4.2.13 Synchronous Optical Network (SONET) Services (L.34.1.4.6, M.6, C.2.5.2-C.2.5.2.1.3)

> **Qwest's Networx SONET Services leverage our next-generation optical infrastructure to deliver a highly reliable, proven capability in support of Federal Agency needs.**

Qwest's Synchronous Optical Network Services (SONETS) provide dedicated duplex transmission connectivity between two or more designated endpoints, over which Agencies' service applications traverse at Agency-specified bandwidths. Qwest's SONETS ride the multi-ring Qwest Four-fiber Bi-directional Line-switched Ring (4F-BLSR) SONET network to provide highly reliable transport from OC-3 through OC-48 with transmuxing and concatenation capabilities as required. ███████████████████████████ ████████████████████

Qwest complies with all of the SONETS performance requirements. Qwest's proven monitoring and measurement systems, procedures, and evaluation methods enable us to exceed the Government's Service Delivery Point (SDP)-to-SDP availability requirements ████████████████████ ████████████████████████

The Qwest network supports all of the capabilities, features, and interfaces required for Networx SONETS. Qwest's SONETS portfolio includes all bandwidths specified by the Government, including T-1, T-3, E-1, and E-3; SONET services █████████████████████████████████ ██ ███████████████████████ .

Qwest supports all of the capabilities, features, and interfaces required for SONET service. Qwest SONETS is a low-risk solution for Agencies, because our network capacity will easily accommodate forecasted SONETS

traffic loads, both now and in the future. Qwest has many years of experience in providing SONETS and currently provides SONETS to ▮▮▮▮▮▮▮▮ ▮▮ ▮▮ ▮▮▮▮▮▮▮▮▮▮▮▮▮

Figure 4.2.13-1 provides an easy reference to correlate the narrative requirements to our proposal response.

Figure 4.2.13-1. Table of SONETS Narrative Requirements

Req_ ID	RFP Section	Proposal Response
31177	C.2.5.2.2.1 (1)	4.2.13.3.2
31210	C.2.5.2.2.1(10)	4.2.13.3.2

4.2.13.1 Reserved (L.34.1.4.6 (a))

4.2.13.2 Reserved (L.34.1.4.6 (b))

4.2.13.3 Satisfaction of Service Requirements (L.34.1.4.6 (c))

The following three sections explain how Qwest will support the capabilities, features, and interface requirements of the Request for Proposal (RFP).

4.2.13.3.1 Satisfaction of SONETS Capabilities Requirements (L.34.1.4.6(c), C.2.5.2.1.4)

Qwest's SONETS provides dedicated duplex transmission connectivity between two or more designated endpoints, over which Agencies' service applications traverse at customer-specified bandwidths. Qwest SONETS rides the Qwest 4F-BLSR network to provide highly reliable transport ▮▮▮ ▮▮ ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮ ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮ ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮ The network is connected to multiple metro networks in every major U.S. city. Qwest has

many options for delivering service in the last mile, through local access alliances, on-net facilities, and custom builds. Qwest has interconnection agreements and physical connectivity with Competitive Local Exchange Carriers (CLECs), Incumbent Local Exchange Carriers (ILECs), and fiber providers to deliver outstanding service everywhere Agencies require service.

Figure 4.2.13-2 provides a brief description of Qwest's technical approach that will enable Qwest to fully meet the Government's feature requirements for SONETS.

**Figure 4.2.13-2. Qwest's Approach to Meeting Capability Requirements of the RFP**

ID Number	Name of Capability		
1	End-to-End SONETS Delivery		
2 [Optiona]	Gateway Functionality		
3	Network Topologies		
4	Protection Methods		
5	Transmux Capability		

ID Number	Name of Capability		
6	Concatenation Methods		
7	SONET Performance		
8	Performance Monitoring		
9	Synchronization and Timing Methods		
10	Interfaces		

RFP: TQC-JTB-05-0002

ID Number	Name of Capability		
11 (Reserved)			
12	Data Communications Channel	███████████	
13	Integrated Control Plane	███████████	
14 (Reserved)			

███

████████████████████████████ The network is connected to multiple metro networks in every major U.S. city. Qwest has many options for delivering service in the last mile, through local access providers, on-net facilities, and custom builds. Qwest has interconnection agreements and physical connectivity with CLECs, ILECs, and fiber providers to deliver outstanding service everywhere Agencies require it. Qwest's SONET network is deployed on a footprint of Points of Presence (POPs) distributed throughout the United States, as shown in ███████████. Hundreds of aggregation points expand the network reach throughout the U.S.
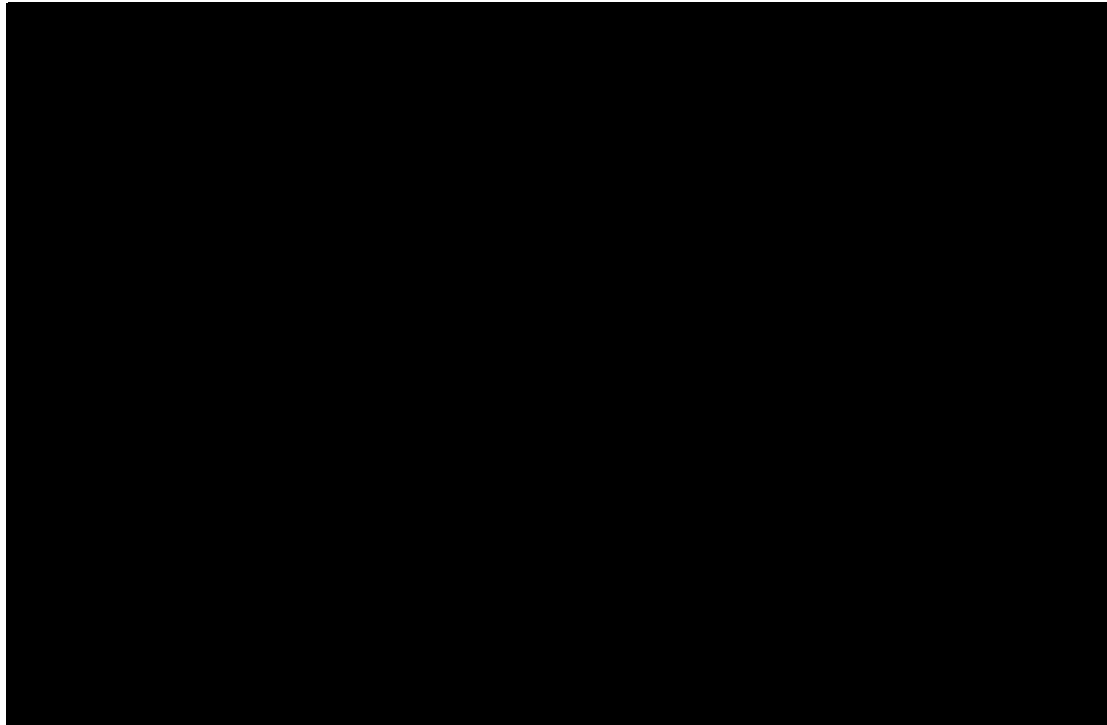
Our combination of design features provides several advantages. 4F-BLSR incorporates both span- and ring-switching for protection, making the Qwest SONET network robust against multiple failure conditions. Our BLSR configuration provides the capability to do scheduled span-switches to allow non-service interrupting maintenance of fiber and optical amplifiers. Qwest supports all mandatory protection mechanisms on the network and tributary side using appropriate SEDs or adjunct Network Elements (NEs) as necessary.

Multiplexing and concatenation (standard and virtual) are standard features of the network. All services are comprised of local access, backbone network, wavelengths, and appropriate SEDs. Our SONETS seamlessly carries a variety of protocols, including ATM, Frame Relay, IP, and Ethernet. These services are delivered transparently from end-to-end.

Additionally, Qwest delivers service internationally and in the last mile through local access providers, on-net facilities, and custom builds. We have

interconnect agreements and physical connectivity with Postal, Telegraph and Telephone (PTTs), CLECs, ILECs, and fiber providers to deliver outstanding service globally ████████████ shows the Qwest Team's global networking capabilities, and ████████████ outlines Qwest's international suppliers.
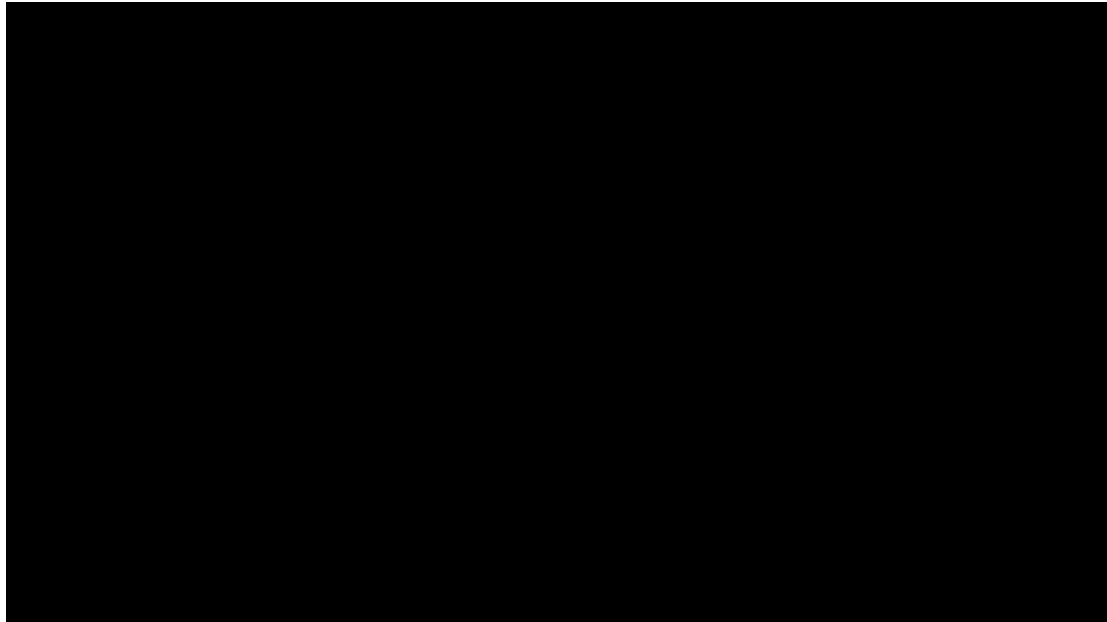
4.2.13.3.2 Satisfaction of SONETS Features Requirements (L.34.1.4.6 (c); C.2.5.2.2- C.2.5.2.2.1)

Figure 4.2.13-6 provides a brief description of Qwest's technical approach that will enable Qwest to fully meet Networx feature requirements for SONETS. Qwest fully complies with all mandatory stipulated and narrative

features requirements for SONETS. The text in Figure 4.2.13-6 provides the technical description required per L.34.1.4.6 (a) and does not limit or caveat Qwest's compliance in any way.

Figure 4.2.13-6. Qwest's Approach to Meeting Feature Requirements of GSA's RFP

ID #	Name of Feature	
1 [Optional]	Bandwidth On-Demand	
2	Channelization	
3 [Optional]	Dedicated Metro Ring	
4 [Optional]	DS-1 Rate Synchronization Service	
5	Equipment Protection 1:1 - CPE	
6	Equipment Protection 1+1 - CPE	
7	Equipment Protection Network Side	
8	Framing for Electrical Interfaces	
9 [Optional]	Geographic Diverse Protection	
10 [Optional]	Local and Remote Node Multiplexing	

Bandwidth on Demand (C.2.5.2.2.1(1); Req_ID 31177)

Local and Remote Node Multiplexing (C.2.5.2.2.1(10); Req_ID 31210)

Qwest fully complies with the requirement to indicate the number and mixture of interfaces allowed for each signal. Qwest will provide the number and mixture of interfaces during the pre-sales design process.

4.2.13.3.3 Satisfaction of SONETS Interface Requirements (L.34.1.4.6 (c), C.2.5.2.3-C.2.5.2.3.1)

Figure 4.2.13-7 is a listing of interfaces that the RFP requires. Qwest has added a column to show SEDs that may be used to enable Qwest to fully meet the Government's interface requirements for the SONETS. Qwest fully complies with all mandatory stipulated and narrative interface requirements for SONETS. The text in Figure 4.2.13-7 provides the technical description required per L.34.1.4.6 (a) and does not limit or caveat Qwest's compliance in any way.

Figure 4.2.13-7. Qwest-Provided SONETS Interfaces at the SDP.

UNI Type	Interface Type	Standard	Frequency of Operation or Fiber Type	Payload Data Rate or Bandwidth	Signaling/ Protocol Type Granularity	███
1	Optical	IEEE 802.3z	1310 nm	1 25 Gbps	Gigabit Ethernet	███
2	Optical	IEEE 802.3z	850 nm	155 Mbps	Gigabit Ethernet	███
3	Optical	IEEE 802.3	1310 nm	155 Mbps	Fast Ethernet	███
4	Optical	GR-253, ITU-T G.707	1310 nm	155 Mbps	SONET or SDH	███
5	Optical	GR-253, ITU-G.707	1310 nm	155 Mbps	SONET or SDH Concatenated	███
6	Optical	GR-253, ITU-G.707	1310 nm	622 Mbps	SONET or SDH	███
7	Optical	GR-253, ITU-G.707	1310 nm	622 Mbps	SONET or SDH Concatenated	███
8	Optical	GR-253, ITU-T G.707	1310 nm	622 Mbps	SONET Channelized	███
9	Optical	GR-253	1310 nm	155 Mbps	ATM over SONET	███
10	Optical	GR-253	1310 nm	622 Mbps	ATM over SONET	███
11	Optical	GR-253, ITU-T G.707	1310 nm	2.5 Gbps	SONET or SDH	███

UNI Type	Interface Type	Standard	Frequency of Operation or Fiber Type	Payload Data Rate or Bandwidth	Signaling/ Protocol Type Granularity	
12	Optical	GR-253, ITU-T G.707	1310 nm	2.5 Gbps	SONET or SDH Concatena- ted	
13	Optical	GR-253, ITU-T G.707	1310 nm	10 Gbps	SONET or SDH	
14	Electrical	ANSI T-1	N/A	1.544 Kbps	DS-1	
15	Electrical	ANSI T-1	N/A	45 Mbps	DS-3	
16	Electrical	ANSI T-1	N/A		STS-1	
17	Electrical	ANSI T-1	N/A	DS-1	DS-0, Nx64 Kbps	
18	Electrical	ANSI T-1	N/A	DS-3	DS-3, Nx1.544Mbp s, DS1	
19	Electrical	ANSI T-1	N/A	E1	Nx64 Kbps	
20	Electrical	ANSI T-1	N/A	E3	E1, Nx64 Kbps, DS-0	
21 [Optional]	Optical	GR-253, ANSI, T-1.105	1300 nm	OC-1	SONET STS-1 payload, VT1.5, VT2	
22	Optical	GR-253, ANSI T-1.105	1300 nm	OC-3 155 Mbps	SONET STS-1, STS-1 payload, VT1.5, VT2	
23	Optical	GR-253, ANSI T-1.105	1300 nm	OC-3c 155 Mbps	SONET STS-3c	
24	Optical	G.707	1300 nm	STM-1 155 Mbps	SDH VC-11(DS1), VC-12 (E1), VC-3 (DS3, E3, other)	
25	Optical	G.707	1300 nm	STM-1 c 155 Mbps	SDH VC-4, VC-3, VC-11, VC-12	
26	Optical	GR-253, ANSI T-1.105	1300 nm	OC-12 622 Mbps	SONET Down to VT1.5 (DS1), VT2 (E1), STS-1 (DS3, E3, other), STS-3c	
27	Optical	GR-253, ANSI T-1.105	1300 nm	OC-12c 622 Mbps	SONET STS-12c	
28	Optical	ITU-T G.707	1300nm	STM-4	SDH STM-1, VC-11 (DS1), VC-12 (E1), VC-3 (DS3, E3, other), VC-4	
29	Optical	ITU- G.707	1300nm	STM-4cVC	VC-4-4c	

UNI Type	Interface Type	Standard	Frequency of Operation or Fiber Type	Payload Data Rate or Bandwidth	Signaling/ Protocol Type Granularity	
30 [Optional]	Optical	OIF-G.707	850 nm	OC-192	VSR4-01 OC-192 (12 fibers)	▮
31 [Optional]	Optical	OIF-VSR4-01.0	1310nm	OC-192	VSR4-02 OC-192 (1 fiber)	▮
32 [Optional]	Optical	OIF-VSR4-03.0	850 nm	OC-192	VSR4-03 OC-192 (4 fibers)	▮
33 [Optional]	Optical	OIF-VSR4-03.0	850 nm	OC-192	VSR4-04 OC-192 (1 fiber)	▮
34 [Optional]	Optical	OIF-VSR4-05.0	OC-192	OC-192	VSR4-05 OC-192	▮
35 [Optional]	Optical	OIF-VSR5-01.0	OC-192	OC-768	VSR5-01 OC-768	▮
36 [Optional]	Electrical	GR-253, ANSI T-1.105	850 nm	STS-1/EC-1 51.84 Mbps	SONET/STS-1, VT1.5 mapping	▮
37 [Optional]	Optical	GR-253	1550 nm	2.5 Gbps	SONET or SDH	▮
38 [Optional]	Optical	GR-253	1550 nm	10 Gbps	SONET or SDH	▮

███

██

████████████████████████

4.2.13.4 SONETS Quality of Service (L34.1.4.6 (d), C.2.5.2.4-C.2.5.2.4.1)

Qwest meets or exceeds all of the AQLs for SONETS, as shown in *Figure 4.2.13-8*. The Qwest network is designed to meet a performance metric of 99.999 percent availability ████████████

███

███

███

Qwest's approach for measuring performance indicators for SONETS is consistent with the GSA's requirements of In-Service Monitoring (ISM) at the SONET layer for availability and Out-of-Service monitoring of BER.

Figure 4.2.13-8. Qwest Compliance with Government SONETS Performance Metrics. *Qwest meets Networx specifications for SONETS performance metrics.*

Key Performance Indicator (KPI)	Service Level	Performance Standard (Threshold)	Acceptable Quality Level (AQL)	
Availability (SDP-to-SDP)	Routine	99.9%	≥ 99.9%	
	Critical	99.999%	≥ 99.999%	██████
Time to Restore	With Dispatch	4 hours	≤ 4 hours	████
	Without Dispatch	8 hours	≤ 8 hours	████
BER	Routine	10^{-12}	≤ 10^{-12}	████

To ensure high availability, Qwest engineers, monitors (including in-service monitoring), and manages end-to-end SONETS solutions. ██████ ██ ██ ████████████████████ Qwest will interface with the NOCs of our suppliers to monitor and manage the proposed SONETS end-to-end to ensure high reliability and availability of the service to Agencies.

███████████████████████████████████████ ███████████████████████████████████████ ███████████████████████████████████████ ███████████████████████████████████. Monitoring of the SONET overhead data is non-intrusive and does not require disruption of the circuit being monitored. The objective is to proactively monitor and detect remote defect, error, and failure indications and to initiate corrective action before the system fails. ████████████████████████████████████ ████████████████████████████

4.2.13.5 Qwest's SONETS Exceeds Service Requirements (L.34.1.4.6 (e))

Qwest's deployed state-of-the-art SONET network is fully capable of meeting the current and future SONET and SDH service requirements of Agencies.

Qwest continuously evaluates new technologies for potential deployment in the network to support new and emerging services and applications. This approach keeps Qwest current with the Agency demands and service requirements. Qwest will work with the Government to identify

any emerging service needs of Agencies and take appropriate measures to satisfy these new requirements promptly.

██

██
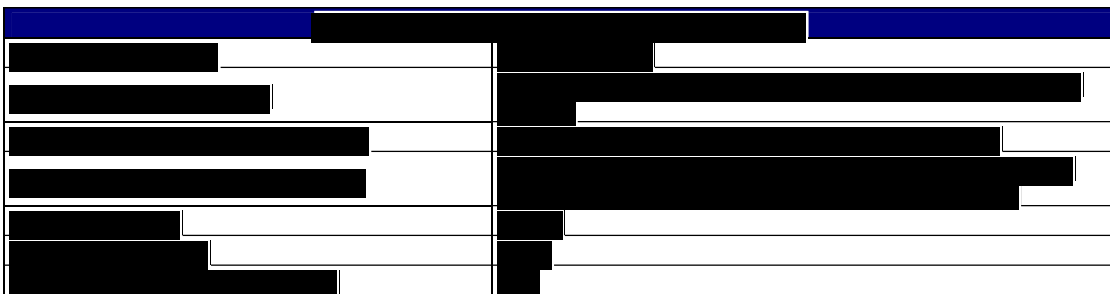
██████████████████████

4.2.13.6 Experience with SONETS Delivery (L.34.1.4.6 (f))

Qwest has a long history of providing SONETS to Agencies. Qwest is both a local operating company (Regional Bell Operating Company (RBOC)) and an Inter-Exchange Carrier (IXC). This perspective provides unique insight into the provision of local access and delivery of service to customers in both market segments ████████████████████████████████████

██

██

██

██

████████████████████████████████ *Figure 4.2.13-9* summarizes our experience with the delivery of SONET services.

Figure 4.2.13-9. Qwest Experience with SONET Services Delivery

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

4.2.13.7 Characteristics and Performance of Access Arrangements (L.34.1.4.6 (g))

Qwest has numerous access methods to reach our backbone, including ILECs, CLECs, Qwest local, Ethernet, fixed wireless, cable, and

private line. We have procedures in place to provide real-time monitoring and performance statistics for these methods. We have strict guidelines on how we connect to LECs, dual entrance facilities, OC-48 capacity, and strict operations agreements.

Qwest realizes that a key differentiator is the ability to ensure robust access, not only to the traditional ILECs, but also to the emerging diversity of CLECs. This combination enables Qwest to leverage our own infrastructure (both as a national provider and as an ILEC in 14 states in the western U.S.), as well as the other ILECs and the CLECs, to provide robust access solutions that meet Agency needs. To ensure the service quality and reliability of access services that connect to our backbone, Qwest uses the same disciplines and approaches that are used to maintain our own facilities-based portions of the service.

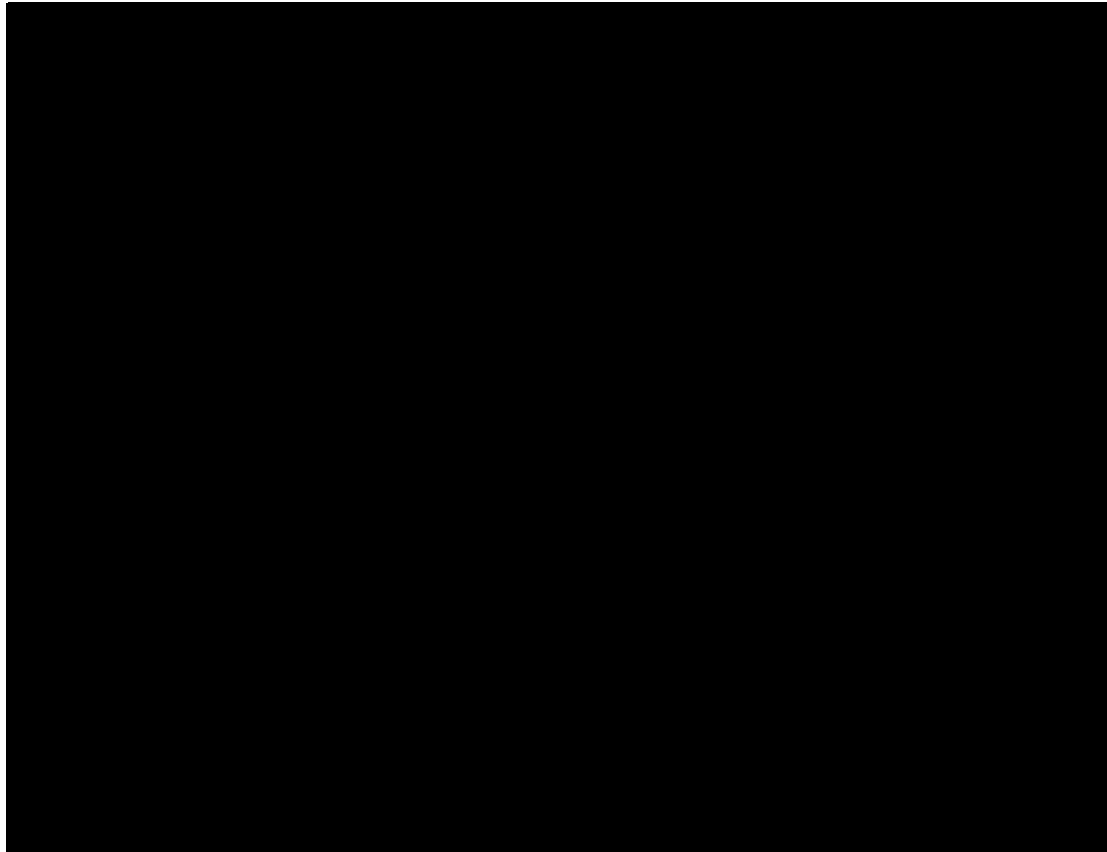Qwest has the staff and procedures to engineer extremely high-availability access arrangements.

Qwest has maintained access delivery excellence for our Government customers over a long interval.

In addition to excellence in continuing operations, Agencies experience the best possible provisioning intervals for service delivery. Qwest and our Contractor Program Office staff have a long and excellent track record of on-time delivery service with reliable service delivery intervals. ▮▮▮▮▮▮▮▮ represents actual service turn-up from the customer's perspective, including all aspects of access, provisioning, demarcation extension, and equipment installation for a major Government department nationwide network.
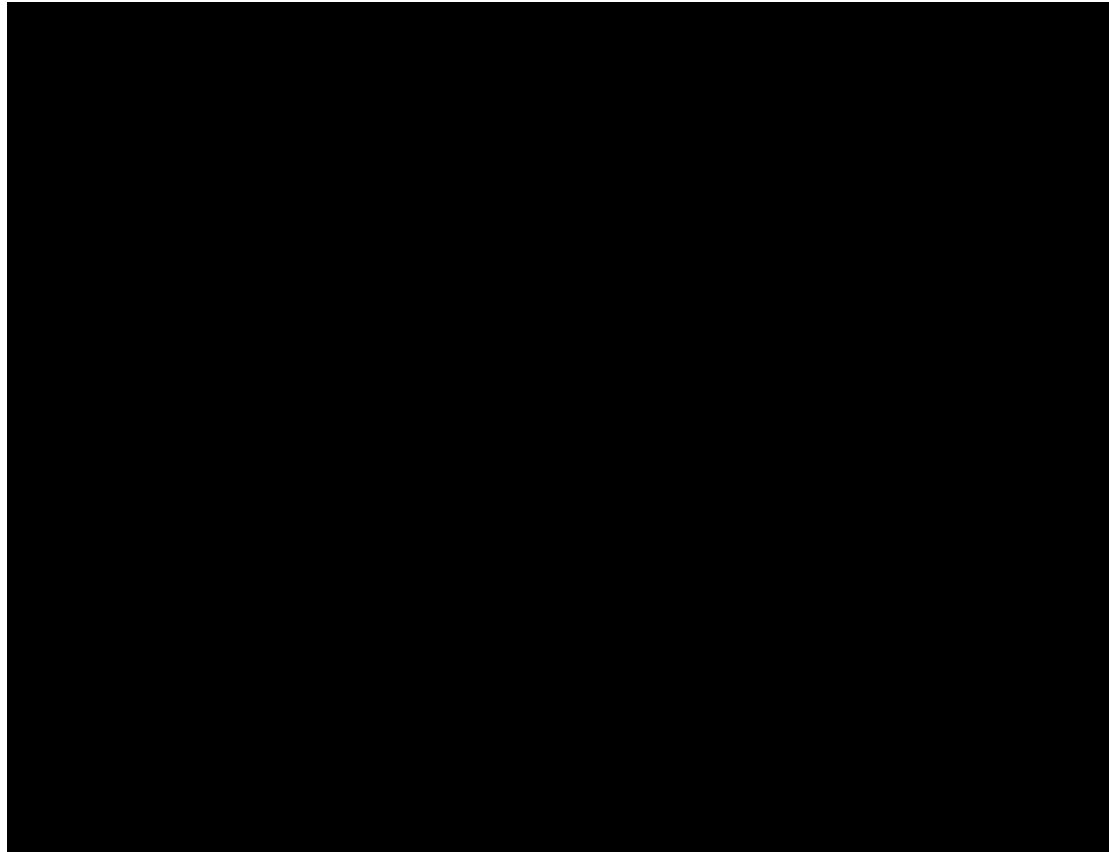
Our performance has direct benefits to Agencies. Qwest meets aggressive timelines for service transitions. ▮▮▮▮▮▮▮▮▮▮▮▮ ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮ ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮

To provide access services, Qwest has a broad variety of agreements with local carriers to ensure flexibility, quality, and reliability. Qwest has strict quality standards for how we connect with other carriers to maintain this high level of performance.

Qwest uses our own and leased-access facilities to connect customer locations to Qwest network services. Qwest uses a variety of technologies, everything from dark fiber to emerging standards such as Worldwide Interoperability for Microwave Access (WiMAX). In each case, Qwest network

engineering and planning ensures that the access from our backbone to the customer's location meets our standards and provides highest quality and reliable services.

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

[REDACTED]

[REDACTED]

4.2.13.8 Approach for Monitoring and Measuring SONETS KPIs and AQLs (L.34.1.4.6 (h))

For SONETS, the NEs capture and maintain performance data on equipment and circuits. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Results are calculated and displayed on the network scorecard. Qwest's performance to required AQLs can be viewed in the Qwest Control Networx Portal. Qwest will measure availability in-service and on an end-to-end basis as described above in Section 4.2.13.4. COT(HR) will be calculated based on Error Seconds and/or Severe Error Seconds as defined by GR-253, G.826 through G.829 and shall be expressed in Hours. Availability will be computed using the standard formula stated in section C.2.5.2.4.1 of the RFP.

$$Av(SONETS) = \frac{RI(HR) - COT(HR)}{RI(HR)} \times 100$$

Measurements will be collected via the [REDACTED] system and reported accordingly.

Qwest monitors all NEs of the SONETS and SEDs on a 24x7x365 basis. ███████████████████████████

██

    ███

    ███

    ██

    ████████████

██

    ███

    ███

    ██

    ████████████

██

    ███

    ██

    ██

    ███

    ████████████

Qwest maintains a central data repository for key network performance information. ██

██

██

██

██

Qwest uses the ██████████ trouble ticketing system. ██████████ is commercial-off-the-shelf trouble ticketing application that we have customized to make more effective for our needs. From this system, we collect many useful metrics that we use internally to evaluate and improve our processes,

including TTR. The calculation for TTR uses the same business rules as the Government requires for its services.

4.2.13.9 SONETS Support of Time-Sensitive Traffic (L.34.1.4.6 (i))

SONETS is a dedicated service that provides fixed bandwidth and a standardized availability of ████████████████. The service platforms introduce minimal latency and jitter. As a consequence, it is ideal for supporting time-sensitive traffic, as degradations to voice and video quality are minimal. Various SEDs may provide different mechanisms for dealing with load conditions.

4.2.13.10 SONETS Support for Integrated Access (L.34.1.4.6 (j))

SONETS provides a single high-bandwidth interface to the customer. This bandwidth is provided with a single performance level and is compliant with the KPIs and AQLs of the RFP. Integrated access for SONETS may be implemented through different SEDs or by bundling with another service (such as PLS or IPS). Using multiplexing, Agencies can designate channels on the SONET access circuit to terminate to other applications such as Voice, Internet, Frame Relay, or ATM. Also, dedicated network builds can provide end customers some flexibility for providing different protection schemes for different products.

4.2.13.11 Infrastructure Enhancements and Emerging Services (L.34.1.4.6 (k))

Qwest has mature processes that enable us to envision research, evaluate, engineer, deploy, and operate new or emerging services. Driven initially by the Chief Technology Office, Qwest evaluates new products and technologies for incorporation into the Qwest network, in partnership with Qwest Product Management. Qwest can satisfy all mandatory service requirements for SONETS without enhancing the network. ████████████
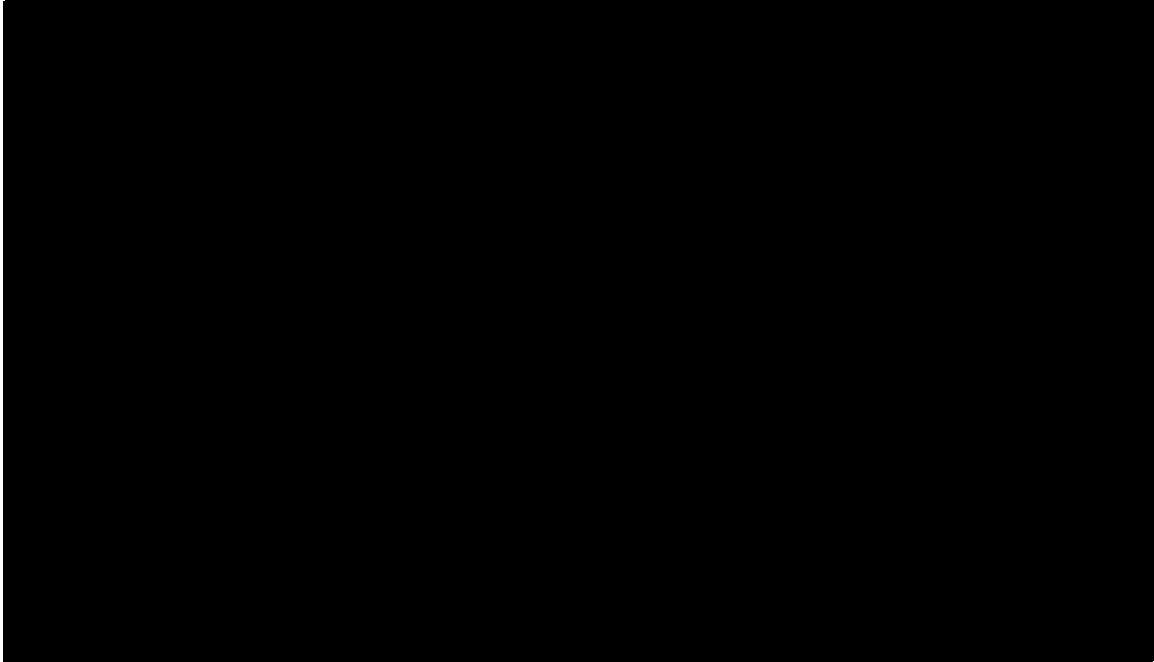
4.2.13.12 Approach for Network Convergence (L.34.1.4.6 (I))

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

On our converged network, our Private MPLS-only core network provides data transport for all of our IP services. Layered onto the MPLS core are edge-provided services that provide private MPLS VPNs, Internet services, and PSTN VoIP backbone bandwidth.

Qwest recognizes that converged customer care and support will be a major challenge that impacts processes, systems, and people. Convergence extends and impacts every facet of the traditional telecommunications value chain.

4.2.13.13 IP-PSTN Interoperability (L.34.1.4.6 (m))

IP network to PSTN interoperability does not apply to SONETS. SONET is a layer one service and is transparent to any addressing by other services.

4.2.13.14 Approach for IPv4 to IPv6 Migration (L.34.1.4.6 (n))

IPv4 to IPv6 migration does not apply to SONET service as SONET is a layer one service. Section 3.3.6, *IPv4-IPv6 Migration*, provides Qwest's IPv4 to IPv6 migration strategy for applicable services.

4.2.13.15 Satisfaction of NS/EP Requirements (L.34.1.4.6 (o))

According to RFP Section C.5.2.2.1, *NS/EP Basic Functional Requirements Matrix for Networx Services*, SONETS is not applicable as a service that must be provided during emergencies. Details of how Qwest supports the 14 basic functional requirements for applicable services are

provided in Section 3.5.1, *Approach to Satisfy NS/EP Functional Requirements*, in this Technical Volume.

4.2.13.16 Support for Signaling and Command Links (L.34.1.4.6 (p))

This requirement is not applicable to SONETS, as circuits do not touch the SS7 network or satellite command links.

4.2.13.17 Service Assurance in the National Capital Region (L.34.1.4.6 (q))

As discussed in Section 3.2, *Approach to Ensure Service Quality and Reliability*, Qwest provides network services in the National Capital Region (NCR) with a robust network architecture designed and engineered to ensure service continuity in the event of significant facility failures or catastrophic impact. Qwest will continue to engineer critical services to meet each Agency's requirements to eliminate potential single points of failure or overload conditions that may impact their network service performance.

Qwest has an active, compliant National Security and Emergency Preparedness (NS/EP) plan. ███████████████████████████████████ ███ ██ ████████████ Qwest also provides functionality that enables Government Emergency Telecommunications Service priority calling mechanisms. Qwest will provide full NS/EP Functional Requirements Implementation Plan (FRIP) documentation upon contract award when requested to proceed with plan delivery. Qwest will update plans, including Part B, addressing our strategy for supporting Agency NCR requirements in accordance with RFP Section C.7.16.

Qwest understands the Government's requirement to assure performance of network services in and around the NCR. ████████████ ██

██████████████ Each of these gateways provides complete redundancy to access Qwest nationwide and international network capabilities as well as regional voice and data services. ███████████████████████████
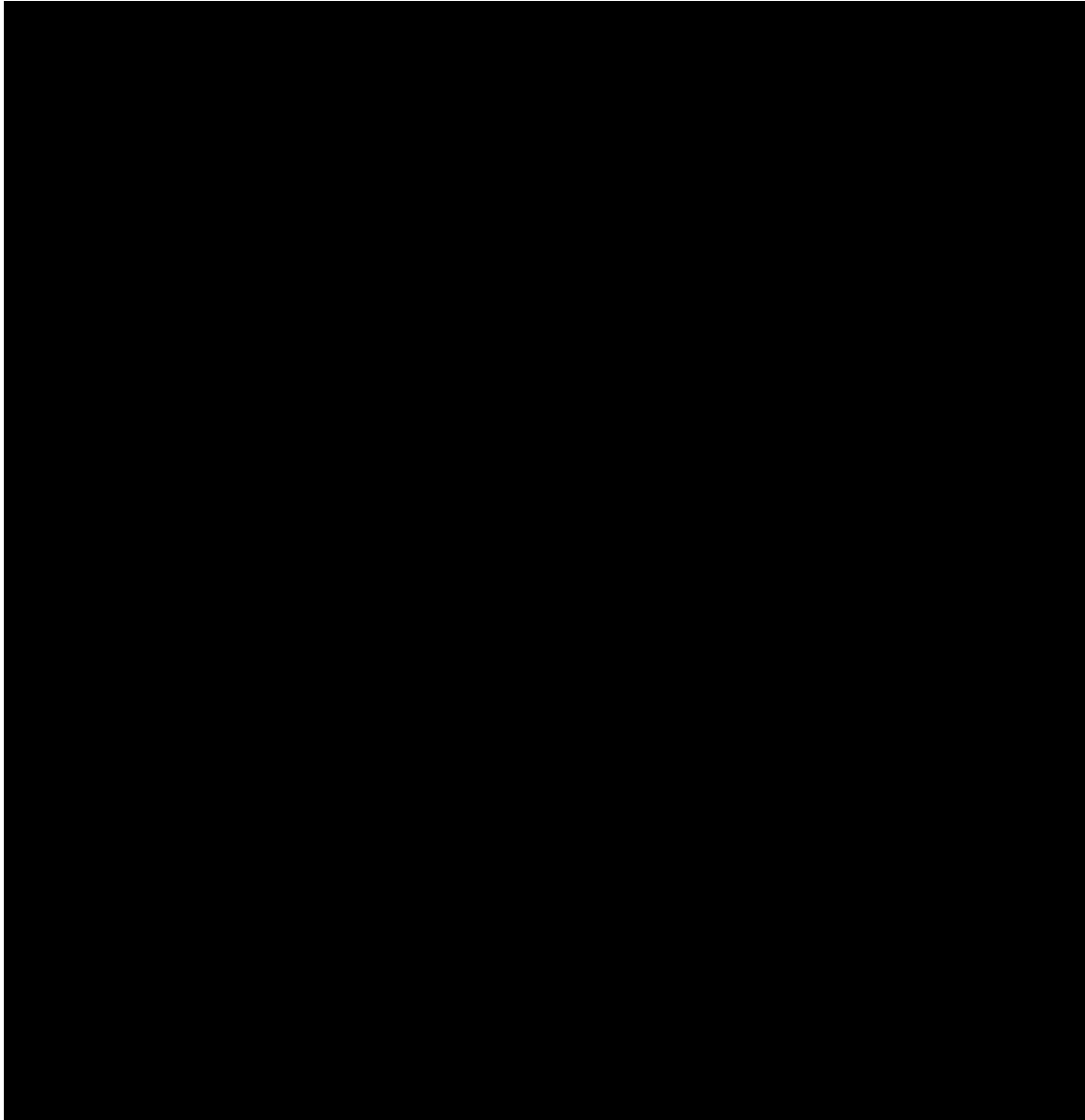
██

██

The route-diverse SONET backbone and access networks that service the NCR enable the transport of services to any Qwest POP nationwide████

██

██

██████████████████████████████ Due to the ring-based architecture, SONETS customers are protected from any single point of failure in the NCR.

██

██

██

██

██

██

██

██

██

██

███████████████

This configuration enables these ▮▮▮ locations to participate in the routing of access and backbone traffic, providing significant load balancing and reconfiguration options in the event of a switch, router, or even a complete POP failure. Qwest has recently acquired OnFiber, a metro SONET and

Ethernet provider with yet another diverse network in the NCR. This gives Qwest at least ███████████ fiber optic networks to use to ensure redundancy and survivability in the greater Washington D.C. area. In effect, this means that Qwest can completely avoid Washington, D.C. and continue to provide services in an emergency.

Qwest operates ███████████ major SONET rings and an extensive fiber infrastructure in the NCR to connect NCR customers. Qwest pre-subscribed this infrastructure from an ILEC and numerous CLECs. As presented in Section 3.2.2, *Arrangements with Other Service Providers for Carrying and Exchanging Traffic*, Qwest connects to ███████████ ILEC POP locations through SONET-protected ring networks to ensure multiple access paths to ILECs services, including voice termination and fiber access. The use of CLECs, who provide infrastructure that is generally separate from the ILECs, gives another level of resiliency to the architecture because these services would not be affected by an ILEC facility failure.

Qwest will address the strategy, technical systems and administration, and management and operation requirements for the NCR in part B of our NS/EP FRIP (a draft appears as Appendix 2 to this Technical Volume).

4.2.13.18 Approach to Satisfying Section 508 Requirements (L.34.1.4.6 (r))

According to RFP Section C.6.4, *Section 508 Provisions Applicable to Technical Requirements*, Section 508 provisions are not applicable to SONETS. Qwest has fully described our approach to satisfying Section 508 requirements for applicable, offered services in Section 3.5.4, *Approach for Meeting Section 508 Provisions*, of this Technical Volume.

4.2.13.19 SONETS Impact on Network Architecture (L34.1.4.6 (s))

The delivery of SONETS has little impact on the existing network architecture. Since there is no change to the network to deliver SONET

service, it is unlikely that any adverse security, quality, reliability, or performance issues would arise. The Qwest SONET network has been operating at a high level of performance for more than nine years. All major routes are already incorporated into the network. We have the capacity now to handle additional SONET transport well into the future. The network will continue to evolve as customer needs change.

Security on the network is the same as any SONET or Private Line Service. It is difficult to gain unauthorized entry into a physical layer service, and any tapping into the line would be intrusive and detected immediately at Qwest NOCs.

The service rides the reliable Qwest 4F-BLSR network, where availability is consistently high ███████████████████████ The SONET service benefits from the same NOC that manages all Qwest Private Line and SONET services. Technicians are well trained and consistently deliver a highly reliable service. The SONET service easily meets the standards set forth in the RFP for performance.

4.2.13.20 Optimizing the Engineering of SONETS (L.34.1.4.6 (t))

Qwest optimizes our network architecture at the local, metro, and national level. Our remote concentration and high bandwidth transmission facilities allow Qwest to aggregate local traffic into centralized locations and transport the traffic to major Qwest transport POPs. Qwest's nationwide SONET networks are optimized by bringing traffic from smaller, remote markets to larger markets over high bandwidth transmission facilities. ██████

███

███

███

██████████████

███

███

██████████████████████████████

Qwest's provisioning and current planning groups ensure that Qwest's state-of-the-art network is engineered for maximum efficiency and utility.

███

███

███

██████████████████████████████████

Qwest also optimizes individual optical circuits to ensure that the most efficient route is chosen, generally the shortest and most direct route, with minimal switching. Circuits are switched between different systems only when absolutely necessary. These practices ensure optimal network efficiency and minimize latency and points of failure on an Agency's circuits.

Qwest optimizes our fiber infrastructure to limit signal-degrading factors such as attenuation, dispersion, and reflection. Qwest uses various amplification technologies, power balancing, dispersion compensation, and fiber splicing to optimize use of the available spectrum, permitting Qwest to provision the maximum amount of optical services on each fiber. Our optimization methods increase network efficiency and reduce costs.

4.2.13.21 Vision for Service Internetworking (L.34.1.4.6 (u))

Qwest anticipates significant advances in SONET technology over the next several years. While some applications served by SONET will migrate to IP/MPLS transport, many will continue to require the predictable, high-availability performance associated with traditional SONET. ████████████

███

███

███

4.2.13.22 Support for Government SONETS Traffic (L.34.1.4.6 (v))

Qwest has analyzed the traffic data provided by the Government. If Qwest provided all the demand for SONETS, on OC-3, OC-12, and OC-48 ███ ███████████████████████████████████ Qwest has enough available capacity to meet current Government requirements. Qwest is also deploying additional capacity in our DWDM network to support additional traffic for wavelength, SONETS, voice and IP services that will meet any unforecasted Government demand.