5.2.6 STORAGE SERVICES (SS) (L.34.1.5.4, M.2.1.4)

Qwest's Networx Storage Services provides a secure and highly available environment for Agency applications, which allows Agencies to free up valuable resources.

Qwest's Storage Services (SS) are layered on top of our Collocated Hosting and Dedicated Hosting Services to provide Agencies with worry-free, end-to-end storage solutions. With Qwest SS, Agencies can utilize Qwest tape and disk storage resources to handle their most demanding storage requirements.

By using a proven Statement on Auditing Standards No. 70 (SAS 70) certified process, Qwest will provide Agencies with storage services specific to their individual needs. The storage services described are offered in Qwest CyberCenters™. Qwest CyberCenters are specially designed to provide state-of-the-art hosting for mission-critical applications and services. Qwest CyberCenters provide a secure, scalable and reliable foundation for success, as described in ***Figure 5.2.6-1***.

Figure 5.2.6-1. Key Characteristics of Qwest's CyberCenters

Feature	Description
Staffing	• 24x7 on-site trained system and network engineering staff backed up by centralized operations staff. • Qwest has developed a problem management process to identify and track problems with Agency-hosted system(s). This process includes a call management system and a multi-level technical support system. • All Agency requests (including, but not limited to, hardware installation, software installation, software modifications, and script-writing outside the scope of Standard Operating Environment Management) will be provided on a "remote hands" basis.

Feature	Description
Heating, Ventilation, and Air Conditioning (HVAC)	• Redundant HVAC to maintain an appropriately air-conditioned environment (between 55 degrees and 85 degrees Fahrenheit) and proper relative humidity level (between 20% and 65%) for the Agency equipment. [redacted]
Power	• N+1 redundancy on generators and UPS. • Multiple power feeds to raised floor. • Power for Collocation is provisioned and installed in standard circuits of 120V/20A. Alternate circuits, on optional diverse PDUs.
Physical Security	24x7 guards, alarms, cameras, bio-scanners and mantraps.
Fire Suppression	Very Early Smoke Detection Apparatus (VESDA), multi zone pre-action dry pipe.
Network	[redacted]

5.2.6.1 Reserved (L.34.1.5.4 (a))

5.2.6.2 Reserved (L.34.1.5.4 (b))

5.2.6.3 Satisfaction of Storage Service Requirements (L.34.1.5.4 (c))

Qwest Storage and Backup Services are a fully-managed, flexible portfolio of state-of-the-art products and services, including Utility Storage (Basic, High and Critical), Managed Dedicated Storage, Point-in-Time Copy, Managed Tape Backup, Non-Disruptive Backup, archiving and restore. The ability to provide these services in conjunction with hosting delivers on our vision of being a comprehensive solution provider.

Interconnection to transfer the data between Agency locations and Qwest's data centers is accomplished by the use of underlying transport services (such as Synchronous Optical Network (SONET), Dark Fiber

Services (DFS), Optical Wavelength Services (OWS), Private Line Service (PLS), Layer 2 Virtual Private Network Services (L2VPNS) and Ethernet).

5.2.6.3.1 Satisfaction of Storage Service Capabilities Requirements (L34.1.5.4 (c), C2.11.10.1.4)

Qwest fully complies with all mandatory stipulated and narrative capabilities requirements for SS. The following text is intended to provide the technical description required per L.34.1.5.4 (c) and does not limit or caveat Qwest's compliance in any way.

ID	Capability	[redacted]
1	The contractor shall support the interfaces for all tiers of storage devices and services, such as Gigabit Ethernet (GigE), and Fibre Channel, as required by the Agency.	[redacted]
2	The contractor shall provide secure data centers to store Agency data. a. The contractor shall provide logical partitioning of storage resources so that storage capacity is dedicated for use by an Agency. b. The contractor shall support dedicated resources, such as but not limited to storage controllers, Fibre Channel ports, and storage cache for Agency use to the extent needed. c. Reserved d. The contractor shall support storage services that meet Agency security certification and accreditation (C&A) requirements, including storage services for classified data if needed by the Agency.	[redacted]
3	Storage resources management. a. The contractor shall provide management tools to the subscribing Agency which supports basic storage services. b. If required by the Agency, the contractor shall support the Agency's investments in storage resources by customizing the service to allow compat bility with Agency storage management policies, procedures, and tools.	[redacted]

ID	Capability	
4	The contractor shall perform scheduled maintenance during off-peak hours. The contractor shall ensure that contractor maintenance windows are arranged to meet Agency needs.	[redacted]
5	Backup and Restore (BBKUP&R) services requirements are the following: a. The contractor shall backup Agency designated files and databases automatically, including files that are open at the time of the backup. b. The contractor shall perform automated data backup at least daily, and, if needed by an Agency, on a more frequent schedule. c. Daily incremental and full weekly backups of data shall be performed, and, if needed by an Agency, on a more frequent schedule. d. The stored backup data shall be kept securely in a geographically separate location as needed by an Agency. The contractor shall provide storage facilities that meet Agency security requirements. e. The contractor shall retain a full backup copy of a month's worth of data for at least three months, and for longer if needed by the Agency. f. The contractor shall restore backup data as needed by the Agency. g. The contractor shall provide Remote Data Replication (RDR) services, such as for Agency archive purposes, by writing Agency data into storage media and then physically transporting and storing the media in a geographically separate secure location. i. The contractor shall enable both automated and manually initiated replication as needed by the Agency. ii. The contractor shall provide secure storage for the media to meet Agency requirements, including storage for classified data if needed by the Agency. h. Remote Data Mirroring (RDM) services shall be provided, if needed by the Agency, to enable two or more locations, such as Agency datacenters and COOP sites, to store and share the same data.	[redacted]

ID	Capability	[redacted]
6	Network Attached Storage (NAS) services requirements are the following: a. The contractor shall provide, operate, and manage storage that is scalable to meet Agency needs. b. The contractor shall perform storage upgrades that shall be transparent to the Agency and the Agency shall not experience downtime during upgrades. c. Rigorous security policies and procedures shall protect Agency data to meet Agency security needs.	[redacted]
7	Storage Area Network (SAN) services requirements are the following: a. The contractor shall provide, operate, and manage storage that is scalable to meet Agency needs. b. The contractor shall perform storage upgrades that shall be transparent to the Agency and the Agency shall not experience downtime during upgrades. c. Rigorous security policies and procedures to protect Agency data to meet Agency security needs.	[redacted]

As shown in [redacted] Qwest uses a combination of storage hardware providers to support our Storage Area Network (SAN) services. These disk platforms include [redacted] Qwest has an Internet Protocol (IP)-based backup solution using dedicated Network Interface Cards (NICs) on the Agency systems that connect into the Qwest Tape Area Network (TAN). Qwest uses [redacted] software to manage backups across the Qwest TAN.

[redacted]

Qwest storage and backup services provide Agencies with a scalable, cost-efficient suite of data storage solutions that are tailored to their individual storage needs. They can now back up data, enhance business continuity planning, retrieve, restore and archive data that is both secure and designed to grow with Agency needs.

Qwest storage and backup services provide Agencies with increased flexibility, rapid scalability of equipment and services, and variable SLAs that meet their exact needs. The services minimize or eliminate the cost of unplanned downtime, reduce Agency investments in areas of rapid change (for example, obsolescence), and turn fixed capital costs into variable expenses.

Qwest SS provides customers with a suite of fully-managed services via multiple disk arrays and tape libraries combined into a shared or dedicated virtual storage environment managed 24x7x365 by Qwest technicians.

5.2.6.3.2 Satisfaction of Storage Service Features Requirements (L.34.1.5.4 (c), C.2.11.10.2)

There are no Storage Service Feature requirements under the RFP Section C.2.11.10.2.

5.2.6.3.3 Satisfaction of Storage Service Interface Requirements (L.34.1.5.4 (c), C.2.11.10.3)

Figure 5.2.6-3 shows the Qwest Storage Service solution interfaces. Qwest fully complies with all mandatory stipulated and narrative interface requirements for SS. The text in Figure 5.2.6-3 is intended to provide the technical description required per L.34.1.5.4 (c) and does not limit or caveat Qwest's compliance in any way.

Figure 5.2.6-3. Qwest's Storage Service Solution Interfaces

UNI Type	Interface Type	Standard	Frequency of Operation	Payload Data Rate or Bandwidth	Signaling or Protocol Type	[redacted]
1	Optical	Institute of Electrical and Electronics Engineers (IEEE) 802.3z	1310 nm	1.25 Gigabits Per Second (Gbps)	Gigabit Ethernet	
2	Optical	IEEE 802.3z	850 nm	1.25 Gbps	Gigabit Ethernet	
3	Optical	IEEE 802.3	1310 nm	125 Mbps	Fast Ethernet	
4	Optical	ANSI	1310 nm	133 Mbps	Fibre Channel	
5	Optical	ANSI	1310 nm	266 Mbps	Fibre Channel	
6	Optical	ANSI	1310 nm	531 Mbps	Fibre Channel	
7	Optical	ANSI	1310 nm	2 Gbps	Fibre Channel	
8	Optical	IBM	850 nm 1310 nm	1.06 Gbps	ISC	
9	Optical	GR-253, ITU-T G.707	1310 nm	155 Mbps	SONET or SDH	
10	Optical	GR-253, ITU- G.707	1310 nm	155 Mbps	SONET or SDH Concaten-ated	
11	Optical	GR-253, ITU- G.707	1310 nm	622 Mbps	SONET or SDH	
12	Optical	GR-253, ITU-T G.707	1310 nm	622 Mbps	SONET Concaten-ated	
13	Optical		1310 nm	155 Mbps	ATM	
14	Optical		1310 nm	155 Mbps	ATM over SONET	
15	Optical		1310 nm	622 Mbps	ATM	
16	Optical		1310 nm	622 Mbps	ATM over SONET	

UNI Type	Interface Type	Standard	Frequency of Operation	Payload Data Rate or Bandwidth	Signaling or Protocol Type	[redacted]
17	Optical	GR-253, ITU-T G.707	1310 nm	2.5 Gbps	SONET or SDH	[redacted]
18	Optical	GR-253, ITU-T G.707	1310 nm	2.5 Gbps	SONET or SDH Concaten-ated	[redacted]
19	Optical	GR-253, ITU-T G.707	1310 nm	10 Gbps	SONET or SDH	[redacted]
20	Copper/ Optical /Coaxial Cable	10 Base-T/TX/FX (Std: IEEE 802.3)		Link bandwidth: Up to 10 Mbps	1. IP (v4/v6) 2. IEEE 802.3 Ethernet MAC	[redacted]
21	Copper/ Optical /Coaxial Cable	100 Base-TX/FX (Std: IEEE 802.3)		Link bandwidth: Up to 100 Mbps	1. IP (v4/v6) 2. IEEE 802.3 Ethernet MAC	[redacted]
22	Optical	1000 Base-T/L/LX/B/B X/ PX (Std: IEEE 802.3)		Link bandwidth: Up to 1 Gbps	1. IP (v4/v6) 2. IEEE 802.3 Ethernet MAC	[redacted]
23 [Opt-ional]	Optical	10 GbE (Std: IEEE 802.3)		Link bandwidth: Up to 10 Gbps	1. IP (v4/v6) 2. IEEE 802.3 Ethernet MAC	[redacted]

5.2.6.4 Achieving Quality of Service Goals (L.34.1.5.4 (d))

Figure 5.2.6-4 lists Qwest's Acceptable Quality Levels as performance metrics.

Figure 5.2.6-4. Qwest's Storage Service Solution Meets the Networx QOS Goals

Key Performance Indicators (KPI)	Service Level	Performance Standard (Threshold)	Acceptable Quality Level	[redacted]
[redacted]				
Av(SS/ BBKUP&R)	Routine	99.9%	≥ 99.9%	[redacted]
Grade of Service (Restore Time)	Routine	30 min	≤ 30 Min	[redacted]
[redacted]				
Av(SS/NAS) (Single Server)	Routine	99.9%	≥ 99.9%	[redacted]
Av(SS/NAS) (Clustered Servers)	Routine	99.99%	≥ 99.99%	[redacted]
Av(SS/NAS) (Mirrored Servers)	Routine	99.999%	≥ 99.999%	[redacted]
Event Notification (EN)	Routine	8 hours/month	≤ 8 hours per month	[redacted]

Key Performance Indicators (KPI)	Service Level	Performance Standard (Threshold)	Acceptable Quality Level	[redacted]
(Total Scheduled Downtime)	Critical	8 hours/year	≤ 8 hours per year	[redacted]
[redacted]				
Av(SS/SAN) (Single Connectivity)	Routine	99.95%	≥ 99.95%	[redacted]
Av(SS/SAN) (Dual connectivity)	Routine	99.999%	≥ 99.999%	[redacted]
Time to Restore (TTR)	Without Dispatch	4 hours	≤ 4 Hours	[redacted]
	With Dispatch	8 hours	≤ 8 Hours	[redacted]

The KPI and the relevant information are as follows:

Backup and Restore – Av (SS/BBKUP&R): [redacted]

Backup and Restore – Grade of Service (Restore Time): [redacted]

NAS – Av (SS/NAS) (Single Server): [redacted]

NAS – Av (SS/NAS) (Clustered Servers): [redacted]

NAS – Av (SS/NAS) (Mirrored Servers): [redacted]

NAS – EN (Total Scheduled Downtime – Routine): [redacted]

NAS – EN (Total Scheduled Downtime – Critical): [redacted]

SAN – (SS/SAN – Single Connectivity): [redacted]

SAN – (SS/SAN – Dual Connectivity): [redacted]

SAN – Time to Restore (Without Dispatch): Qwest measures TTR as defined in C.3.3.1.2.4. Qwest trouble management processes and dedicated trouble management staff will allow Qwest to meet this 4 hour objective.

SAN – Time to Restore (With Dispatch): Qwest measures TTR as defined in C.3.3.1.2.4. Qwest trouble management processes and dedicated trouble management staff will allow Qwest to meet this 8 hour objective.

5.2.6.5 Proposed Service Enhancements (L.34.1.5.4 (e))

[redacted] In the event an Agency has a specific business need or application problem, Qwest is willing to work with the Agency to deliver a solution that meets their needs through a special combination of vendor solutions and engineering capabilities.

5.2.6.6 Qwest Experience in Delivering Storage Services (L.34.1.5.4 (f))

Qwest has provided utility storage and tape back-up services for many years. [redacted]

[redacted]

5.2.6.7 Approach to Performance Verification (L.34.1.5.4 (g))

Qwest will ensure that all tools, systems (ticketing, ordering, and change management) and portals supporting Government requirements are maintained at or above industry standards. [redacted] With staff on-site 24x7x365, and emergency contracts with subcontractors, Qwest is able to provide Agencies with the stated service levels.

Qwest uses data from these systems in several ways:

[redacted]

Qwest provides Agency access to performance reports through the Qwest Control Networx Portal, which is connected to all of our monitoring systems. Vendor-specific tools and our experience in their use allow us to properly report relevant SAN, NAS and tape backup performance statistics. [redacted]

Any time a breach occurs to any of our performance levels, we conduct a thorough review of the issue from two points of view:

[redacted]

Through this approach, Qwest continually rethinks how service performance can be improved to benefit Agencies.

5.2.6.8 Delivery Impact on Network Architecture (L.34.1.5.4 (h))

Qwest's SS is offered domestically at our advanced CyberCenters that are geographically dispersed throughout CONUS. [redacted] This provides robust and secure high-speed interconnection accessibility to Agency locations.

[redacted]

Qwest has designed and engineered our CyberCenters to be fully integrated with our transport services; there is no impact to the Network Architecture to support SS.

5.2.6.9 Approach to Satisfying NS/EP Requirements (L.34.1.5.4 (i))

As defined in RFP Section C.5.2.2.1, SS is not a National Security and Emergency Preparedness (NS/EP) impacted service. Qwest's overall support of the NS/EP requirements can be found in Section 3.5.1 and our NS/EP plan can be found in Appendix 2.

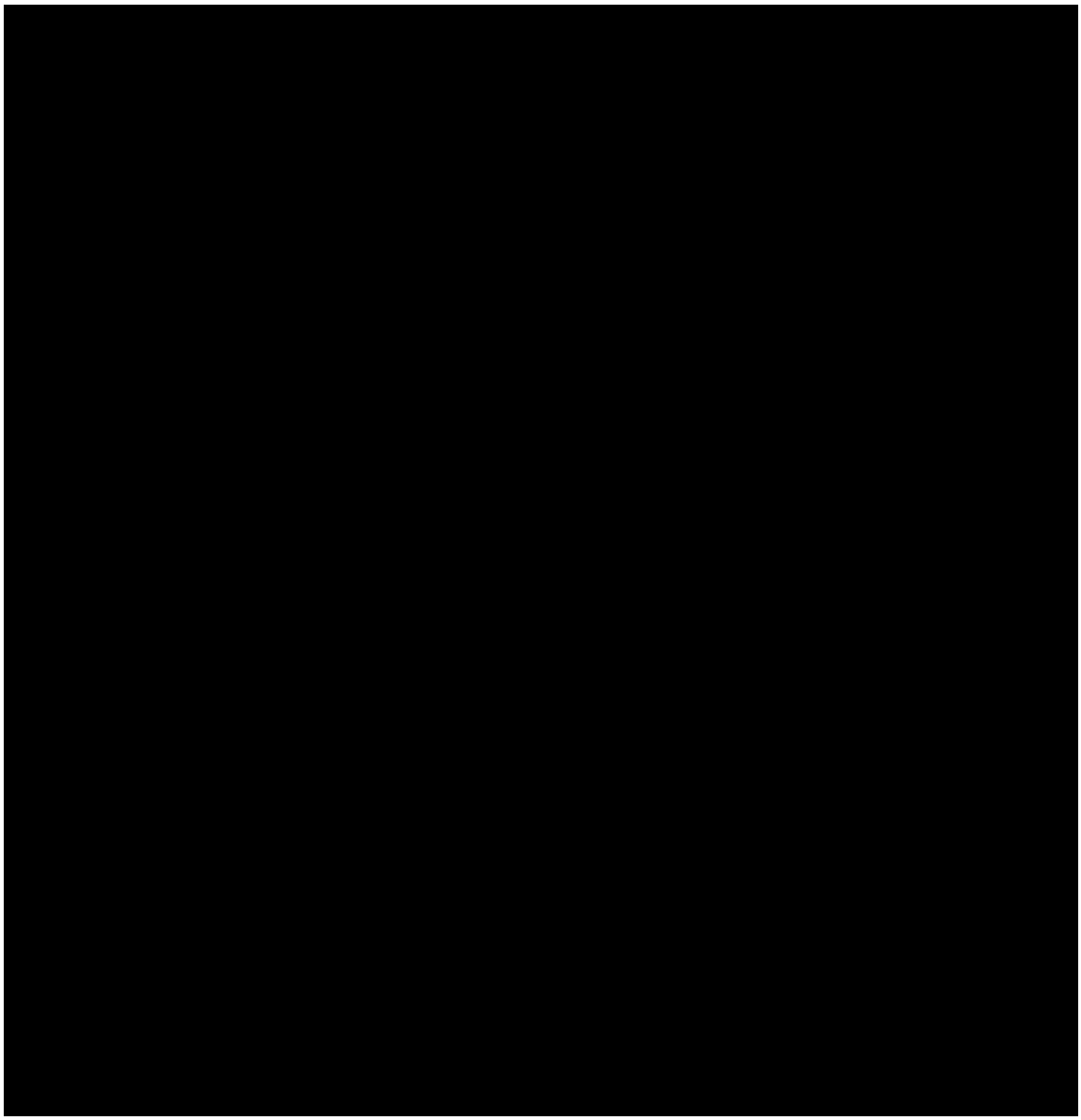
5.2.6.10 Approach to Assured Service in the National Capital Region (L.34.1.5.4 (j))

Qwest understands the Government's requirement to assure performance of network services in and around the National Capital Region

(NCR). [redacted] Each of these gateways provides complete redundancy to access Qwest's nationwide and international network capabilities as well as regional voice and data services. [redacted] has diverse and redundant transport facilities to separate Points of Presence to maximize service survivability. In addition, SS configurations may, at an Agency's option, be backed up in hosting centers outside of the NCR.

Qwest is already a leading provider of network services in the NCR with robust network architecture to ensure service continuity in the event of significant facility failures. Qwest has, and will continue to engineer, critical services to meet the requirements of each Agency to eliminate single points of failure for their network services. Qwest will update and provide full NS/EP documentation, as required, upon a notice to proceed by the Government.

[redacted] shows both the logical configuration of the major transport facilities as well as the services provided at each POP.



[redacted] This configuration enables these three 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 [redacted] regional fiber optic networks to use to ensure redundancy and survivability in the greater D.C area. In effect, this means that Qwest can completely avoid Washington, to continue providing services in an emergency.

5.2.6.11 Approach to Meeting Section 508 Provisions (L.34.1.5.4 (k)

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

5.2.6.12 Approach to Incorporating Technological Enhancements and Improvements (L.34.1.5.4 (l))

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, headed by the Qwest chief

Technology Officer, Qwest evaluates new products and technologies for incorporation into the Qwest network, in partnership with Qwest Product Management.

[redacted]

[redacted]