1.7.5 Land Mobile Radio Service (LMRS) [C.2.14.6]

Land mobile radio service (LMRS) provides critical mobile communications to first responders performing vital public safety missions. Critical Government personnel receive the necessary mobile communications to fulfill their missions. AT&T, Northrop Grumman Information Technology, Inc. (NGIT), and Information Systems Support, Inc. (ISS), have teamed for Networx to bring experience and a commitment to quality to LMRS networks through all phases of design, implementation, and operation.

1.7.5.a Reserved [L.34.1.7.5.a]

1.7.5.b Reserved [L.34.1.7.5.b]

1.7.5.b.1 Reserved [C.2.14.6.1.4.1(1)]

1.7.5.b.2 Reserved [C.2.14.6.1.4.1(3)]

Pages 1314 through 1316 have been deleted in conformance with Amendment 5 revisions.

1.7.5.c Service Description [L.34.1.7.5.c]

(c) A technical description of how the service requirements (e.g., capabilities, features, interfaces) are satisfied.

LMRS systems use radio frequencies (RF) to reliably connect Government personnel to each other and other networks while simultaneously providing the required mobility for public safety missions. The basic architecture of an LMRS system is depicted below in **Figure 1.7.5.c-1**. AT&T's LMRS supplies Agencies with solutions that meet the requested basic functional definition and capabilities of LMRS (**Table 1.7.5.c-1)**.

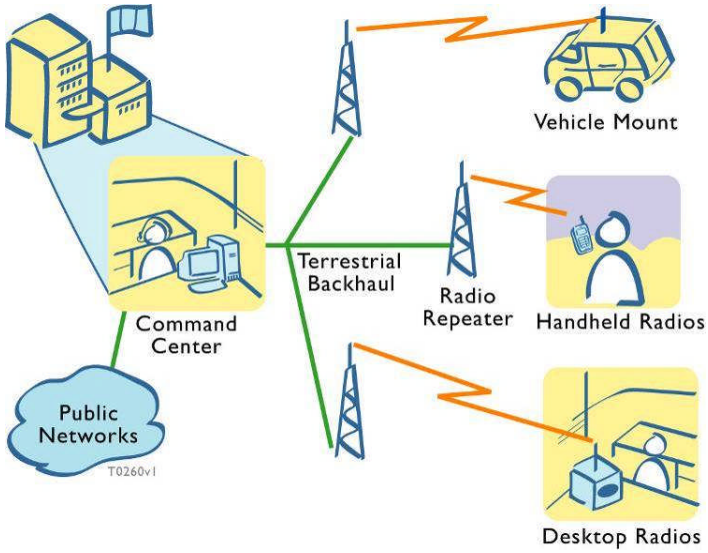

Figure 1.7.5.c-1: LMRS Basic Network Components. *LMRS systems typically consist of a command center console, trunking to the radio repeaters, tower-mounted repeaters, and a range of field radio devices.*

REQUESTED LMRS SYSTEM CHARACTERISTICS	AT&T PROPOSED LMRS SOLUTION
Connects LMRS users to each other (service delivery point [SDP] to SDP) with commercially available, two-way, half-duplex radio equipment on RF	Any command center or field radio (SDPs) can contact another if authorized (**Figure 1.7.5.c-1**)
SDPs include portable radios, vehicle-mounted mobile radios, and stationary dispatch consoles	LMRS offers command center consoles, as well as handheld (portable); mobile (vehicular); and desktop (stationary) field radios
Connects LMRS users to appropriate public and private network resources (SDP to POP), (e.g, public switched telephone [PSTN]), public Internet protocol [IP] and private IP or virtual private networks [VPNs])	AT&T's LMRS systems connect to public and/or private voice/data networks, based on Agency requirements

Table 1.7.5.c-1: Provided Basic LMRS Characteristics. *Agencies' general requirements for LMRS are met by the AT&T Team's offering.*

1.7.5.c.1 Standards Requirements

AT&T will provide Agencies with system that meet the requested standards, and will propose additional advanced standards as they become available (**Table 1.7.5.c-2**).

REQUIRED STANDARD	DESCRIPTION	BENEFITS
American National Standards Institute/ Telecommunications Industries Association/ Electronic Industries Alliance (ANSI/TIA/EIA) 102 Series APCO Project 25 (P25) Common Air Interfaces • Digital Conventional • Digital Trunked	AT&T can provide P25 compatible systems that provide a broad choice of mobile equipment and do not tie the Agency to a proprietary technology, while simultaneously providing a variety of requested trunking schemes.	• Agencies receive a standards-based LMRS that may lower system cost by incorporating existing Government furnished equipment. • Provides for simplified system expansion with standards-based equipment.
National Telecommunications and Information Administration (NTIA) Manual of Regulations and Procedures for Federal Radio Frequency Management.	LMRS systems will adhere to mandated frequency assignments and channelization plans for land mobile radio.	Minimizes potential overlap of radio frequency with commercial wireless providers that could interfere with LMRS system operation.
NTIA Narrowband (12.5 kHz) Operation Directive for Systems Below 512 MHz.	AT&T Team will design and provide Agencies LMRS systems that use RF spectrum efficiently per Government mandates at all applicable frequency ranges.	Efficient use of frequency space to maximize the volume of LMRS subscribers.
TIA TSB88-A and TIA TSB88-A-1 Wireless Performance in Noise and Interference Limited Situations.	Our equipment and design methods respect and comply with Government mandates regarding the field operation and reliability of communications they provide.	Increases the performance and service quality of the LMRS by reducing potential sources of interference.
Standard Addressing and Numbering Plans, including: North American Numbering Plan (NANP), ITU-ISS E.164 (World Numbering Plan), Transmission Control Protocol/Internet Protocol (TCP/IP) version 4/6.	Proposed LMRS is compatible with public addressing and numbering schemes as requested, allowing users to connect to destinations outside provided system.	Allows LMRS system to interact with the PSTN for Voice Services and the Global Internet for Data Services.

Table 1.7.5.c-2: Standards and Compliance. *The proposed LMRS offering is designed to meet all relevant specifications and guidelines pertaining to land mobile radio.*

1.7.5.c.2 Technical Capabilities – Design Engineering Services

AT&T and its partners provide Agencies with a full suite of services that define and design LMRS systems (**Table 1.7.5.c-3**).

DESIGN ENGINEERING PHASE	DESCRIPTION	BENEFITS/DELIVERABLES
Requirements Definition	AT&T LMRS team collects data from various sources, including interviews with key personnel, users, and decision-makers; observations of conditions under which proposed system will be used, and critical evaluation of strength and deficiencies of existing communications systems.	• Concept of Operations (CONOPS) document that presents system boundaries and proposed functionalities • Preliminary report or presentation on proposed system • Technical Requirements Document (TRD) and customer review (can include interface descriptions to other public or Agency networks)
Site Surveys	All fixed locations are surveyed for physical security, connectivity requirements, utility service, accessibility, regulatory requirements, installation concerns, Federal Aviation Administration (FAA) compliance, and continuity of operations (COOP) during emergencies. Survey processes are driven by proven checklists, and results are documented.	• Survey checklist completed; Site photographs and measurements are collected for system design process • Site drawings for system design • Site Survey Report which provides assessment of GFE that may be used in the system implementation • Site Survey Management Presentation that summarizes key benefits/issues associated with selected LMRS site.
Network Design Engineering	AT&T's experienced LMRS team will perform engineering tasks to design system for all agreed network functionalities.	• RF planning which identifies the available RF for the LMRS system • Capacity planning and traffic modeling provides assessment of network capacity requirements and equipment needs • Technical control and oversight of manufacturer and vendor engineering functions and solutions • Configuration management optimizes the network implementation • Document management provides coordination of LMRS specifications • Program and design reviews provide venue for Agency input and reporting system status • Technical Interchange Meetings (TIMs) with Agency personnel provides ongoing status
Regulatory and Spectrum Assistance	AT&T estimates spectrum needs, based on system design and starts regulatory process. Advise Agency personnel on effects of interference, offer technical alternatives where appropriate, present limited system design variations, if necessary, and address radio-related issues, such as allowable effective radiated power regulations.	• Assist Agency personnel in filing required license applications for acquiring spectrum/authorizations from NTIA or FCC • Respond to issues and exceptions from regulatory bodies relating to design of system • Limited adjustments to LMRS design based on regulatory issues

Table 1.7.5.c-3: Design Engineering Services. *Agencies needs for LMRS engineering services are met by AT&T and its partners. Each design phase provides tangible deliverables.*

1.7.5.c.3 Technical Capabilities – Implementation Services

AT&T and its partners provide Agencies with a full suite of services that lead to the deployment of reliable LMRS systems (**Table 1.7.5.c-4**).

DEPLOYMENT PHASE	DESCRIPTION	BENEFITS/DELIVERABLES
Service Enabling Device (SED) Management	SEDs are acquired, shipped, and stored to Agency specified location	• SED management is provided to Agencies. SEDs do not have to be acquired, stored or maintained by Agencies.
Site Preparation and Installation Preparation	AT&T LMRS team readies site, network equipment, and resources for installation of network	• Site modifications identified in site surveys are implemented. Applicable Government Furnished Equipment (GFE) is prepared for integration into the LMRS network • System equipment is ordered, sorted, packed, and shipped to appropriate facility installation points (e.g., repeater sites, command centers) where equipment is staged and prepared for final placement • Integration Test Bed (ITB) is conducted at team member facility or vendor facility to verify system operations and performance during installation
Installation	System is assembled, constructed, and powered	• Progress reports provide Agency with ongoing status of system installation • System is constructed without requiring the assignment of additional Agency personnel • System Acceptance Test plan is prepared for Agency review. • Initial turn-up of LMRS system is completed to initiate acceptance testing
Test Program	Testing verifies that system as a whole meets agreed operational specifications and functions appropriately to satisfy needs of users	• Factory Acceptance Tests (FATs) certifies that equipment matches design specifications • Full battery of subsystems tests verifies the LMRS subcomponents operate properly and facilitates a smoother System Integration Test • System Integration Tests (SITs), including interoperation with other networks, verifies that all subcomponents, including GFE, operate as a single system. • System acceptance testing, including verification of dispatch-to-mobile connectivity, provides Agency with rigorous evaluation prior to accepting system
Services Available	LMRS satisfies Agency requirements	System matches Agency's service requirements: • Push-to-talk half-duplex communications • Conferencing/talk groups by subscription • Broadcast to multiple SDPs simultaneously • Fixed frequency operation • Trunking for channel sharing • P25 compatibility/interoperability per EIA/TIA 102 standards • Data transmission – text, graphics, and video, as applicable to system and radio design
Types of Service	AT&T will provide Agencies with systems designed, based on specified RF architecture	Provides a system architecture that matches an Agency's needs: • Analog legacy systems provide Agencies with a system that operates in existing RF spectrum and with existing GFE. • Digital, non-P25 systems provides Agencies with higher capacity LMRS system architectures • P25 systems provides standards-based digital system

Table 1.7.5.c-4: Implementation Services. *AT&T's LMRS team will deploy LMRS systems meeting the agreed design criteria.*

1.7.5.c.4 Technical Capabilities – Management

AT&T will manage and operate LMRS systems as required by Agencies (**Table 1.7.5.c-5**).

MANAGEMENT SERVICE	DESCRIPTION	BENEFITS/DELIVERABLES
Training	AT&T team develops training programs internally as well as using our manufacturer/vendor training resources to prepare Agency personnel to operate, maintain, and train others on system	LMRS instructors and resources cover all aspects of hardware and software maintenance and operation with unique class materials, reference guides, and detailed operation and maintenance manuals. Some training modules include, but are not limited to the following: • Field user training for variety of equipment types • Console operator training • System administrator training • Routine operational management training • Advanced system training.
Operations Support	AT&T system management approach provides that all capabilities inherent in LMRS remain available to end users	AT&T LMRS Team can provide systems and/or personnel that keep LMRS operating at its most efficient level. Personnel can operate or monitor system remotely or onsite, as agreed for: • Fault management • Configuration management • Accounting management • Performance management • Security management
Management	LMRS management can include specific tasks related to routine operations and system upkeep.	AT&T LMRS Team can provide systems and/or personnel to manage the Agency's LMRS system: • Maintaining/updating user base (adding and deleting users) • Assigning passwords • Building user profiles • Maintaining talk groups • Adjusting frequency assignments • Over-the-air Rekeying (OTAR), as required by Agency policies • Scaling system (within its design parameters) as needed to accommodate growth in demand • Testing of backup and disaster recovery capabilities to ensure readiness • Reporting on usage and performance statistics
Maintenance	Provides Agencies' LMRS required service to keep it within its original design parameters	AT&T LMRS Team can maintain the system as required to keep it operational: • Onsite deployment of service assets • Dispatched maintenance service.

Table 1.7.5.c-5: LMRS Management Services. *AT&T LMRS team will operate, manage, and repair Agencies' LMRS systems as agreed.*

Agencies receive a custom-designed network implementation and operations solution when they select the AT&T Team as their LMRS contractor. Agencies can obtain LMR services that range from defining initial LMRS network requirements to the delivery, installation, maintenance, and operation of LMR systems. Our LMRS team has a demonstrated successful history of delivering projects that encompass each phase the system lifecycle including:

- System Requirements Definitions – matches Agency's requests and needs assessments

- Site Surveys and Regulatory Support – document environmental impacts as well as other regulatory requirements
- System Architecture and Design – engineer to meet system capacities and capabilities
- Site Development and Preparation Services - installation plan for each physical location within the proposed network
- System Installation
- Verification and Acceptance Testing - verify that the system's capabilities match the design specifications
- Training - live instruction and development of training collateral
- Operations Support - qualified personnel and automated monitoring tools keep LMRS system optimized
- Maintenance - repair services by trained technicians and engineers

1.7.5.c.5 Subscriber Terminals

LMRS delivers connectivity to a variety of field user devices or SDPs, including portable handheld units, vehicle-mounted mobile units, and desktop stationary terminals shown in **Figure 1.7.5.c-2**.

PORTABLE (HANDHELD)	DESKTOP (STATIONARY)	MOBILE (VEHICLE MOUNTED)
		

Figure 1.7.5.c-2: LMRS Field Radios. *AT&T's LMRS solutions include field equipment that is handheld, mounted in vehicles, or placed on desktops.*

1.7.5.d Service Quality and Performance [L.34.1.7.5.d]

(d) A description of the quality of the services with respect to the performance metrics specified in Section C.2 Technical Requirements for each proposed optional service, and other performance metrics used by the offeror.

Networks that support emergency service applications and first responders require a network infrastructure that offers high availability and reliability. AT&T will comply with and meet or exceed the LMRS quality performance metrics specified in Section C.2.14.6.4.1, as illustrated in **Table 1.7.5.d-1.**

KEY PERFORMANCE INDICATOR	SERVICE LEVEL	PERFORMANCE STANDARD (THRESHOLD)	PROPOSED SERVICE QUALITY LEVEL
Availability	Routine	99.5%	[redacted]
Time to Restore (TTR)	Without Dispatch	4 hr	
	With Dispatch	8 hr	

Table 1.7.5.d-1: Metrics Compliance. *The proposed LMRS solution complies with metrics required by the Agency.*

1.7.5.e Attributes and Values of Service Enhancements [L.34.1.7.5.e]

(e) If the offeror proposes to exceed the specified service requirements (e.g., capabilities, features, interfaces), a description of the attributes and value of the proposed service enhancements.

In addition to the standard services, Agencies can enhance their LMRS with additional features and capabilities for an additional fee. **Table 1.7.5.e-1** highlights additional service features and capabilities available with LMRS. AT&T proposes the attributes in **Table 1.7.5.e-1** as service enhancements.

SERVICE ENHANCEMENT	DESCRIPTION	BENEFIT
[redacted]		

Table 1.7.5.e-1: Service Enhancements. *Using the proposed service enhancements, Agencies can customize and enhance their LMRS service to match their specific requirements.*

The AT&T team proposes advanced interoperability techniques that seamlessly tie LMRS systems together that are based on different

architectures, including systems from multiple vendors, conventional and trunked, operating in different frequency bands. Current examples include:

[redacted]

Agencies can specify other characteristics or performance levels of the LMRS system not discussed in the RFP. For example, the network's grade of service (GoS) can be measured using system-level automated tools that total the number of calls and the number of busy signals, or blocked call attempts. The achieved GoS can be computed based on actual usage statistics and reported to the Agency.

Through these additional service specific requirements, Agencies can customize their LMRS solution to best meet their individual needs.

1.7.5.f Service Delivery Experience [L.34.1.7.5.f]

(f) A description of the offeror's experience (including major subcontractors) with delivering each proposed optional service

AT&T Networx Team offers Agencies extensive experience providing managed services that create value to our customers to both in Government and commercial entities. This experience has given us the ability to engineer and deliver services. Two examples of AT&T Team's experience performing managed services are described in **Table 1.7.5.f-1**.

[redacted]

Client Need	Solution	Created Value
[redacted]	[redacted]	[redacted]

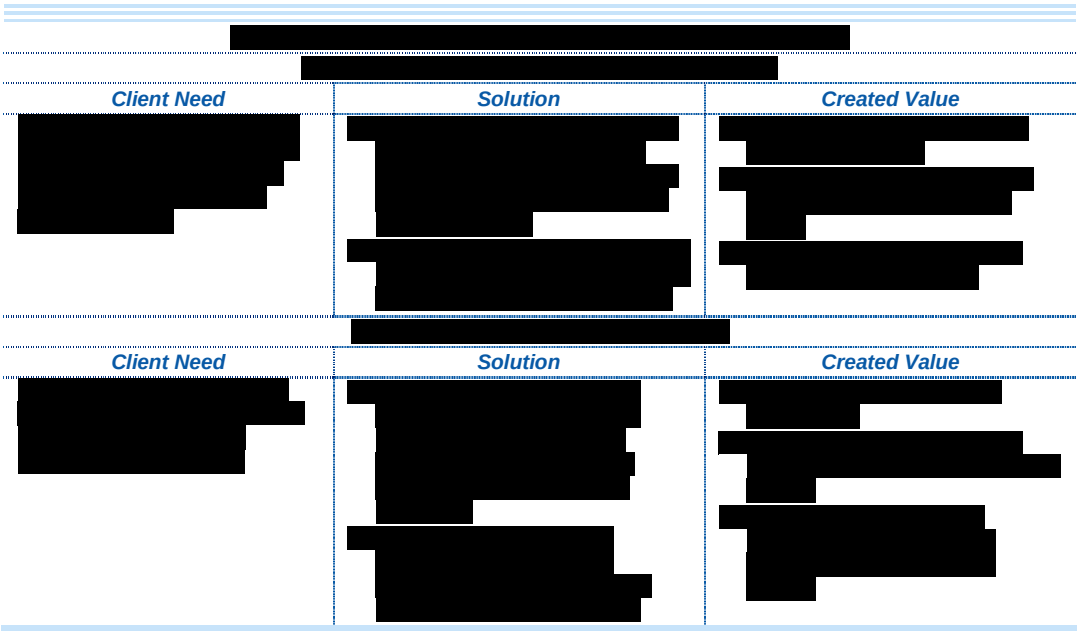

Table 1.7.5.f-1: Land Mobile Radio Experience. *The AT&T team has successfully delivered, or is currently deploying, LMRS systems for a variety of Government customers nationwide.*

AT&T, Northrop Grumman Information Technology, Inc. and ISS all have all delivered quality LMRS projects in the recent past. Our LMRS team has recently provided customized network designs and/or implemented systems.

1.7.5.g Approach to Perform Service Verification [L.34.1.7.5.g]

(g) A description of the offeror's approach to perform verification of individual services delivered under the contract, in particular the testing procedures to verify acceptable performance and Key Performance Indicator (KPI)/Acceptable Quality Level (AQL) compliance.

Prior to service turn-up, the service performance must be verified; key performance indicators (KPIs) will be monitored to certify that the service performance complies with quality requirements. **Table 1.7.5.g-1** summarizes the verification and testing procedures for the LMRS KPIs.

KEY PERFORMANCE INDICATOR	VERIFICATION APPROACH	TESTING PROCEDURES
Availability	[redacted]	[redacted]
Time to Restore (TTR)	[redacted]	

Table 1.7.5.g-1: Service Delivery Verification. *The Key Performance Indicators are closely monitored through a comprehensive verification approach and testing procedure that certifies that the LMRS service performance achieves or exceeds the Acceptable Quality Levels.*

The AT&T Networx Contractor Program Organization (CPO) will exercise direct control and oversight of LMRS system verification activities using approved program management and control processes. These processes will include:

[redacted]

With AT&T's careful engineering and design, implementation, and management of a LMRS system, Agencies will obtain performance that meets or exceeds the specified requirements.

1.7.5.h Optional Services Network Impact [L.34.1.7.5.h]

(h) A description of how the delivery of any optional services would impact the wireless network architecture (e.g., security, quality and reliability, performance).

Each LMRS system is a custom solution. The impact of a new or modified LMRS system on the existing wireless infrastructure will be captured during

the design and engineering phase, documented in the system design documents, and reviewed with the Agency at the system design reviews.

Because the LMRS is a private network solution, the system design will not impact existing public wireless networks such as the cellular/personal communications service (CPCS).

1.7.5.i National Capital Region Assured Service Network Architecture [L.34.1.7.5.i]

(i) A description of how the network architecture will satisfy the requirements in Section C.5.2.7 for assured service in the National Capital Region, if applicable.

AT&T Team approach to and network architecture for providing assured service in the Capital Region are presented in Section 1.3.5.c.

1.7.5.j Section 508 Requirements [L.34.1.7.5.j]

(j) A description of the offeror's approach for providing the capabilities needed to meet Section 508 provisions identified in Section C.6.4 for the proposed optional services.

AT&T Team approach to supporting the Section 508 requirements are described in Section 1.3.5.d.

1.7.5.k Approach to Incorporating Optional Services, Enhancements, or Improvements [L.34.1.7.5.k]

(k) A description of the approach for incorporating into the proposed optional services, technological enhancements and improvements that the offeror believes are likely to become commercially available in the timeframe covered by this acquisition, including a discussion of potential problems and solutions.

AT&T Team will continue to evaluate new LMR technologies in our laboratories and test facilities and through field experience gained in our system deployments. Additionally, we participate in and comment on the formulation of emerging LMRS standards. As new technologies become available from manufacturers, and through our own development efforts, we offer them to Agencies as potential components to an overall LMRS solution that makes our first responders safer and more effective.

AT&T's vision for enhancing LMRS in the future is based on providing yet more connectivity options to field personnel, such as advanced high-speed data services that enable more user applications; implementing the spectrally efficient vision provided in the Project 25 standards that utilize 6.25KHz channelization schemes; and improving the overall interoperability experience for interagency communications. In addition to its growing acceptance domestically, Project 25 is also gaining acceptance overseas, providing opportunities for interoperability and cooperation with other foreign government personnel (**Figure 1.7.5.k-1**).

During the Design and Engineering phase of the LMRS system development, the AT&T Team will perform trade studies specific to the Agency's LMRS requirements to identify the most up-to-date technology optimizing the LMRS system.

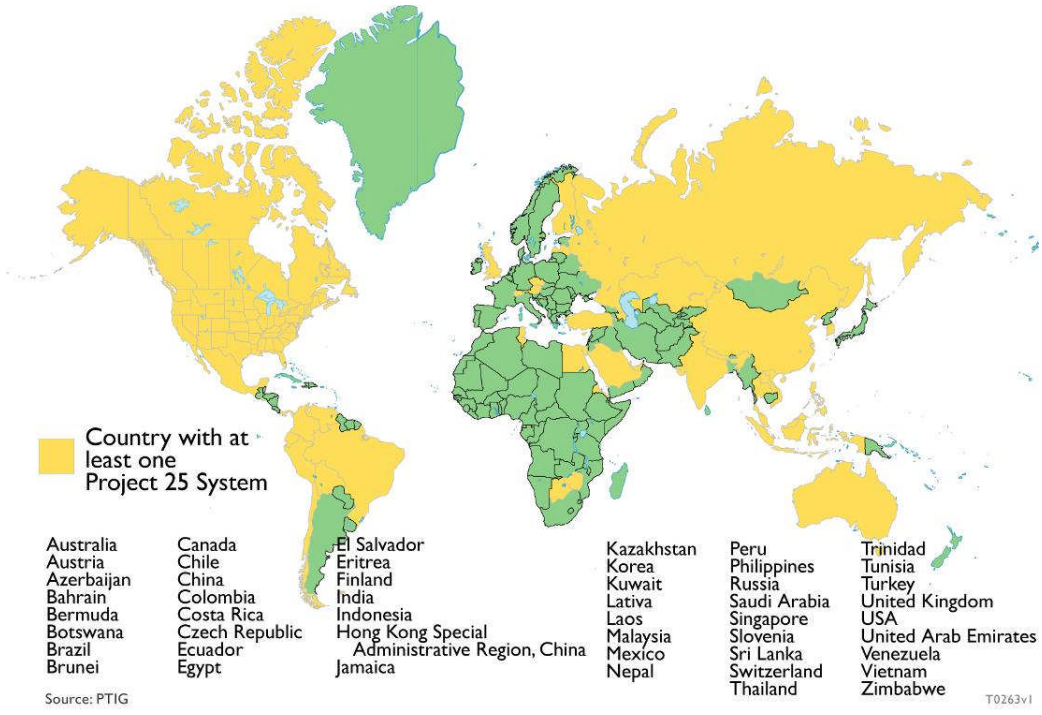

Figure 1.7.5.k-1: Project 25 Systems Worldwide. *P25 Land Mobile Radio Services have gained acceptance with government authorities in many countries across the globe.*

1.7.5.1 Narrative Requirements

1.7.5.1.1 Develop Operational Concept [C.2.14.6.1.4.1(1)]

The following Land Mobile Radio Service capabilities are mandatory unless marked optional:
1. The contractor shall develop the Agency's functional and performance specifications for Land Mobile Radio (LMR) systems and SEDs in response to Agency requirements. This task includes development of the operational concept for LMR within the Agency's overall network architecture. The specifications also may include the identification of necessary interfaces between the Agency's wireline and wireless systems and LMR.

[redacted]

Figure 1.7.5.b-1 shows the work products developed during the planning and requirements engineering phases.

Figure 1.7.5.b-1: Systems Planning and Requirements Engineering Work Products. [redacted]

[redacted]

1.7.5.1.2 Develop Detailed System Design [C.2.14.6.1.4.1(3)]

The following Land Mobile Radio Service capabilities are mandatory unless marked optional:
3. The contractor shall develop a detailed system design. The system design shall address network topology, configuration, addressing (fleet mapping), bandwidth and frequency requirements, RF coverage, availability, reliability, scalability, security, SEDs, and disaster recovery requirements.

[redacted]

[redacted]

[redacted] Systems Design Phase work products are shown in **Figure 1.7.5.b-2,** System Design.

Figure 1.7.5.b-2: Systems Design Phase Work Products. [redacted]

[redacted]

1.7.5.2 Stipulated Requirements

(a) Stipulated responses to the requirements in Table J.9.1.1.2 (b) Technical Stipulated Requirements for Optional Services.

AT&T takes neither deviation nor exception to the stipulated requirements.