7.2 MULTIMODE WIRELESS LAN SERVICE (L.34.1.7)

> *The Qwest Team's Multimode Wireless Local Area Network solution brings last mile mobile access to the user. With convergence over this last mile, the next-generation network is always within reach.*

Qwest is teaming with ███████████ in providing Multimode Wireless Local Area Network Service (MWLANS). The service consists of a public network subscription service and a private hotspot network solution for serving private Agency locations. Qwest's public network subscription service will allow Agency employees to securely access the Internet and Agency networks from outside Agency firewalls from public hotspots worldwide.

Qwest's private network solution, using dual-band radio, wireless-meshed technology, provides best-in-class reliability, capacity, coverage, and quality. Mesh networking eliminates single points of failure by routing traffic around failed components. ████████████████████████████ ██ ███████████████████████████████ Using multiple radios at 5.8GHz for backhaul and 2.4GHz for access provides a high-capacity, low-latency, low-jitter solution that enables the support for real-time applications such as Voice over Internet Protocol (VoIP) and video.

7.2.1 Technical Approach to Multimode Wireless Services Delivery (L.34.1.7.1, C.2.14.3)

Qwest provides coverage throughout the world within existing hotspots. In addition to the existing sites, Qwest will support Agencies' coverage and capacity requirements by building additional sites where required as well as by using supporting roaming agreements with other Wireless Internet Service Providers (WISPs). Additionally, Qwest will build

private hotspots and mesh networks at Agency locations by request. Both the public and private networks will support seamless login, IP mobility, and roaming capabilities for Agency end-users.

7.2.1.1 Approach to Multimode Wireless Service Delivery (L.34.1.7.1(a))

Qwest's multi-vendor experience allows us to leverage our wireless industry alliances to design, build, and integrate both a public and private network solution. Qwest's public network subscription service will be supported by a seasoned network force that has deployed and operated wireless networks.

Each Access Point (AP) supports multiple Service Set Identifiers (SSID), where each SSID can be mapped to a different Virtual LAN and supports separate security profiles. This multiple SSID support allows secure access to both public and private networks. Our hotspot Operational Support System (OSS) facilitates easy administration of Inter-WISP roaming via its integrated clearing, settlement, and reconciliation capabilities and provides a common login procedure to Agency users whether they are accessing the Internet or network resources from the private network, the public network, or while roaming on another WISP's network. This integrated private/public network solution was designed with simplicity of use in mind for the end-user.

Qwest's public and private network solutions are supported from a geographically diverse Network Operations Center (NOC) with a worldwide reach. Both the public network subscription service and the private network solutions will support 802.11a/b/g compliant Service Enabling Devices (SEDs), including Wireless Fidelity (WiFi) enabled desktop, notebook, and laptop Personal Computers (PCs), Personal Digital Assistants (PDAs), and HP iPAQs. All of our APs support 802.11b/g access devices. Additionally, we will deploy indoor APs where additional coverage or capacity is required.

7.2.1.2 Benefits of Multimode Wireless Services Technical Approach (L.34.1.7.1(b))

Qwest's multi-vendor experience enables us to offer both a public subscription service network and a private on-Agency facility network with the market differentiation. The features and benefits of Qwest MWLANS are described in *Figure 7.2.1-1*.

Figure 7.2.1-1. Market Differentiators of Qwest MWLANS Solution

Feature		
Dual-band Radio Wireless Mesh Technology		
Hotspot OSS Platform		
IP Mobility Option		
Security		
Device Agnostics Communication support		

RFP: TQC-JTB-05-0001   December 13, 2006

At the most basic level, Qwest's MWLANS solution is simply IP access and transport and, as such, inherently supports FEA objectives and enterprise requirements in general, including access and transport for voice, data, video, messaging, and collaboration applications. Qwest's solution will make the Internet and Agency network resources more accessible, resulting in improved use of Government information resources, enhanced cost savings and avoidance, and increased cross-Agency and inter-Government collaboration. ***Figure 7.2.1-2*** highlights FEA objectives and explains in more detail how the MWLANS solution effectively supports these objectives.

Figure 7.2.1-2. FEA Objectives

FEA Objective	How this Service Supports the Objective
Improve the utilization of Government information resources to focus on core Agency missions and service delivery	Qwest's MWLANS solution makes access more convenient for Agency employees, thereby improving the use of Government information resources to focus on core Agency missions and service delivery.
Enhance cost savings and cost avoidance	Qwest's MWLANS solution enhances cost savings and cost avoidance by making Agency end-users more productive and by using existing networks more effectively through robust roaming agreements.
Increase cross-Agency and inter-Government collaboration	Qwest's MWLANS solution increases cross-Agency and inter-Government collaboration by making access more convenient, regardless of location of Agency employees.

7.2.1.3 Solutions to Multimode Wireless Service Problems (L.34.1.7.1(c))

Without an experienced WiFi solution provider, the Agency might expect to encounter problems such as those listed in ***Figure 7.2.1-3***.

Figure 7.2.1-3. Qwest Solutions to Common MWLANS Problems

Problem Area	Qwest Solution
Inadequate Radio Frequency (RF) Coverage	
Availability and Capacity	
Security	
Network Management	
Network Maintenance	
User Requires Help Desk Support	

Problem Area	Qwest Solution
Real-Time Application Support	███
Mobility	███

7.2.1.4 Multimode Wireless Services Architecture Design and Benefits (L.34.1.7.1(d))

As shown in ██████████ our wireless mesh solution is created with the latest modular internetworking AP platforms that are designed for outdoor deployment to provide coverage over large areas and into buildings. These broadband platforms are designed with a high-performance network processing core, multiple WiFi access and backhaul radios, and an open, embedded software environment.
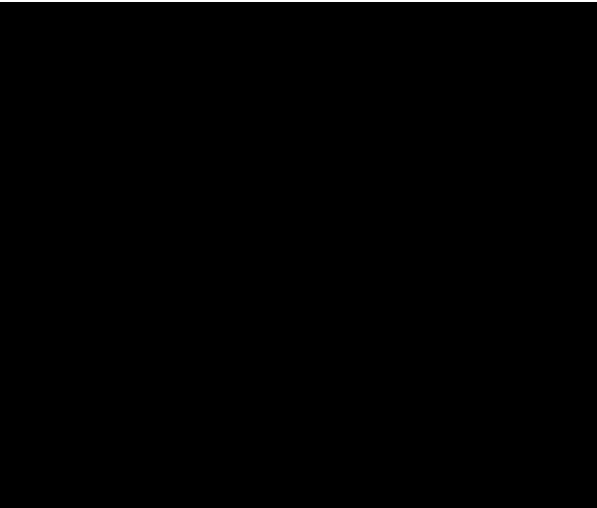
The multiple backhaul radios in each platform are configured point-to-point with directional antennas. Individual platforms can connect to multiple platforms; the combined connections form a wireless mesh. Advanced radio and antenna techniques enable multiple radios to operate in a single package without degradation of performance. Integrated access radios allow for full WiFi point-to-multipoint access at every point.

No additional switches, routers, or cables are required to connect multiple platforms. The backhaul radio modules form a fully meshed wireless backbone that provides carrier grade network level redundancy to ensure service availability without operator intervention. The backhaul radios that

form the mesh operate in a different frequency band from the WiFi access radios. This allows both the wireless access and backhaul networks to operate independently and at full speed, with a low latency and jitter, thereby enabling high performance for real-time services such as VoIP and video. Furthermore, the maximum number of hops is limited to minimize latency and maintain quality.

The multiple point-to-point links also make interconnecting the AP platforms simple and cost-effective. Capacity, scalability, and reliability are also enhanced because the mesh architecture supports multiple, full duplex exit points to the wired network. Wireless routing with load balancing and alternate paths are used to enhance system availability and provide a self-healing network. For the few locations that may be unreachable by outdoor AP platforms, an indoor platform will be used.

The Qwest solution has integrated a "best-in-class" carrier grade network management platform, ██████████████████████ providing feature-rich, user-friendly network management capability. These attributes will ensure that Qwest's WiFi solution best achieves the Agency's objectives for both the public subscription service and the private hotspot network.
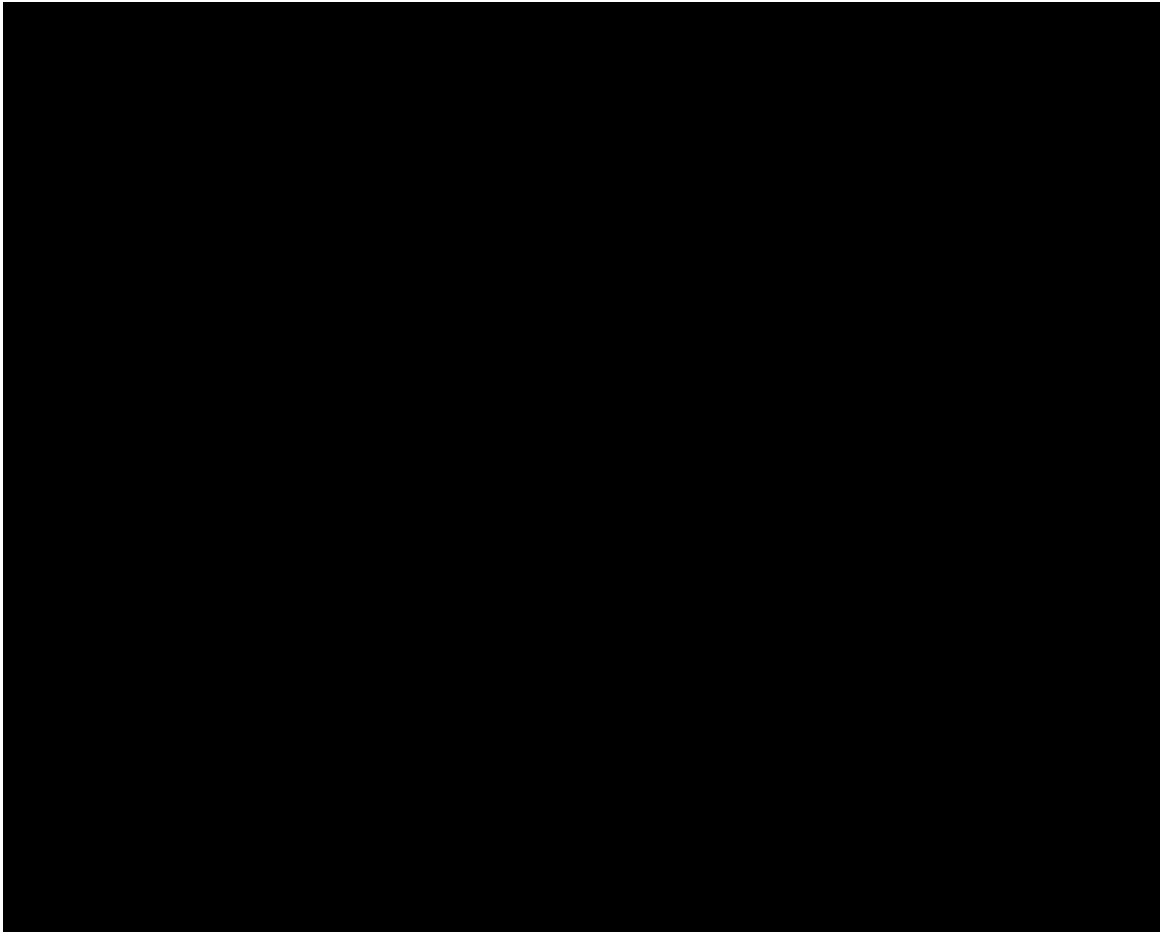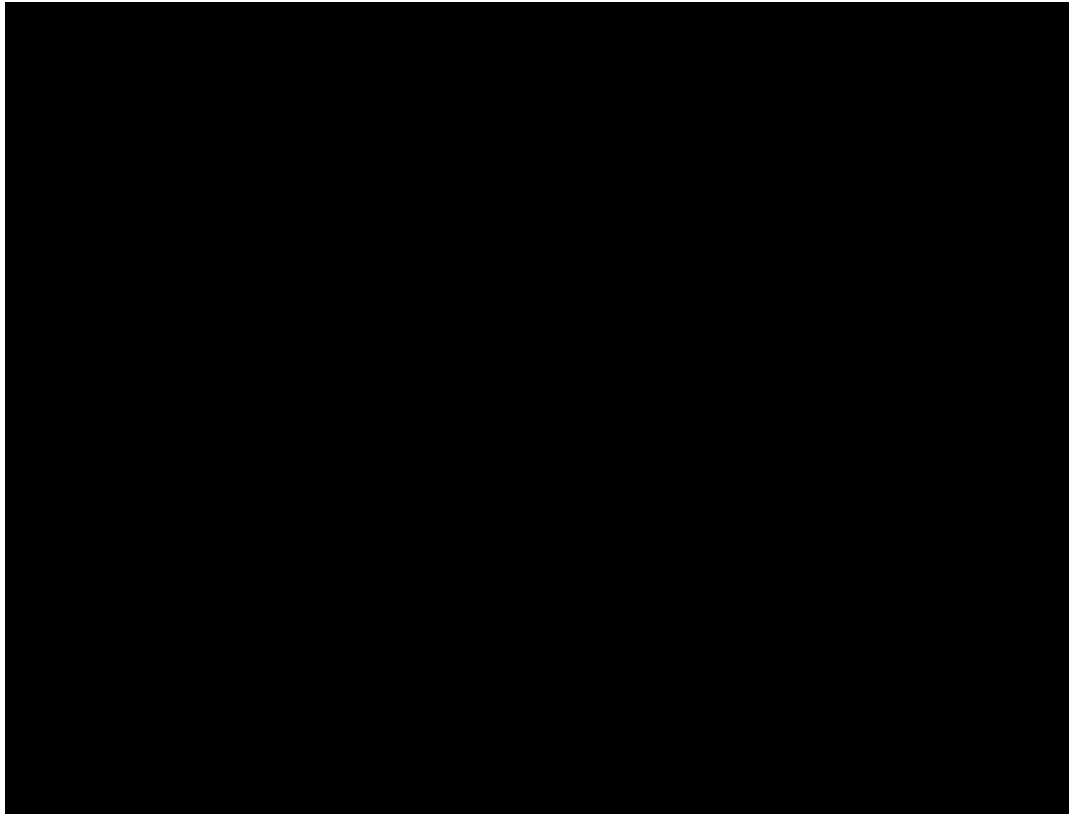
Qwest's integrated security applications are discussed in detail in Section 5.2.1.5

7.2.1.5 Multimode Wireless Services Architecture Attributes (L.34.1.7.1(e))

██

████████████████████

7.2.2 Satisfaction of Multimode Wireless Performance Requirements (L.34.1.7.2)

Qwest's MWLANS solution ████████████████ Government requirements. This performance is verifiable with proven monitoring and measurement systems, procedures, and evaluation methods.

7.2.2.1 Multimode Wireless Services Quality of Service (L.34.1.7.2 (a))

Figure 7.2.2-1 illustrates our compliance to KPIs.

Figure 7.2.2-1. Key Performance Indicator Compliance

Key Performance Indicator (KPI)	Service Level	Performance Standard	Acceptable Quality Level (AQL)	███████
Time to Restore	Without Dispatch	4 Hours	≤ 4 Hours	███
Time to Restore	With Dispatch	8 Hours	≤ 8 Hours	███

Qwest monitors and measures the KPIs and AQLs using automated processes that pull data from its primary source, summarize it, and present user-friendly Web reports. The Web displays actual performance results. Results that meet performance goals are presented in green; results that do not meet performance goals are presented in red. Qwest completely automates the process, from data collection to Web display, so that both Qwest and our customers stay focused on improving performance results rather than "report generation." Process automation also establishes business rules and ensures that customers receive completely accurate performance data.

For Network KPIs, we use the Statistical Analysis System software package to display the Network Reliability Scorecard, with the KPIs, the objectives, and an indication of whether the objectives are met or missed for

each reporting period. The scorecard is our tool to show both upper management and network management the current health of the network. The scorecard is reviewed daily at the executive level to ensure the proper attention and focus as well as by our network management teams to ensure that SQL levels are met consistently.

Qwest uses a single, industry-leading, commercial-off-the-shelf trouble ticketing system customized for Qwest's services. From this system, we collect many useful metrics that we use internally to evaluate and improve our processes, including Time to Resolve (TTR). We use the same business rules as the Government requires for its services to calculate our TTR.

Data contained on this page is subject to the restrictions on the title page of this proposal.

███████████████████████████████████

███████████████████████████████████

███████████████████████████████████

███████████████████████████████████

███████████████████████████████████

███████████████████████████████████

███████████████████████████████████

███████████████████████████████████

████████████████████████████

7.2.2.2 Approach for Monitoring and Measuring Multimode Wireless Services (L.34.1.7.2(b))

Qwest monitors and measures the KPIs and AQLs via automated processes that pull data from the root source, summarize it, and display it via Web tools. These Web tools display actual results and indicate via red/green color marking whether goals are met or not. Our approach is to completely automate the process (from data collection to displaying results) so that the focus is placed on taking action rather than on "report generation." Further, with the process automated, we ensure that business rules are established and there is no chance of manipulating the data.

Qwest provides a full suite of carrier-grade monitoring and measuring tools that will be extended to Agencies directly through our Qwest Control Networx Portal and/or summarized in regular reports. KPIs are gathered by multiple systems that will monitor every user from the user's device through the network to the destination server and provide data needed to improve capacity utilization and meet service quality requirements. The KPIs can be from network, application, business, or mission management systems. Thresholds can be applied to the KPIs. Threshold violations will be monitored by the NOC.

To test its network, Qwest has an ongoing process of collecting drive test data. During these drive tests, signal strength, coverage, and overall customer data quality are evaluated for each network area under study. Qwest uses a weighting scheme to normalize the data and then evaluates each of its markets not only from a network performance perspective but also in comparison to the other operating carriers.

Qwest has RF technicians who are responsible for day-to-day optimization. If, during the normal optimization activity, second-tier assistance is needed to resolve a network issue, the required coordination is performed to provide additional assistance and evaluation. RF technicians are available to resolve Agency coverage issues.

7.2.2.3 Verification of Multimode Wireless Services (L.34.1.7.2(c))

The network monitoring system has several test/verification datasets ████████████████████████████ event monitoring, and probing agent, that take active measurements of KPIs. The statistics gathered by these datasets are stored in the network performance tool to verify AQLs. Quality of services being delivered and heat charts, viewed via the Qwest Control Networx Portal, provide "at-a-glance indicators" of network performance problems with window drill-downs to obtain additional performance details. Qwest Control Networx Portal reports show KPIs to verify compliance. More importantly, service quality alarms will indicate when network performance falls below quality of service thresholds.

Capacity planning is another important component to ensure that KPIs are in compliance. The proposed network monitoring system stores historical usage (duration settable by user) and generates trend graphics to show predicted utilization for a single resource. With proper capacity planning based on past performance and usage projection, Qwest will proactively ensure that KPIs will be met.

7.2.2.4 Multimode Wireless Services Performance Improvements (L.34.1.7.2(d))

Qwest proposes to meet all required KPIs and AQLs for MWLANS. In the event that an Agency has a specific business need or application problem, Qwest is willing to discuss service enhancements. Qwest will operate in good faith to engineer an MWLANS solution to serve unique Agency needs. Qwest is able to leverage our vast MWLANS product portfolio, which includes a variety of SED providers and specific MWLANS solutions. Through a special combination of vendor solutions and talented engineering capabilities, Qwest will be able to serve an Agency's business needs.

7.2.2.5 Additional Multimode Wireless Services Performance Metrics (L.34.1.7.2(e))

7.2.3 Satisfaction of Multimode Wireless Service Specifications (L.34.1.7.3, C.2.14.3)

Qwest's solution utilizes a state-of-the-art dual radio mesh wireless network, along with roaming agreements with existing public hotspot networks. It also provides for the deployment of private network hotspots to provide coverage for designated Federal Agency buildings and campuses, as described in Section 7.2.1.1. Both networks will be managed by our hotspot OSS platform, which provides unique features to enhance the end-user experience and administers roaming agreements among other WISPs.

[REDACTED]

7.2.3.1 Satisfaction of Multimode Wireless Service Requirements (L.34.1.7.3(a))

7.2.3.1.1 Satisfaction of MWLANS Capability Requirements (L.34.1.7.3(a); C.2.14.3)

Qwest fully complies with all mandatory stipulated and narrative capabilities, features, and interface requirements for MWLANS. The following *Figure 7.2.3-1* and *Figure 7.2.3-2* summarize Qwest's response to the MWLANS capabilities listed in RFP C.2.14.3.1.4 and interfaces of RFP C.2.14.3.3.1. These subsections are intended to provide the technical description required per L.34.1.7.3(a) and do not limit or caveat Qwest's compliance in any way.

Figure 7.2.3-1. Description of Technical Capabilities

ID	Technical Capability	Technical Capability Description	
1	Wireless Access in Packet Mode	Wireless access in packet mode to mobile terminals shall be supported. Mobile terminals shall include but not be limited to wireless-enabled Notebooks, Laptops, and PDAs. Access coverage shall include wireless LAN hotspots such as hotels, airports, convention/conference centers, or other public establishments.	
2	Authenticated	Access shall only be provided after authentication	

Data contained on this page is subject to the restrictions on the title page of this proposal.

ID	Technical Capability	Technical Capability Description		
	Access	by user-ID and password by the contractor. The user shall be able to change password as often as deemed necessary.		
3	Dynamic and Static IP Addressing	The contractor shall support dynamic IP address as well as single or multiple static IP address.		
4	Domain Name Service	The contractor shall provide a public DNS for users to access the Internet.		
5	Roaming Agreements	The contractor shall have established roaming agreements with public hotspot providers and aggregators so that users can roam globally.		
6	Private MWLANS Network	The contractor shall provide private hotspots (i.e., dedicated network infrastructure) at Government locations as required by an Agency.		
7	Wireless NICs	The contractor shall provide commercially available Wireless NICs for mobile terminals as required by an Agency.		
8	(Optional) Support for 802.11e	(Optional) Support for IEEE 802.11e for Agency applications such as, but not limited to, transport of voice, audio, and video over 802.11 wireless networks, video conferencing, media stream distribution, enhanced security applications, and mobile and nomadic access applications.		

7.2.3.1.2 Satisfaction of MWLANS Interface Requirements (L.34.1.7.3(a); C.2.14.3.3.1)

Qwest's network solution supports the interfaces listed in Figure 7.2.3-2.

Figure 7.2.3-2. Qwest Solution Interface

UNI Type	Interface Type and Standard	Payload Data Rate or Bandwidth		
1	2.4 GHz (Physical interface is Type II PCMCIA card of handheld computers and card/chip in PDA)	Up to 11Mbps for IEEE 802.11b		
2	2.4GHz (Physical interface is Type II PCMCIA card of handheld computers and card/chip in PDA)	Up to 54Mbps for IEEE 802.11g		
3	5GHz (Physical interface is Type II PCMCIA card of handheld computers and card/chip in PDA)	Up to 54Mbps for IEEE 802.11a		

RFP: TQC-JTB-05-0001 December 13, 2006

7.2.3.2 Proposed Enhancements for Multimode Wireless Services (L.34.1.7.3(b))

██

██

██

██

██

██

███████████████████████████████████

7.2.3.3 Experience with Multimode Wireless Service Delivery (L.34.1.7.3(c))

██

███████████████████████████████ The Qwest Team has built, operated, and managed wireless networks that support both voice and data. In addition, the Qwest Team has performed bi-annual wireless network benchmark drives to ensure that network quality and coverage is competitive. Qwest has integrated WiFi into our commercially available product offerings. Wireless networking provides a wireless link from a laptop or desktop computer to a single Qwest Digital Subscriber Line (DSL) Internet connection using WiFi 802.11b/g. During product development, Qwest also tests many WiFi SEDs. Testing focuses on throughput, latency, link bandwidth to distance measurements, and percent bit rate lost. WiFi testing is a continuous, ongoing effort to keep equipment from our suppliers up to state-of-the-art, best-in-class performance standards and metrics.

## 7.2.4 Robust Delivery of Multimode Wireless Services (L.34.1.7.4, C.2.14.3)

7.2.4.1 Multimode Wireless Service Measures and Engineering Practices (L.34.1.7.4(a))

Qwest's selected WiFi solutions for this application have inherent built-in resiliency due to the usage of multiple technologies that serve as dual coverage options. Virtual wireless mesh-based traffic paths avoid any single point of failure in the backbone network. Refer to Section 7.2.4.3 for more details on methodologies for building robust and resilient wireless networks.

7.2.4.2 Multimode Wireless Services Methodologies for RF Optimization (L.34.1.7.4(b))

▮▮▮▮▮▮▮▮ illustrates RF Engineering Services methodology. Ongoing network monitoring using the network performance and monitoring software will ensure that cell site performance meets design criteria.
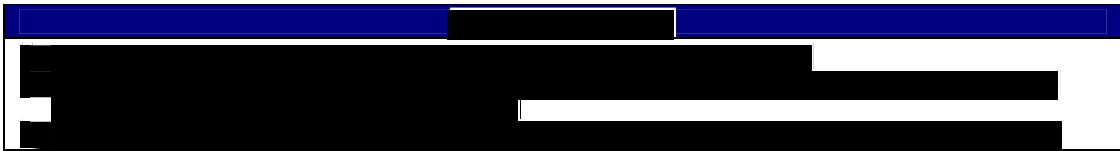
7.2.4.3 Multimode Wireless Service Measure and Engineering Practices (L.34.1.7.4(c))

Qwest's Disaster Recovery Plan is based on the four phases of disaster preparedness as defined by the Federal Emergency Management Agency. They are mitigation, preparedness, response, and recovery.

Mitigation refers to the activities that actually eliminate or reduce the chance of a disaster's occurrence or its effects. Since WiFi antennas are smaller in size (compared to cellular antenna) and are mounted securely and lower in height, they are less susceptible to impacts of natural disasters on the antenna and, by extension, the network. In addition, the proposed wireless mesh solution uses APs that allow up to three backhaul radio modules and therefore effectively route around congestion and failures. An additional OSS platform can be provided for geographic diversity.

Preparedness is planning how to respond—and increase resources available to effectively respond—to all situations. Preparedness is designed not only to maintain network connectivity, but also to minimize dangers to employees. This phase also includes the training of personnel and the testing of recovery plans to enhance response capabilities and to familiarize personnel with plan objectives. Network deployment is documented and resources planned so recovery can begin as soon as possible after the area is clear from danger to personnel.

Response is the activity occurring during and immediately following an emergency. During this phase, Corporate Response Teams may be dispatched to the affected area to assist in the coordination of recovery

efforts. Skilled installation and maintenance teams are diverted to respond to any disaster to restore service as quickly as possible.

Recovery is the final phase of the disaster preparedness planning process. Recovery continues until all systems return to normal or near normal. However, the recovery phase from a disaster may go on for months until operations are at the same pre-disaster level. Our response teams work to ensure that full recovery is made in a timely manner.

7.2.4.4 Multimode Wireless Service Fraud Prevention and Privacy (L.34.1.7.4(d))

Wireless technology is transforming roles and responsibilities across all branches of the Government and critical supporting industries. From laptops to PDAs to mission-specific information tools, wireless devices are pervasive in today's environment. While convenient, wireless comes with risks; therefore, measures must be taken to protect the data being transported on these new systems. Agency users must be able to logon to either the public or the private network and know that their data and the Agency's resources are protected.

The most basic form of security inherent in our solution is the user login procedure. All Agency users must login with a secure password to gain access to the network. The next layer in security is to add a VPN and encryption level of security for protection of end-user privacy for voice, video, and data traffic. For this, we deploy an Internet Protocol Security (IPsec) client on the end-user devices and build a VPN tunnel back to a network firewall.

Our IP Data Roaming solution combines services and software to extend the protection of the secure corporate LAN to a private WLAN as well as to the Internet. Whether moving from a LAN connection at an Agency desk to WiFi in the conference room, outside the office to DSL, Cable, public WiFi,

2.5/3G, or dial-up networks, the mobile data device experiences a single seamless and secure transparent network connection. If an IPsec VPN can't be established, all network access to the mobile data device is blocked thereby supporting the Agency's efforts to maintain security on their enterprise data assets.

Our secure VPN solution offers a complete set of security internetworking software including:

███████████████████████████████████████

███████████████████████████████████████

███████████████████████████████████████

███████████████████████████████████████

████████████████

███████████████████████████████████████

███████████████████████████████████████

████████████████

███████████████████████████████████████

7.2.4.5 Multimode Wireless Services Policy and Options on Commercial Advertising (L.34.1.7.4(e))

Qwest does not introduce any advertising content as part of the MWLANS media stream. Qwest has a full privacy policy where no customer data is shared to any outside parties.

7.2.4.6 Multimode Wireless Services Security and Reliability (L.34.1.7.4(f))

Qwest provides a best practice, layered approach for security. In Section 7.2.4.4, Qwest demonstrates a solid foundation for security with sign-on and VPNs to protect transport of data and protect against fraud. As higher levels of security are required, Qwest offers a comprehensive security assessment. This assessment would provide additional recommendations for security solutions at each location.

Qwest's MWLANS architecture supports state-of-the-art security standards in full compliance with the NIST under the FIPS 140.

Qwest's wireless mesh technology network solution provides best-in-class wireless network reliability. Please refer to Section 7.2.1.5 for a detailed discussion of our network reliability.

7.2.4.7 Multimode Wireless Services Number Portability (L.34.1.7.4(g))

Local number portability is a component of Public Switched Telephone Network service and is not applicable to MWLANS.

7.2.4.8 Infrastructure Security Enhancements for Multimode Wireless Services (L.34.1.7.4(g))

██

██

████████████████████ Qwest's Technology Team continues to participate in various wireless industry standard meetings and conferences to stay in tune with industry trends and updates on the latest equipment availability. Qwest continues to test new technology by bringing in vendor equipment into various labs, conducting technology testing, and evaluating test results. Through testing, Qwest will uncover potential problems and develop solutions. Qwest will work closely with the equipment vendor(s) to resolve issues prior to commercial deployment. The Qwest Team will continue to provide security services solutions to all customers. As such, we will continually update our security portfolio of solutions and services.

Network-specific security solution options will be recommended based upon specific Agency requirements as part of a security assessment that will be performed during each network design. Please refer to Section 7.2.1.5 for more information on the security applications integrated into our solution.

7.2.4.9 Approach to Multimode Wireless Services Network Convergence (L.34.1.7.4(i))

Our proposed MWLANS solution is an IP access and transport solution and, as such, supports a natural evolution to next-generation network services. Present and future network commercial services will evolve with the access devices. The access device evolution will only occur as new applications are developed. ████████████████████████████████

███

███

██

██

██

██

██

████████████████████████████████████ It enables new converged voice and data services, while allowing for the interoperability of these converged services between subscribers.

7.2.4.10 Approach for 2.5G –3G Migration (L.34.1.7.4(j))

This requirement is applicable to Personal Communications System (PCS) and is not applicable to MWLANS.