



REGIONAL TELECOMMUNICATIONS PLAN

**Prepared by the
Southeastern Wisconsin Regional
Planning Commission
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Regional Telecommunications Plan

❖ History

- Commission initiated regional telecommunications planning program in September, 2004
- Based on Prospectus published in December 2003
- Advisory committee formed on Regional Telecommunications Planning

❖ Three Network Plans

- Regional Public Networks Plan
- Regional Antenna Site and Related Wireless Infrastructure Plan
- Comprehensive Regional Wireline-Wireless Telecommunication Network Plan (Also called Universal Broadband Access Plan)
- Network Monitoring System
 - Wireless
 - Wireline

❖ Regional Public Networks plan

- Public Safety—Emergency Response
- Transportation—Intelligent Transportation Systems (ITS)
- Healthcare
 - Home Healthcare
 - Pre-Hospital EMS
- Homeland Security Monitoring
- Utility SCADA Systems
- Environmental Sensor Networks

❖ Regional Commercial Wireless Plan

❖ Regional Wireline-Wireless Plan

Regional Telecommunications Planning Program

TASK NAME	2004				2005												2006								
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	
NETWORK MONITORING SYSTEM																									
WIRELESS NETWORK PLAN																									
INVENTORY TECHNICAL REPORT																									
PUBLIC NETWORKS PLAN																									
REGIONAL NETWORK PLAN																									

 FIELD DEPLOYMENT OF NETWORK MONITORING SYSTEM

 END OF SEVEN COUNTY MEASUREMENT CYCLE



Telecommunications- Definition and Importance

- Broadband
 - Little - 200 Kilobits per second
 - Big – 20 Megabits per second and greater

- Media
 - Voice, Data, Video, Multimedia

- Terrestrial Wireless Plan
 - 1G, 2G, 3G, 4G
 - Advisory Commercial Plan
 - Direct Public Networks Plan

Wireless Telecommunications Planning Functions

- Wireless Inventory
 - Infrastructure
 - Performance
 - Monitoring System
- Wireless Plan Design
 - Improve 2G, 2.5G, 3G
 - New 4G Plan
- Wireless Plan Implementation
 - Commercial Networks
 - Advisory Plan
 - Public Networks
 - Public Safety
 - Transportation
 - Public Health
 - Home Healthcare
 - Homeland Security

Public Safety Communications Status and Prospects

Overall Status

- Current 150 MHz and 800 MHz systems
 - For voice communications
 - Slow data communications
 - 19.2 Kilobits per second
 - No agency or jurisdictional interoperability

- New WiFi/WiMAX Technology
 - New 4.9 GHz band released April 2004 for public safety
 - Avoids contention with 900 MHz, 2.4GHz and 5.4-5.8 GHz bands
 - High speed data/video network for public safety communications
 - Performance potential throughput—20-100 megabits per second
 - Problem: high transmission losses at 4.9 GHz
 - Solution: higher sensitivity radio receivers
 - City of Waukesha 4.9 GHz wireless test project



Public Safety Communications Status and Prospects—continued

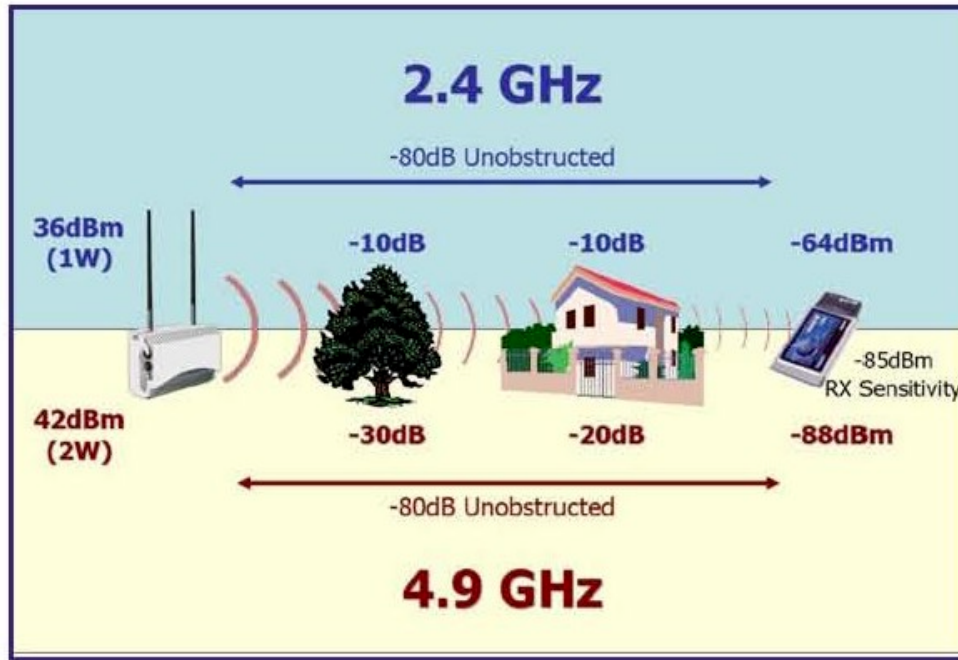
Regional Status

- Ozaukee County
 - Budgeted for WiMAX high speed public safety data systems in 2006
 - Lower cost than proprietary systems

- City of Waukesha Test
 - Results discouraging
 - But technical solution is available

- County Broadband Public Safety Communications Plans
 - Commission will provide for any Regional county

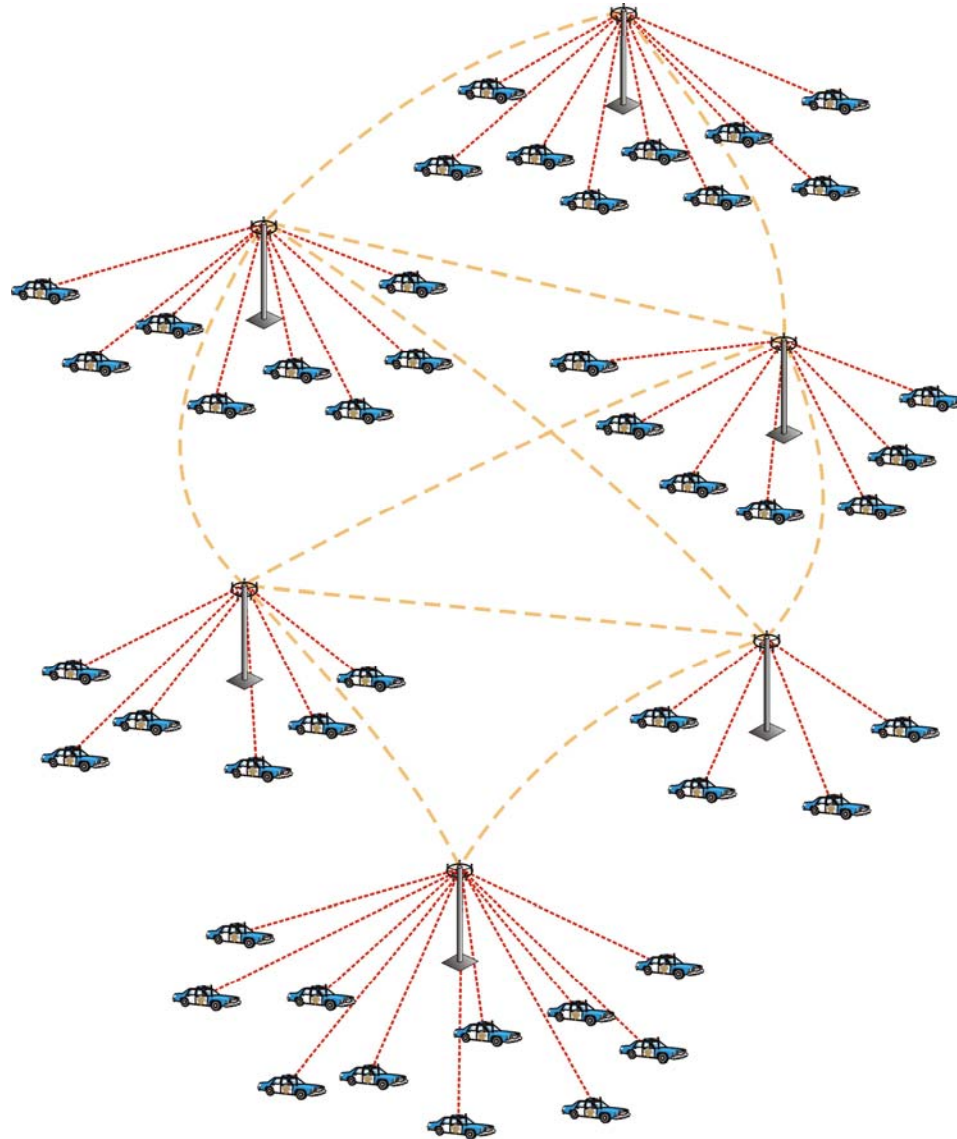
4.9 GHz Transmission Losses



Source: Tropos 2004

- ❖ Loss Through Foliage and Construction Materials
- ❖ Remedies
 - Improved S/N Receivers
 - Better Mobile Antennas

Public Safety WiMax Network



WiMAX/WHIRLWIND

PUBLIC SAFETY WiMAX

4.9 GHz Band Plan

The following channel center frequencies are permitted, per FCC rules (90.1213), to be aggregated to channel bandwidths of 5, 10, 15 or 20 MHz. The maximum bandwidth of a 4.9 GHz channel is 20 MHz.

Center Frequency (MHz)	Channel Nos.	Channel Bandwidth
4940.5	1	1 MHz
4941.5	2	1 MHz
4942.5	3	1 MHz
4943.5	4	1 MHz
4944.5	5	1 MHz
4947.5	6	5 MHz
4952.5	7	5 MHz
4957.5	8	5 MHz
4962.5	9	5 MHz

Center Frequency (MHz)	Channel Nos.	Channel Bandwidth
4967.5	10	5 MHz
4972.5	11	5 MHz
4977.5	12	5 MHz
4982.5	13	5 MHz
4985.5	14	1 MHz
4986.5	15	1 MHz
4987.5	16	1 MHz
4988.5	17	1 MHz
4989.5	18	1 MHz

The peak transmit power should not exceed:

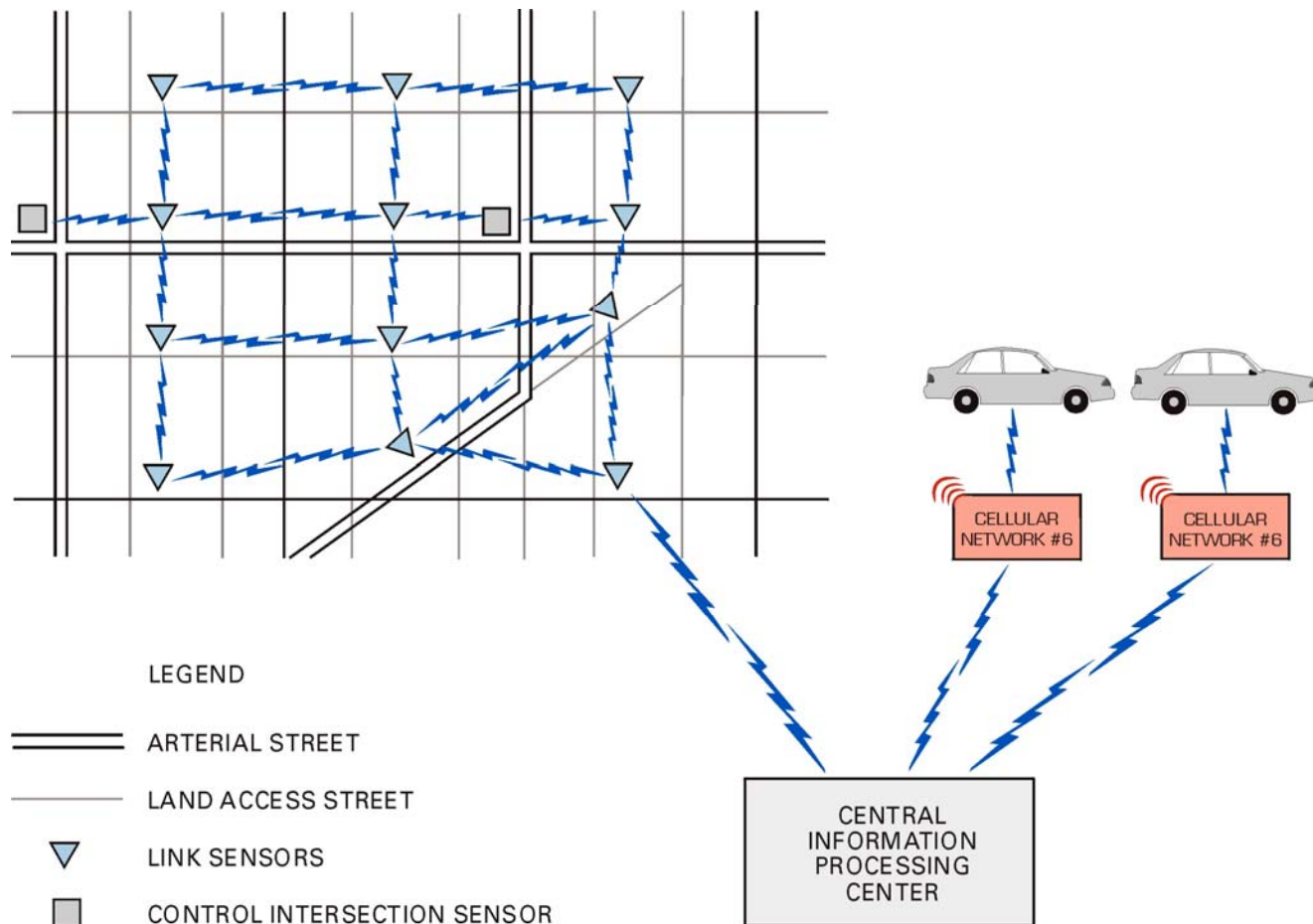
Channel Bandwidth	Low power peak Transmitter power	High power peak Transmitter power (dBm)
1	7	20
5	14	27
10	17	30
15	18.8	31.8
20	20	33

Transportation Communications and Control Systems

- Centralized Freeway Control
 - Current localized ramp metering control system
 - Proposed centralized adaptive control system
 - Phase I — Feasibility Study
 - Phase II — System Deployment
 - Impact of WAVE (IEEE 802.11p)

- Areawide Traffic Routing
 - Extending centralized traffic beyond the freeways to the arterial street network
 - Travel time instrumentation
 - Data communication network
 - Central information processing
 - Broadcast to vehicles
 - Telematic motor vehicles

Block Diagram Areawide Traffic Routing System





Public Healthcare Communications

- Home Healthcare
 - Home patient monitoring
 - Videoconferencing
 - Medication control
 - Patient education
- Pre-hospital EMS
 - Hospital to ambulance videoconferencing



Fourth Generation (4G) Wireless Plan

- Antenna Site Inventory
- Performance Monitoring Inventory
- 4G Regional WiFi/WiMAX Plan
 - WiFi access networks
 - WiMAX backhaul network
 - Throughput standard: 20-100 megabits per second
 - Sample plan completed February 20,2006
 - Final plan – May 2006



Comprehensive Regional Wireline- Wireless Telecommunications Plan

- Universal Broadband Access Plan
 - Big Broadband for all of Southeastern Wisconsin
 - Throughput: 20-100 megabits per second

- Wireline Segment
 - Core fiber network
 - Fiber to wireless access points
 - Fiber to wireline (copper) remote terminals
 - Fiber to premises

- Wireless Segment
 - WiFi access networks
 - WiMAX backhaul network
 - Fixed users
 - Nomadic users
 - Mobile users



Comprehensive Regional Wireline- Wireless Telecommunications Plan— continued

- Plan Implementation
 - Commercial Access Networks
 - Private carriers?
 - Local government?
 - Public Networks—Transportation
 - WisDOT
 - Public Safety Networks
 - Regional counties
 - Regional municipalities