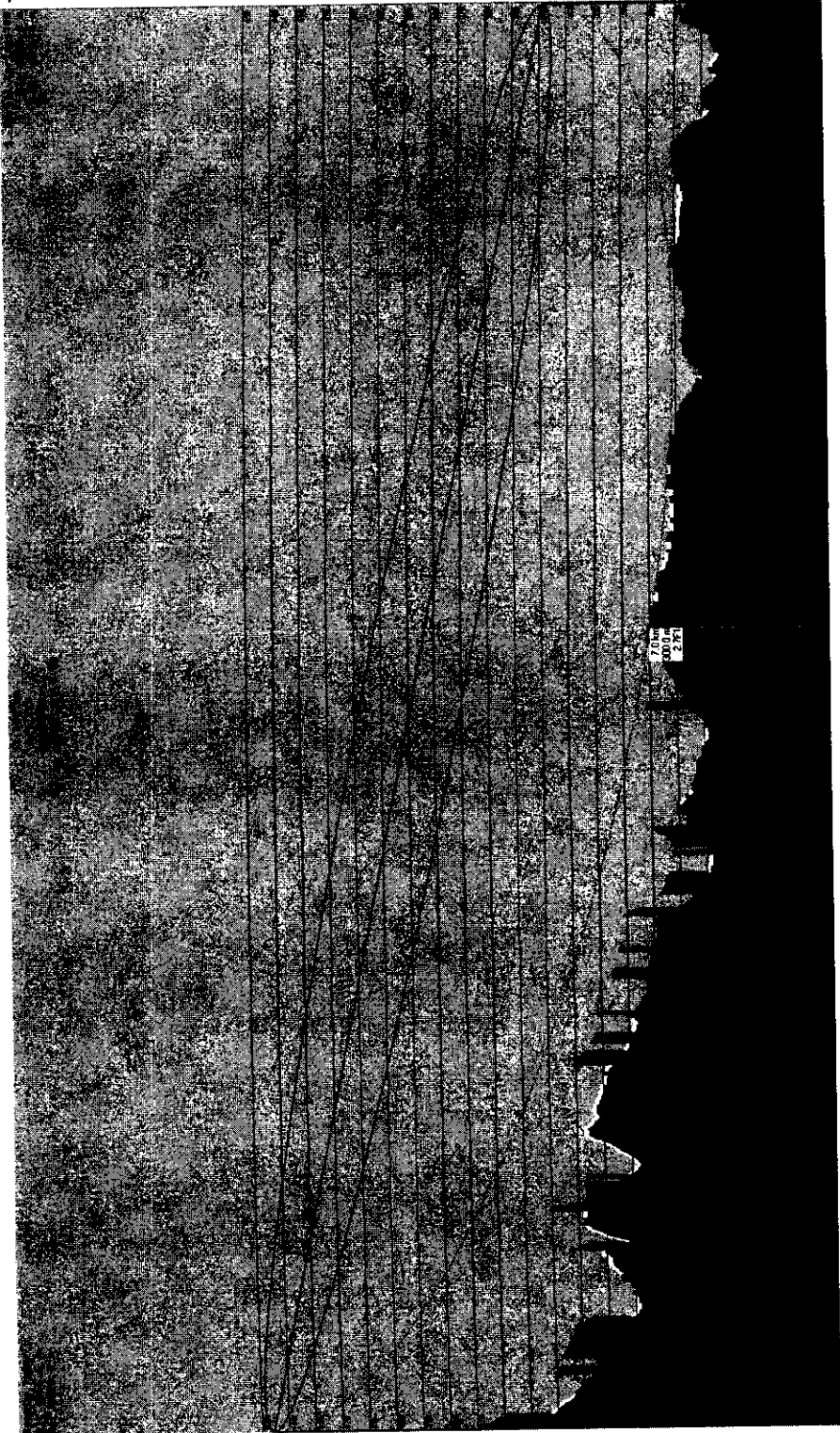


Radio Link Path Profile Charts

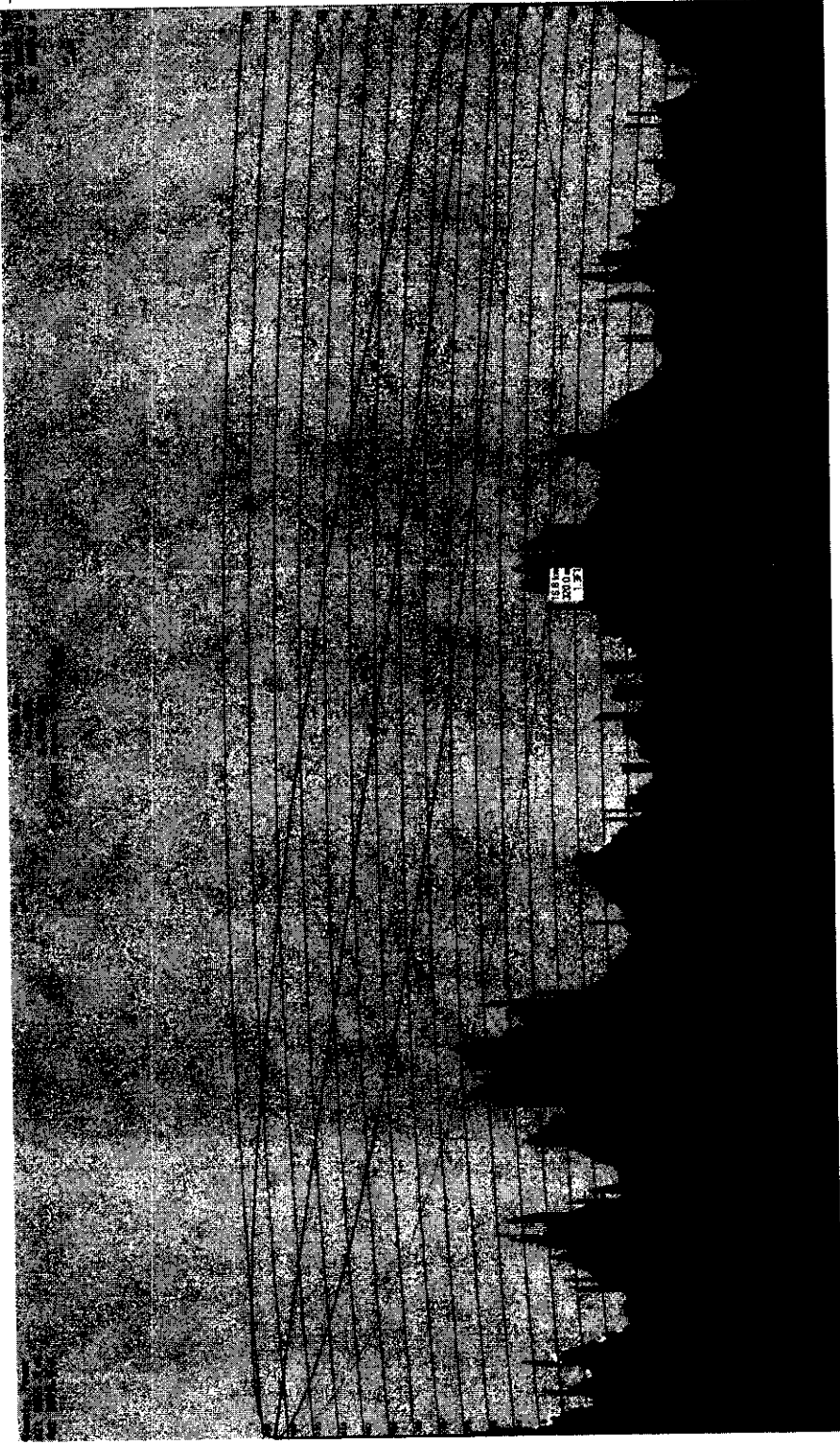
Link-1 County Tower – St Jo Building Path Profile Chart



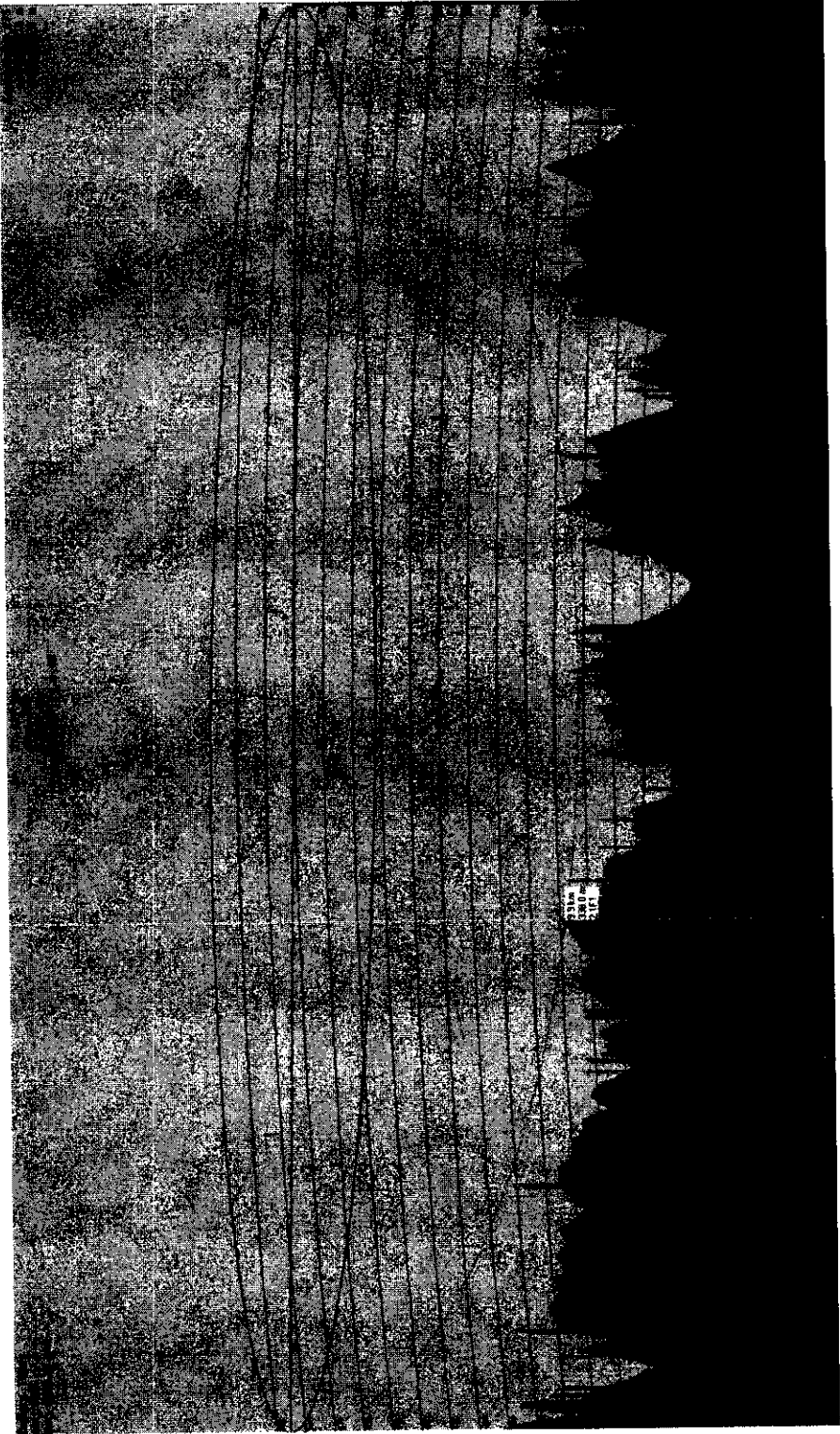
Link-2 County Tower – Barell Springs Path Profile Chart



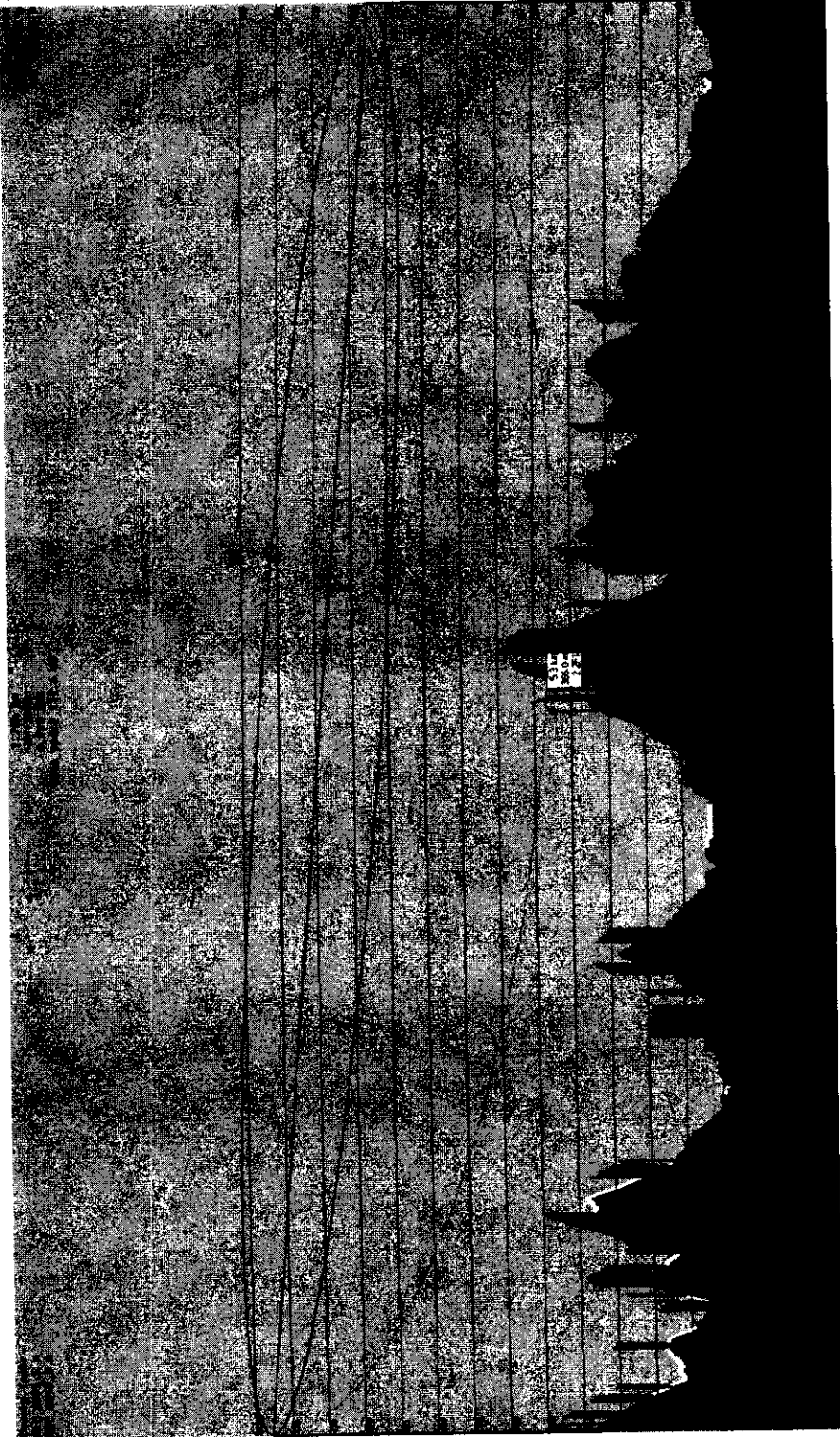
Link-3 County Tower – Nocona Hills Path Profile Chart



Link-4 County Tower – Forestburg Path Profile Chart



Link-5 County Tower – Bowie Path Profile Chart



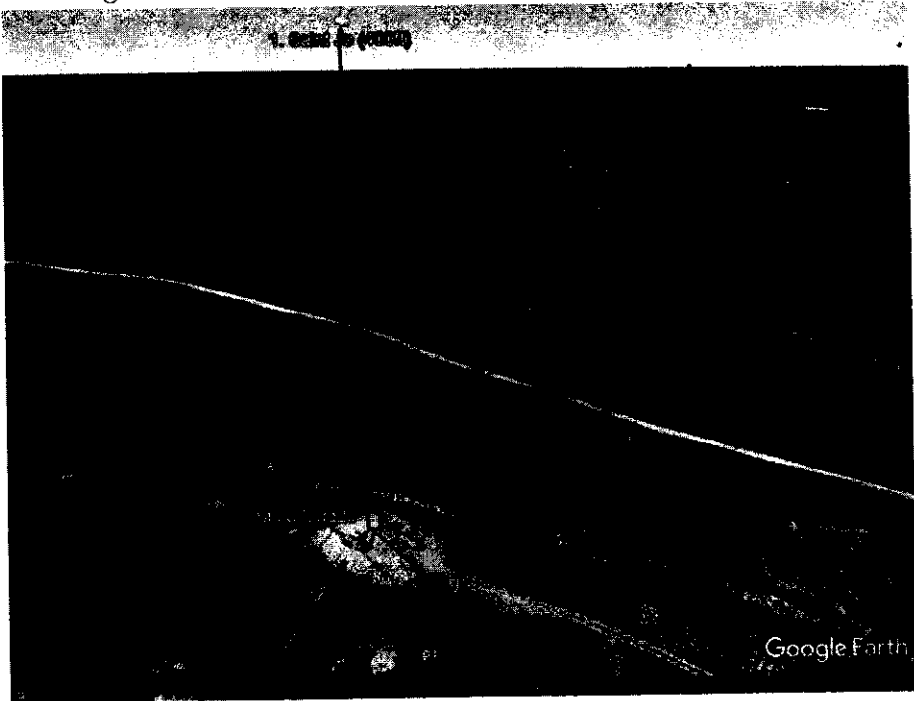
Google Earth Site Views

County Tower Links



From the left, Links 2, 3, 1, 4 and 5.

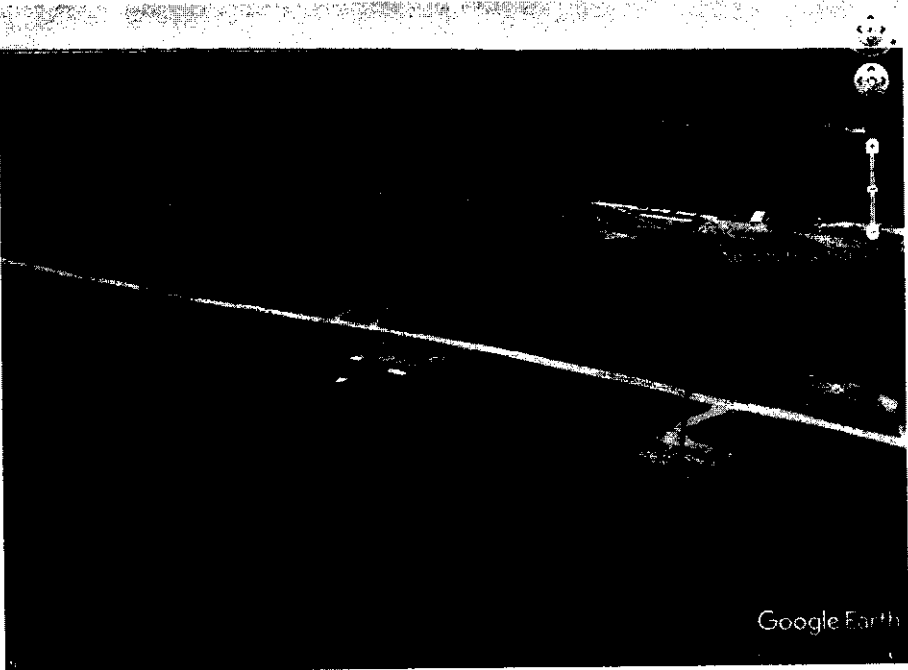
Link-1 St Jo Building Mounted Antenna facing County Tower



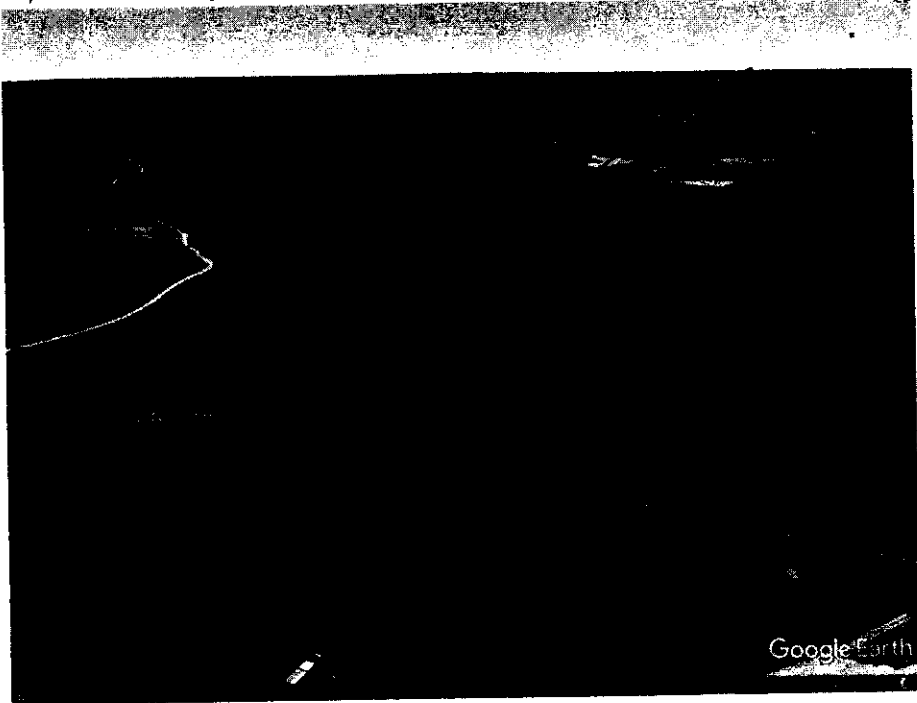
Link-2 Barell Springs facing County Tower



Link-3 Nocona Hills facing County Tower



Link-4 County Tower facing Forestburg



Links 2, 3 and 1 to the left, Link-5 facing to the right.

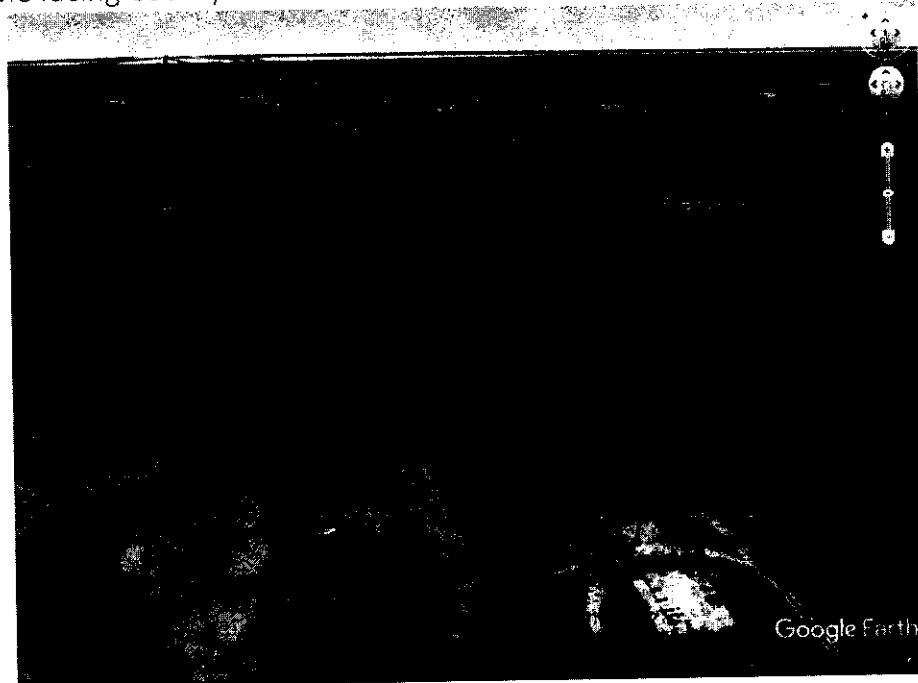
Link-4 Forestburg facing County Tower



Link-5 County Tower facing Bowie



Link-5 Bowie facing County Tower



Appendix B
Project Schedule and Gantt Chart

Montague Co Simulcast Project

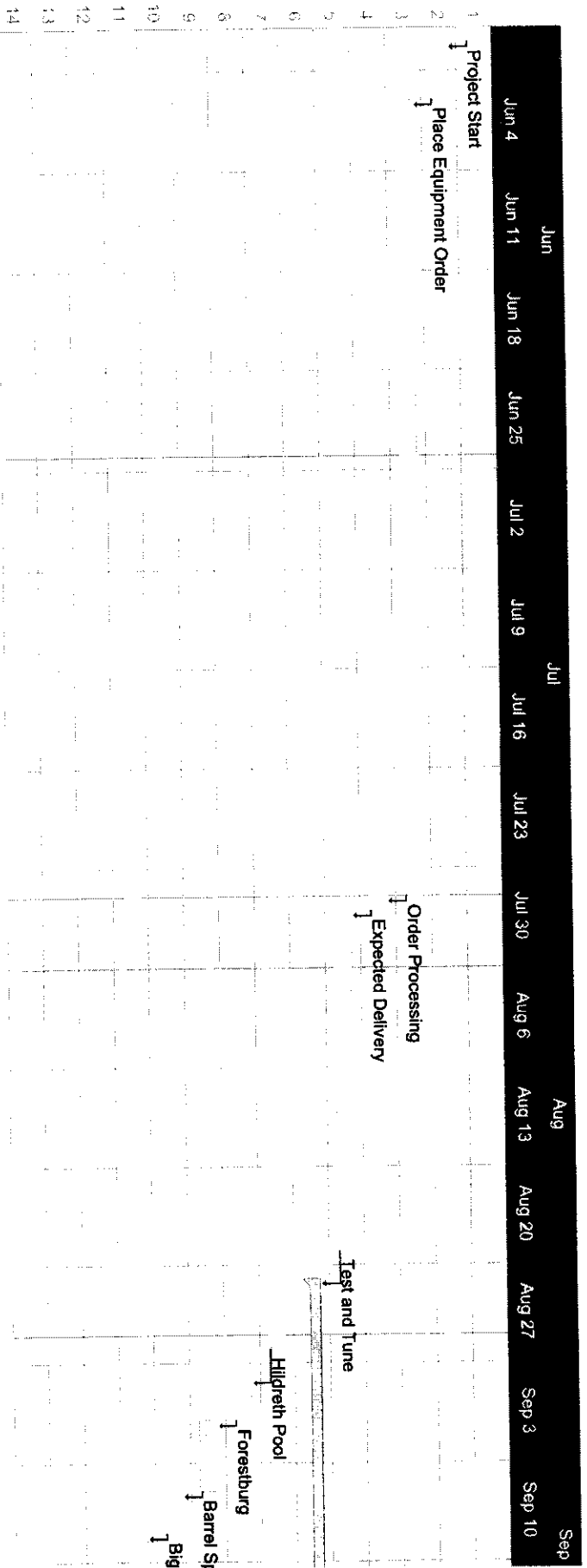
Self Radio Proposed Montague County VHF Simulcast Project Gantt Chart. Dates are tentative and subject to change.

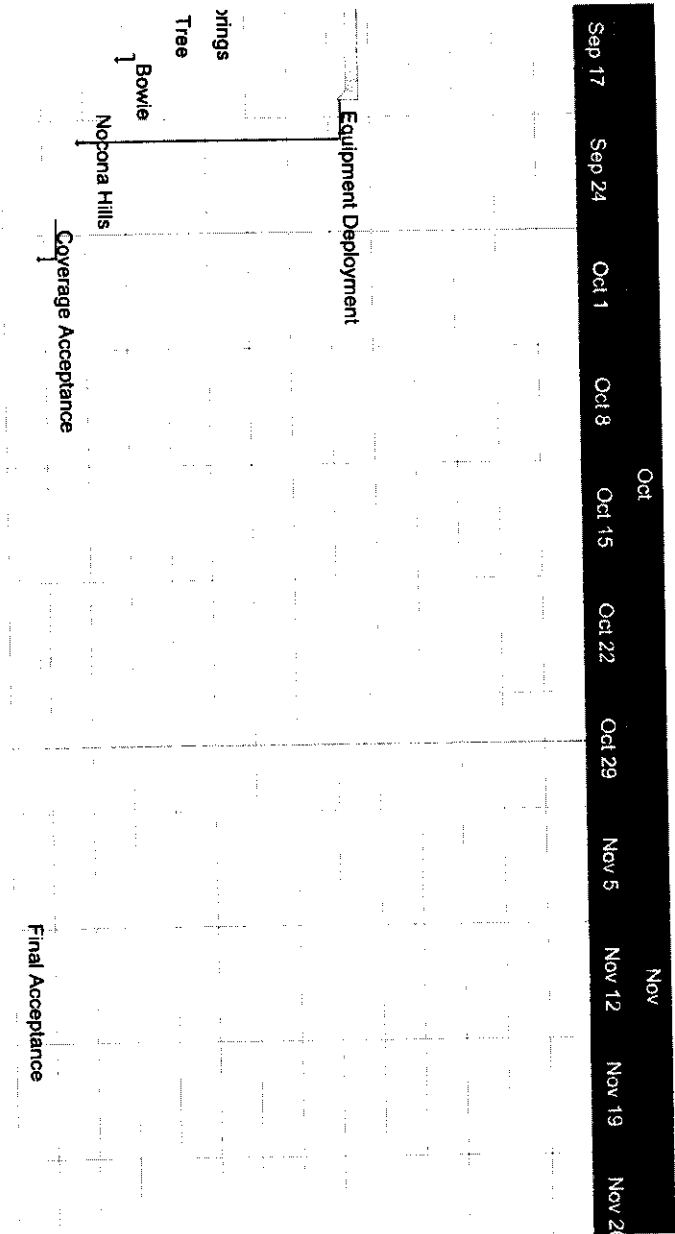
Task	Predecessors	Start Date	Duration	End Date
1 Project Start		06/01/23	1d	06/01/23
2 Place Equipment Order	1	06/02/23	2d	06/05/23
3 Order Processing	2	06/06/23	8w	07/31/23
4 Expected Delivery	3	08/01/23	1d	08/01/23
5 Test and Tune	4	08/02/23	18d	08/25/23
6 - Equipment Deployment	5	08/28/23	20d	09/22/23
7 Hildreth Pool		08/28/23	5d	09/01/23
8 Forestburg	7	09/04/23	3d	09/06/23
9 Barrel Springs	8	09/07/23	3d	09/11/23
10 Big Tree	9	09/12/23	3d	09/14/23
11 Bowie	10	09/15/23	3d	09/19/23
12 Nocona Hills	11	09/20/23	3d	09/22/23
13 Coverage Acceptance	6	09/25/23	1w	09/29/23
14 Final Acceptance	13	10/02/23	30d	11/10/23

Montague Co Simulcast Project

smartsheet

Self Radio Proposed Montague County VHF Simulcast Project Gantt Chart. Dates are tentative and subject to change.





Appendix C
Estimated Equipment Price Quotes

Self Radio Inc. Quotation

P.O. Box 76 - Montague, TX 76251 - Ph. 940-894-2181 FAX 940-894-2191

Company Montague County Quote Number Tait Repeaters
 Address _____ Quote Date April 21, 2023
 City _____ Phone Number _____
 State _____ Zip Code _____ Fax Number _____
 Contact Name _____

Material			
TB9400 100watt w Simulcast and Voter Control	2	\$ 27,891.96	\$ 55,783.92
TB9400 100 watt Simulcast Enabled	6	\$ 20,978.56	\$ 125,871.36
		\$ -	\$ -
Frequency Kit	6	\$ 6,065.80	\$ 36,394.80
SVF-CAS Manage Support Case	2	\$ 924.00	\$ 1,848.00
SVF-COM Services Commissioning	2	\$ 2,035.00	\$ 4,070.00
			\$ -
			\$ -
Warranty Options:			
3-year extension (5-years total)	3	\$ 2,096.02	\$ 6,288.06
5-year extension (7-years total), maximum available	5	\$ 2,096.02	\$ 10,480.10
(available in 1-year increments, chose 5-year to match RFP, and maximum option)			\$ -
			\$ -
			\$ -
			\$ -
Total			\$ 223,968.08

3-year extension added \$ 230,256.14
 5-year extension added \$ 234,448.18

Self Radio Inc. Quotation

P.O. Box 76 - Montague, TX 76251 - Ph. 940-894-2181 FAX 940-894-2191

Company Montague County Quote Number Mimomax Data Radios
 Address _____ Quote Date April 21, 2023
 City _____ Phone Number _____
 State _____ Zip Code _____ Fax Number _____
 Contact Name _____

Material			
Point to point radios with backup (Dual Radio)	10	\$ 10,800.00	\$ 108,000.00
DC Connector and Lead	20	\$ 16.00	\$ 320.00
900MHZ MIMO Panel Antenna	10	\$ 1,840.00	\$ 18,400.00
Mounting Rack	10	\$ 80.00	\$ 800.00
SERV-TEC-CFG-HR Configuration Days	2.5	\$ 950.00	\$ 2,375.00
SERV-ENG-RFL-PJ Licensing	5	\$ 1,200.00	\$ 6,000.00
SERV-ENG-OFF-DY	2	\$ 1,500.00	\$ 3,000.00
SERV-MSC=FRE Freight	1	\$ 1,450.00	\$ 1,450.00
SERV-MSC-DUT Custom & Duty Charges	1	\$ 75.00	\$ 75.00
MMX-SERV-SUP-AGR Extended Support Annual Fee	5	\$ 6,750.00	\$ 33,750.00
MMX-SERV-EXT-WAR Extended Warranty	4	\$ 3,200.00	\$ 12,800.00
1 Year Support and Warranty included with purchase			\$ -
			\$ -
			\$ -
Total			\$ 186,970.00

Self Radio Inc. Quotation

P.O. Box 76 - Montague, TX 76251 - Ph. 940-894-2181 FAX 940-894-2191

Company Montague County Quote Number Miscellaneous Materials for Simulcast Project
 Address _____ Quote Date April 21, 2023
 City _____ Phone Number _____
 State _____ Zip Code _____ Fax Number _____
 Contact Name _____

Material			
Coax	6600	\$ 8.57	\$ 56,562.00
Connectors	48	\$ 40.00	\$ 1,920.00
Hoisting Grips	24	\$ 30.00	\$ 720.00
Grounding Kits	48	\$ 30.00	\$ 1,440.00
DB224	6	\$ 1,000.00	\$ 6,000.00
Duplexers and Band Pass Filter	5	\$ 6,340.00	\$ 31,700.00
Data radio power supplies with battery backup	10	\$ 250.00	\$ 2,500.00
Cabinets for Bowie, Nocona Hills and Barrel Springs	3	\$ 8,500.00	\$ 25,500.00
Tower Crew Part	1	\$ 41,025.00	\$ 41,025.00
Antenna side mount brackets	4	\$ 400.00	\$ 1,600.00
Self Radio days assembling and supervising	18	\$ 680.00	\$ 12,240.00
RF Jumpers from Coax to Equipment	54	\$ 95.00	\$ 5,130.00
Deep Cycle Batteries	8	\$ 279.00	\$ 2,232.00
Relay Racks	3	\$ 250.00	\$ 750.00
Total			\$ 189,319.00

Self Radio Inc. Quotation

P.O. Box 76 - Montague, TX 76251 - Ph. 940-894-2181 FAX 940-894-2191

Company Montague County Quote Number Spare Repeaters and Data Radios
 Address _____ Quote Date April 21, 2023
 City _____ Phone Number _____
 State _____ Zip Code _____ Fax Number _____
 Contact Name _____

Material			
TB9400 100 Watt Simulcast and Voter Controller	1	\$ 27,891.96	\$ 27,891.96
TB9400 100 Watt Simulcast Enabled	1	\$ 20,978.56	\$ 20,978.56
Tornado 1+1 Data Link Radio	2	\$ 10,800.00	\$ 21,600.00
900 MHz Mimo Panel Antenna	2	\$ 1,840.00	\$ 3,680.00
			\$ -
			\$ -
Tait Warranty Options			
3-year extension (5-year total)	3	\$ 563.89	\$ 1,691.67
			\$ -
			\$ -
Mimomax Warranty Options			
5-year software support	5	\$ 1,516.80	\$ 7,584.00
4-year hardware warranty (1-yr included total of 5-ys)	4	\$ 758.40	\$ 3,033.60
			\$ -
			\$ -
			\$ -
Total			\$ 86,459.79

Appendix D
Insurance



SELFR-1

OP ID: SC

DATE (MM/DD/YYYY)
04/18/2023

CERTIFICATE OF LIABILITY INSURANCE

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER Hutcherson Insurance Agency P. O. Box 430 Gainesville, TX 76241-0430 Greg Hutcherson	CONTACT NAME: Shelia Colwell PHONE (A/C, No, Ext): 940-665-4711 E-MAIL ADDRESS: shelia@hutchersoninsurance.com	FAX (A/C, No): 940-665-7363
	INSURER(S) AFFORDING COVERAGE	
INSURED Self Radio, Inc. P.O. Box 76 Montague, TX 76251-0076	INSURER A: Texas Mutual Insurance Co	NAIC # 22945
	INSURER B: Hartford Underwriters Insuranc	001
	INSURER C: West American Insurance Co	
	INSURER D:	
	INSURER E:	
	INSURER F:	

COVERAGES CERTIFICATE NUMBER: REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
B	<input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS-MADE <input checked="" type="checkbox"/> OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: <input checked="" type="checkbox"/> POLICY <input type="checkbox"/> PRO-JECT <input type="checkbox"/> LOC OTHER:			46SBAAT5U78	08/07/2022	08/07/2023	EACH OCCURRENCE \$ 1,000,000 DAMAGE TO RENTED PREMISES (Ea occurrence) \$ 300,000 MED EXP (Any one person) \$ 10,000 PERSONAL & ADV INJURY \$ 1,000,000 GENERAL AGGREGATE \$ 2,000,000 PRODUCTS - COMP/OP AGG \$ 2,000,000
C	AUTOMOBILE LIABILITY <input type="checkbox"/> ANY AUTO OWNED AUTOS ONLY <input checked="" type="checkbox"/> HIRED AUTOS ONLY <input checked="" type="checkbox"/> SCHEDULED AUTOS <input checked="" type="checkbox"/> NON-OWNED AUTOS ONLY			BAW61604903	07/07/2022	07/07/2023	COMBINED SINGLE LIMIT (Ea accident) \$ 1,000,000 BODILY INJURY (Per person) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE (Per accident) \$
C	<input checked="" type="checkbox"/> UMBRELLA LIAB <input checked="" type="checkbox"/> OCCUR <input type="checkbox"/> EXCESS LIAB <input type="checkbox"/> CLAIMS-MADE <input type="checkbox"/> DED <input checked="" type="checkbox"/> RETENTION \$ 10000			46SBAAT5U78	08/07/2022	08/07/2023	EACH OCCURRENCE \$ 2,000,000 AGGREGATE \$ 2,000,000
A	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY <input type="checkbox"/> ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	Y/N	N/A	0002017368	07/07/2022	07/07/2023	<input checked="" type="checkbox"/> PER STATUTE <input type="checkbox"/> OTH-ER E.L. EACH ACCIDENT \$ 1,000,000 E.L. DISEASE - EA EMPLOYEE \$ 1,000,000 E.L. DISEASE - POLICY LIMIT \$ 1,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

CERTIFICATE HOLDER

MONTAGU

Montague County Auditor
 PO Box 56
 Montague, TX 76251

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE
 Greg Hutcherson