



THE DIGITAL MALAWI PROGRAM PHASE I: DIGITAL FOUNDATIONS PROJECT

Name of Project:	Digital Malawi Program Phase I: Digital Foundations Project
IDA Credit No.:	60500 MW
Contract Name:	Upgrade and Installation of Local Area Network (LAN) in selected Government buildings (Parliament and Capital Hill)
Identification Number:	MW-PPPC-154319-NC-RFB

Addendum No. 1

Following the request from bidders and to provide for adequate time to prepare responsive bids, the bidding document has been revised as follows:

A. ITB 23.1 is amended to Read as follows:

ITB 23.1	The deadline for Bid submission is: Date: 30th March 2022 Time: 14:00 hrs. Bidders shall not have the option of submitting their Bids electronically as stipulated above.
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B. Part II – Employer’s Requirements should be Read together with the Following:

Summary of Changes

Version: 0.2 Dated: 2022/03/09 – 15:34

1. Technical Responsiveness and Compliance Tables – have been updated
2. Appendices: A, B, C, D, E – these include indicative network equipment to guide bidders.

Amendments:

No	Bid Document	Replacement Section of this Document
1		
2		

Technical Responsiveness and Compliance Sheets

1.1 Core Network

	LAN and WAN Network Controller: Server Hardware & Server Software
Bidders Proposed Equipment – Manufacturer and Model of Equipment:	

No	Minimum Requirements	M/P	Bidder's Compliance of Specification Offered
1	Hardware Number of CPUs: 2 CPU Frequency: 2.6GHz CPU Cores: 32 Memory (RAM): 4x32GB Disk Space: 4x1200GB 2x4x10/100/1000Base-T ports 2x4x25GE/10GE SFP+ Optical Ports AC power supply: 2x2000W	M	
2	System Architecture Browser Server Architecture, standalone and cluster deployment with Geographic Redundancy for service continuity, Multi-Tenant Management - System Administrator, Managed Service Provider (MSP) and Tenant.	M	
3	LAN-WAN Convergence Management LAN and WAN services management through single portal, End to End (E2E) convergent deployment, service monitoring, and Operations & Maintenance (O&M) capabilities for LAN and WAN services.	M	
4	Device Management & Deployment Device Management, Certificate Management, Upgrade Management Deployment Through the Registration Query Centre, Deployment Through the DHCP Server, Deployment by App-based Barcode Scanning, Email-based Deployment, using IPv4/IPv6 network addressing	M	
5	Service Configuration Service Templates, Wizard Configuration, Time zones, NTP Servers, Interface Service, Layer 2 Services (VLANs), Layer 3 Services (DHCP, DNS, NAT, IPSec, VPN), WLAN Services, SSID	M	

No	Minimum Requirements	M/P	Bidder's Compliance of Specification Offered
	Management, User Isolation, Unscheduled Automatic Power Save Delivery (U-APSD)		
6	Quality of Service QoS definition using Access Control Lists (ACLs), Bandwidth policies, Latency Reduction, Jitter Reduction, Packet Loss Prevention, Security Enhancements, Classification and Marking, Congestion Management, Congestion Avoidance, Policing and Shaping, Link Efficiency	M	
7	Security Service Security policy definition, packet fragment attacks, and ICMP/TCP SYN/UDP flood attacks, DHCP snooping, URL filtering, URL blacklist/whitelist, antivirus, intrusion defence, Advanced Persistent Threat (APT) attack defence, Wireless Intrusion Prevention System (WIPS), Wireless Intrusion Detection System (WIDS)	M	
8	Virtual Network Management Software-defined Wide Area Network (SD-WAN) Virtual WAN Architecture, Multiprotocol Border Gateway Protocol (MP-BGP) Ethernet Virtual Private Network (EVPN), Virtual Extensible LAN (VXLAN), Centralized Gateway Solution, Distributed Gateway Solution, Fabric Management	M	
9	User Management User Account Management, User Groups, Authentication Management: MAC address-prioritized Portal authentication, 802.1X authentication and EAP-PAP/MSCHAP V2, Portal Authentication Server, Google Authentication, Facebook authentication, SMS authentication, one-click authentication, Passcode authentication, SSID-based open authentication, PSK authentication, PPSK authentication Authorization Management: authorize users by user group, account, SSID, time range, terminal IP address, and access device, authorization ACLs, authorization VLANs, URL filtering, security policies, and bandwidth policies, free authentication for inter-branch site roaming Traffic Volume and Online Duration Control: Upper limit for traffic volume on a daily or monthly basis, maximum online duration, Portal Management: customisable portal pages - authentication page, authentication success page, user notice page, registration page, registration success page, password modification page, user name authentication page, and password reset page. Page pushing policies based on the SSID, device, time range, and terminal IP address segment.	M	
10	Monitoring, Operations & Maintenance (O&M) Customisable Dashboard, Site Monitoring: network traffic statistics, traffic rate, Top N device traffic, Top N SSID traffic, and number of online users. Device Monitoring: monitor a single device and display device details including whether the device is online, version, model, IP address, manufacturer,	M	

No	Minimum Requirements	M/P	Bidder's Compliance of Specification Offered
	<p>registration time, login time, MAC address, last logout time, ESN, CPU, memory, interface status, SSID information, radio information, network traffic statistics, number of connected terminals, user information list, and fault alarms.</p> <p>Fault Diagnosis: fault locating tools, such as virtual cable test, radio ping, device ping, packet path tracing, device traceroute test, and packet header obtaining. These tools help rapidly and accurately rectify live network faults.</p> <p>User Behavior Analysis</p> <p>Alarm Monitoring: view device alarms, including the alarm type, alarm name, alarm generation time, and fault location information, and clear and export alarms; Email alarm notifications.</p> <p>LAN-WAN Inter-site Monitoring: Physical and logical network topology display, GIS-based query of the VPN link and topology, site health, online status of devices and LAN-side users, Application Quality Measurement (AQM), Link Quality Measurement (LQM), network link latency, jitter, packet loss rate, Top N application traffic, and Top N links with worst LQM between sites.</p>		

1.4Enterprise Core Switch

	Enterprise Core Switch
Bidders Proposed Equipment – Manufacturer and Model of Equipment:	

No	Minimum Requirements	M/P	Bidder's Compliance of Specification Offered
1	<p>Hardware</p> <p>Assembly Chassis</p> <p>10GBase-USR Optical Transceiver, SFP+,10G, Multi-Mode Module</p> <p>Centralized Monitoring Board</p> <p>48-Port 10GE SFP+ interface card (X6S, SFP+)</p> <p>Switching capacity: 19.2 Tbps</p> <p>Forwarding performance: 14,400 Mpps</p> <p>MPU slots: 2</p> <p>SFU slots: 2</p> <p>LPU slots: 4</p> <p>Fan trays: 2</p> <p>Power: 4</p> <p>Buffering capacity: Up to 200 ms data buffering per port</p> <p>Redundancy design: MPU, SFU, power module, and fan module</p> <p>Virtualization: CSS service port clustering</p> <p>Operating voltage DC : -48V~-60V AC : 90V~290V</p> <p>Maximum power consumption: 3344W</p>	M	

No	Minimum Requirements	M/P	Bidder's Compliance of Specification Offered
2	User management: Unified user management, PPPoE, 802.1X, MAC, and Portal authentication, Traffic- and duration-based accounting, User authorization based on user groups, domains and time ranges	M	
3	MAC address: Number of MAC address entries 512K(MAX), Automatic MAC address learning and aging, Static, dynamic, and blackhole MAC address entries, Source MAC address filtering, MAC address learning limiting based on ports and VLANs	M	
4	VLAN: 4K VLANs, Access, trunk, and hybrid interface types; auto-negotiation of LNP link types, Default VLAN, VLAN switching, QinQ and enhanced selective QinQ, Dynamic VLAN assignment based on MAC addresses	M	
5	ARP: Maximum number of ARP entries 256K(MAX), ARP Snooping	M	
6	IP routing: Maximum number of IPv4 routing entries 512K(MAX), IPv4 dynamic routing protocols such as RIP, OSPF, IS-IS, and BGP, IPv6 dynamic routing protocols such as RIPng, OSPFv3, ISISv6, and BGP4+	M	
7	Multicast: Maximum number of multicast routing entries 64K(MAX), IGMPv1/v2/v3 and IGMP v1/v2/v3 Snooping, PIM-DM, PIM-SM, and PIM-SSM, MSDP and MBGP, Fast-leave mechanism, Multicast traffic control, Multicast querier, Multicast protocol packet suppression, Multicast Call Admission Control (CAC), Multicast ACL	M	
8	MPLS Basic: MPLS functions, MPLS OAM, MPLS TE, MPLS VPN/VLL/VPLS	M	
9	VXLAN: VXLAN distributed gateway and centralized gateway, BGP-EVPN, Configures VXLANs through NETCONF, QoS: Number of ACL rules 6K(MAX), Traffic classification based on Layer 2 headers, Layer 3 protocols, Layer 4 protocols, and 802.1p priority, Actions such as ACL, Committed Access Rate (CAR), re-marking, and scheduling, Queuing algorithms, such as PQ, WRR, DRR, PQ+WRR, and PQ+DRR, Congestion avoidance mechanisms such as WRED and tail drop, HQoS, Traffic shaping	M	
10	iPCA: Marks the real service packets to obtain realtime count of dropped packets and packet loss ratio, Counts the number of dropped packets and packet loss ratio on devices and L2/L3 networks	M	
11	SVF 2.0: Up to 10K clients (access switches and APs) virtualized into a single device, Two layers of ASs allowed in an SVF system, Third-party devices allowed between SVF parent and clients	M	
12	Ring network protection: STP (IEEE 802.1d), RSTP (IEEE 802.1w), and MSTP (IEEE 802.1s), SEP, BPDU protection, root protection, and loop protection, BPDU tunnel, G.8032 Ethernet Ring Protection Switching (ERPS)	M	
13	Reliability: Link Aggregation Control Protocol (LACP) and E-Trunk, Virtual Router Redundancy Protocol (VRRP) and Bidirectional Forwarding	M	

No	Minimum Requirements	M/P	Bidder's Compliance of Specification Offered
	Detection (BFD) for VRRP, BFD for BGP/IS-IS/OSPF/static routes, Non-Stop Forwarding (NSF) and Graceful Restart (GR) for BGP/IS-IS/OSPF/LDP, TE Fast ReRoute (FRR) and IP FRR, Eth-OAM 802.3ah and 802.1ag (hardware based), High-speed Self Recovery (HSR), ITU-Y.1731, Device Link Detection Protocol (DLDP), Smart Link, Monitor Link		
14	Configuration and maintenance: Easy Operation, Terminal access services such as console port login, Telnet, and SSH, Network management protocols, such as SNMPv1/v2/v3, File uploading and downloading through FTP and TFTP, Boot ROM upgrade and remote in-service, upgrade Hot patches, User operation logs, Open Programmability System (OPS), Streaming Telemetry, eMDI		
15	Security and management: MAC address, Portal, 802.1X, and DHCP snooping-triggered authentication, MACsec, NAC, RADIUS and HWTACACS authentication for login users, Command line authority control based on user levels, preventing unauthorized users from using command configurations, Defence against DoS attacks, Transmission Control Protocol (TCP) SYN Flood attacks, User Datagram Protocol (UDP) Flood attacks, broadcast storms, and heavy traffic attacks, 1K CPU hardware queues to implement hierarchical scheduling and protection for protocol packets on the control plane, Remote Network Monitoring (RMON), Secure boot (need to use MPU that supports secure boot), Big data security collaboration	M	
16	Wireless management (integrated WLAN AC): Basic WLAN services, Mesh networking, N+N cold backup for devices with integrated WLAN AC functionality, Hot backup for devices with integrated WLAN AC functionality in cluster mode, WLAN terminal location, Locating of interference sources, Spectrum analysis function, 2.4GHz & 5GHz load balancing	M	
17	Wireless management (integrated WLAN AC): AP management, Total number of managed APs 10K, An IPv4/IPv6 network between an AP and a WLAN AC, AP blacklist, AP whitelist, Sets the AP access control mode, AP configuration and management, AP energy saving, AP LLDP topology awareness, Adjustable priority of traffic on wired interfaces of APs, Rate limiting on wired interfaces of Aps, Wireless user management, User roaming within a WLAN AC, AP-based user location, User roaming between WLAN ACs, 802.1X authentication, Portal authentication, MAC address authentication, CAPWAP, Direct data forwarding on L2/L3 networks, Tunnel-based data forwarding on L2/L3 networks, Dual-link load balancing for CAPWAP tunnels, CAPWAP tunnel encryption, RF management, 802.11a/b/g/n, 802.11ac wave1/wave2, 802.11ax, Sets RF interference monitoring and avoidance, Detects co-channel interference, adjacent	M	

No	Minimum Requirements	M/P	Bidder's Compliance of Specification Offered
	interference, and interference from other devices and STAs, Automatically selects channels and power when APs go online, Dynamic power and channel optimization, WLAN QoS, Mapping from wireless-side priority to wired side priority, Mapping from wireless-side priority to CAPWAP channel priority, Rate limiting of upstream and downstream traffic on the air interface based on the VAP, Rate limiting of upstream and downstream traffic on the air interface based on users, SSID-based CAR, CAR for WLAN users		
18	Interoperability: Interoperable with VBST (compatible with PVST/PVST+/RPVST), Interoperable with LNP (similar to DTP), Interoperable with VCMP (similar to VTP)	M	

Appendices

Appendix A - Description of the Services

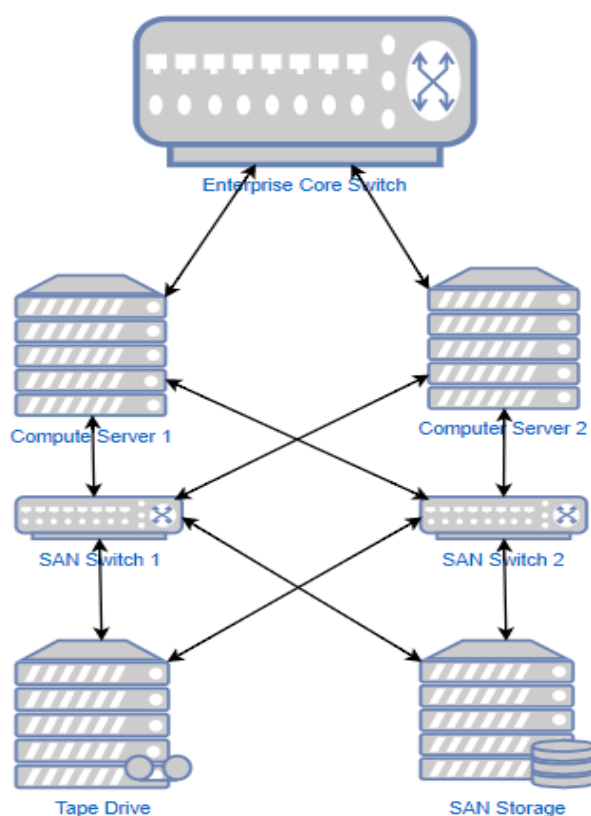
Appendix B - LOT 1: Core Network

Scope:

No	Capital Hill Redundancy & Parliament	Quantity
1.1	LAN and WAN Network Controller: Server Hardware & Server Software	2
1.2	Enterprise Core Router	2
1.3	Enterprise Core Firewall	2
1.4	Enterprise Core Switch	2
1.5	42U Rack	4
1.6	10KVA UPS	6
1.7	Rack Mount Integrated LCD KVM Console with KVM Switch	3
1.8	Network Infrastructure Servers & Services	2

1.8 Network Infrastructure Servers & Services

NO	Item	Quantity
1	Compute Server	2
2	SAN Switch	2
3	SAN Storage	1
4	Tape Drive	1
5	42U Rack	1
6	10KVA UPS	2
7	Rack Mount Integrated LCD KVM Console with KVM Switch	1



Lists of services to be installed and configured by the vendor for the network:

- Email (250,000 active users)
- DNS Server (IPv4 and IPv6)
- Active Directory – Devices
- Active Directory User Accounts (Centralised Authentication)
- LDAP Server to Synchronise with Active Directory Server
- Radius Server
- Website Server
- SSL Certificates for 2 domains (Parliament and Government) x 5 years
- Windows Server Update Services (WSUS) on Windows Server 2019

These services shall run on virtual servers on the computer servers.

NO	ITEM	MINIMUM SPECIFICATIONS
1	Compute Server	Number of CPUs: 2 CPU Frequency: 2.3GHz CPU Cores: 16 Memory (RAM): 8x32GB Disk Space: 1TB SSD ATA DVD-RW Optical Drive 16Gb Dual Port Fibre Channel Host Bus Adapter Ethernet 1Gb 4-port

		Microsoft Windows Server 2019 (16-Core) x 16 Server Licenses VMware vSphere Enterprise Plus X 4 CPU Licenses
2	SAN Switch	Store Fabric 12-port 16Gb Fibre Channel Switch 2.4m Jumper (IEC320 C13/C14 M/F CEE 22) 1.0m External Mini SAS High Density to Mini SAS Cable Store Fabric 16 Gb Fibre Channel SW SFP+ Transceiver Flex LC/LC Multi-mode OM4 2 fiber 15m Cable
3	SAN Storage	SAN Dual Storage Controller 60TB Usable Storage 16Gb Short Wave Fibre Channel SFP+ 4-pack Transceiver Small Form Factor (SFF) Disk Enclosure Advanced Data Services Suite Compatible Operating Systems: Microsoft Windows Server 2019, Microsoft Windows Server 2016, Microsoft Windows Server 2012, HP-UX, Red Hat Linux, SuSE SLES Linux, VMware ESXi, OVMS
4	Tape Drive	Linear Tape-Open Consortium LTO-8 Drive 30 terabytes (TB) of compressed storage Data Verification for 100 Cartridges E-LTU Tape Assure Advanced E-LTU 2m External Mini-SAS to 4x1 Mini-SAS Cable 40 x LTO-8 Ultrium 30TB RW Data Cartridges with Cases Backup and Replication Enterprise

Email Solution

The final email solution will be spread across mailbox data across 3 sites. For the first phase we will implement the first email servers of the cluster in Lilongwe. Typical features of the email platform must include:

- Minimum number of users: 250,000 Government of Malawi employees
- SMTP services for sending and receiving mail
- IMAP services for accessing mailboxes
- LMTP services for mail delivery
- Sieve services for mail filtering and forwarding
- Spam filtering services
- Webmail services
- Outlook connectivity
- Network devices registration
- Unlimited web browser user
- Mail Server Cluster
- Authentication using centralised Active Directory Server (may use slave LDAP servers)
- Domain Keys Identified Mail (DKIM)
- Sender Policy Framework (SPF)
- Domain-based Message Authentication, Reporting & Conformance (DMARC)

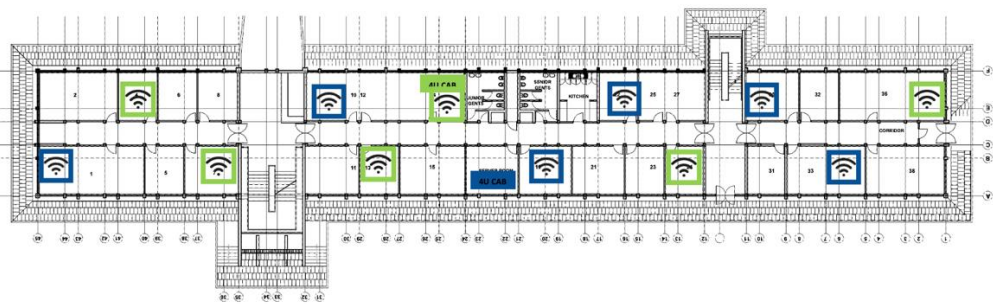
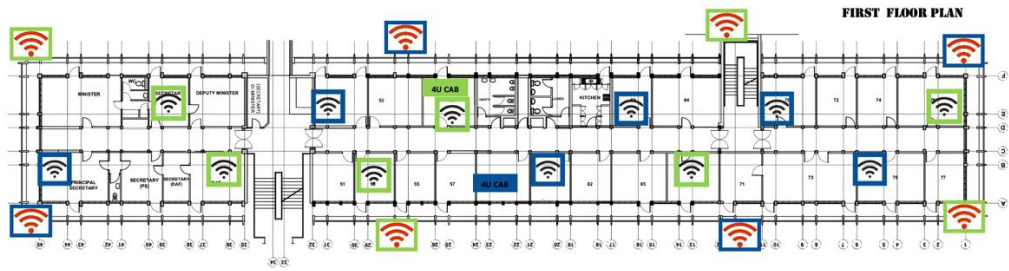
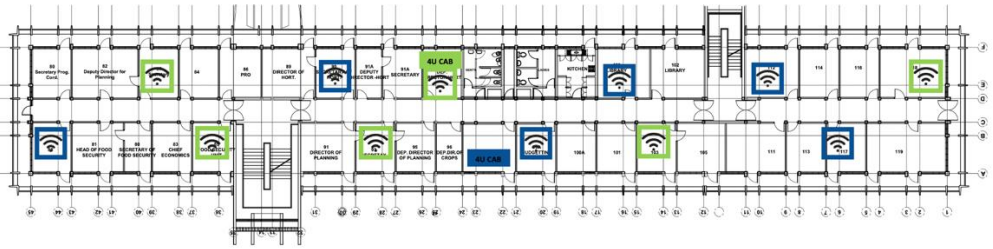
Appendix C - LOT 2: Department of Economic Planning & Development and Ministry of Justice

Scope:

No	Building
2.1	Department of Economic Planning & Development
2.2	Ministry of Justice

Department of Economic Planning & Development

Floor Plans

Floor	Floor Plan
Ground	<p>Ground Floor</p> <p style="text-align: right;">GROUND FLOOR PLAN</p> 
First Floor	<p>First Floor</p> <p style="text-align: right;">FIRST FLOOR PLAN</p> 
Second Floor	<p>Second Floor</p> <p style="text-align: right;">SECOND FLOOR PLAN (EXISTING)</p> 

Indicative Network Equipment

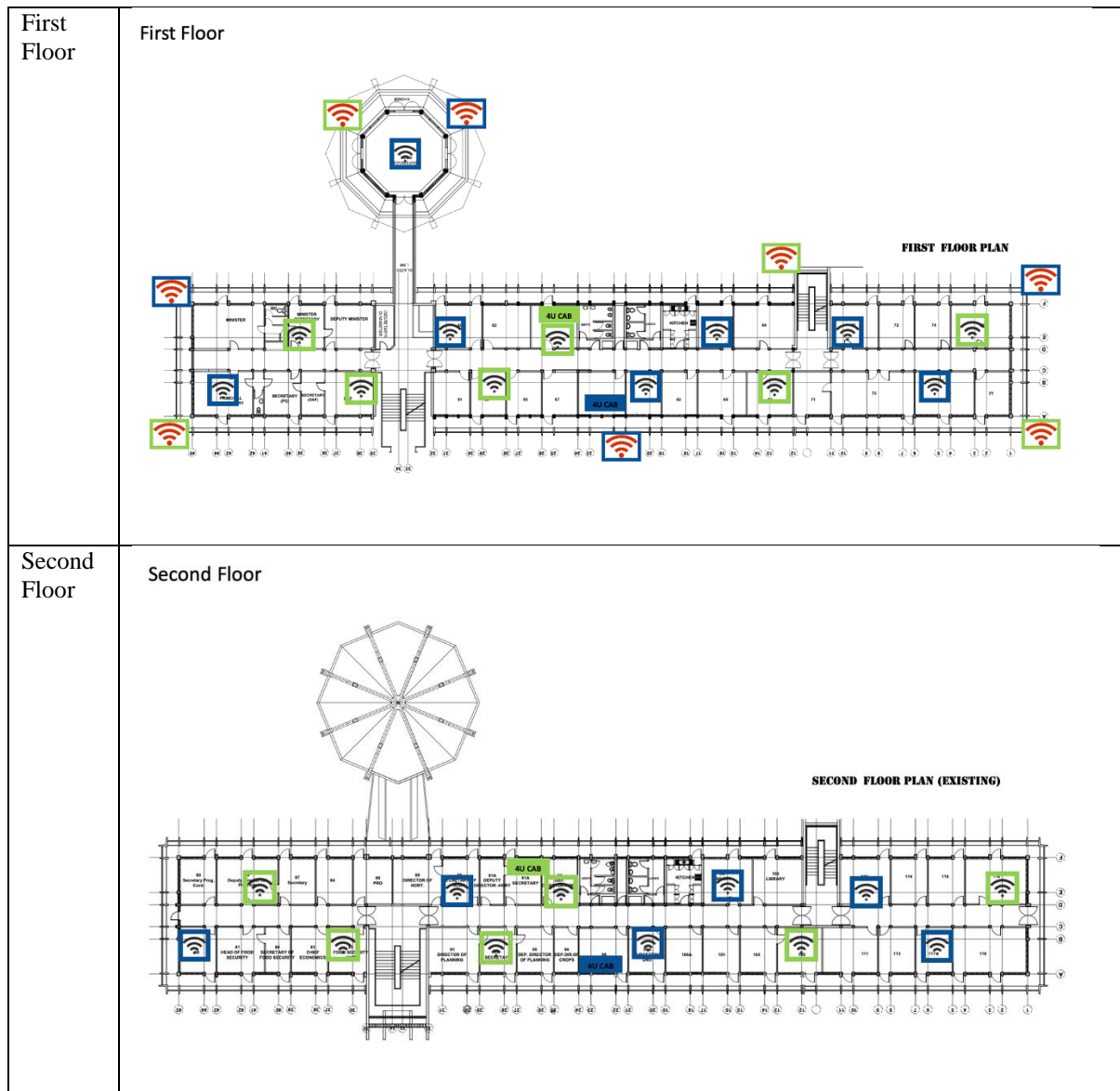
NO	ITEM	QUANTITY
1	Cat6e Unshielded Twisted Pair (UTP) Pure Copper LAN Cable - 305M	5

2	Indoor Access Point (High Performance)	36
3	Long Range Outdoor Access Point (High Performance)	8
4	Access switch (High Performance)	6
5	Aggregation Switch (High Performance)	1
6	Cat6e Shielded Twisted Pair (STP) Pure Copper LAN Cable - 305M	2
7	50X50 Trunking	12
8	Brush Panel	6
9	4U Wall Mount Network Cabinet	6
10	Universal gang Surge Power Extension 6 Sockets	6
11	Standard PVC Pipe 25mm 3 metres	50
12	25mm PVC Coupling	60
13	25mm PVC Bracket	100
14	RJ-45 Cat6 Connectors 1000 Pack	1
15	RJ-45 Cat6 Boots	1
16	8mm Fish plugs (white)& 8mm wood screws (50/box) complete	12
17	Cable ties - 6" Pack of 100	1
18	Cable ties - 8" Pack of 100	1
19	Cable ties - 12 " Pack of 100	1
20	Cable clips - 6mm	1
21	Cable clips - 8mm	1
22	Cable clips 12mm	1
23	8mm concrete drill bits	5
24	12mm concrete drill bits	5
25	Plastic Spiral Cable Manager	1
26	Optic Fibre Multimode (Uplinks to Building Aggregation Switch/Routers) Per 100M with assumption of 110M/uplink	6

Ministry of Justice

Floor Plans

Floor	Floor Plan
Ground	<p>Ground Floor</p>



Indicative Network Equipment

NO	ITEM	QUANTITY
1	Cat6e Unshielded Twisted Pair (UTP) Pure Copper LAN Cable - 305M	5
2	Indoor Access Point (High Performance)	37
3	Long Range Outdoor Access Point (High Performance)	8
4	Access switch (High Performance)	6
5	Aggregation Switch (High Performance)	1
6	Cat6e Shielded Twisted Pair (STP) Pure Copper LAN Cable - 305M	2
7	50X50 Trunking	12
8	Brush Panel	6
9	4U Wall Mount Network Cabinet	6
10	Universal gang Surge Power Extension 6 Sockets	6
11	Standard PVC Pipe 25mm 3 metres	50
12	25mm PVC Coupling	60
13	25mm PVC Bracket	100
14	RJ-45 Cat6 Connectors 1000 Pack	1

NO	ITEM	QUANTITY
15	RJ-45 Cat6 Boots	1
16	8mm Fish plugs (white)& 8mm wood screws (50/box) complete	12
17	Cable ties - 6" Pack of 100	1
18	Cable ties - 8" Pack of 100	1
19	Cable ties - 12 " Pack of 100	1
20	Cable clips - 6mm	1
21	Cable clips - 8mm	1
22	Cable clips 12mm	1
23	8mm concrete drill bits	5
24	12mm concrete drill bits	5
25	Plastic Spiral Cable Manager	1
26	Optic Fibre Multimode (Uplinks to Building Aggregation Switch/Routers) Per 100M with assumption of 110M/uplink	6

Appendix D - LOT 3: Department of Energy & Department of Fisheries

Note that the position or number of equipment's in the floor plans are indicative and not prescriptive.

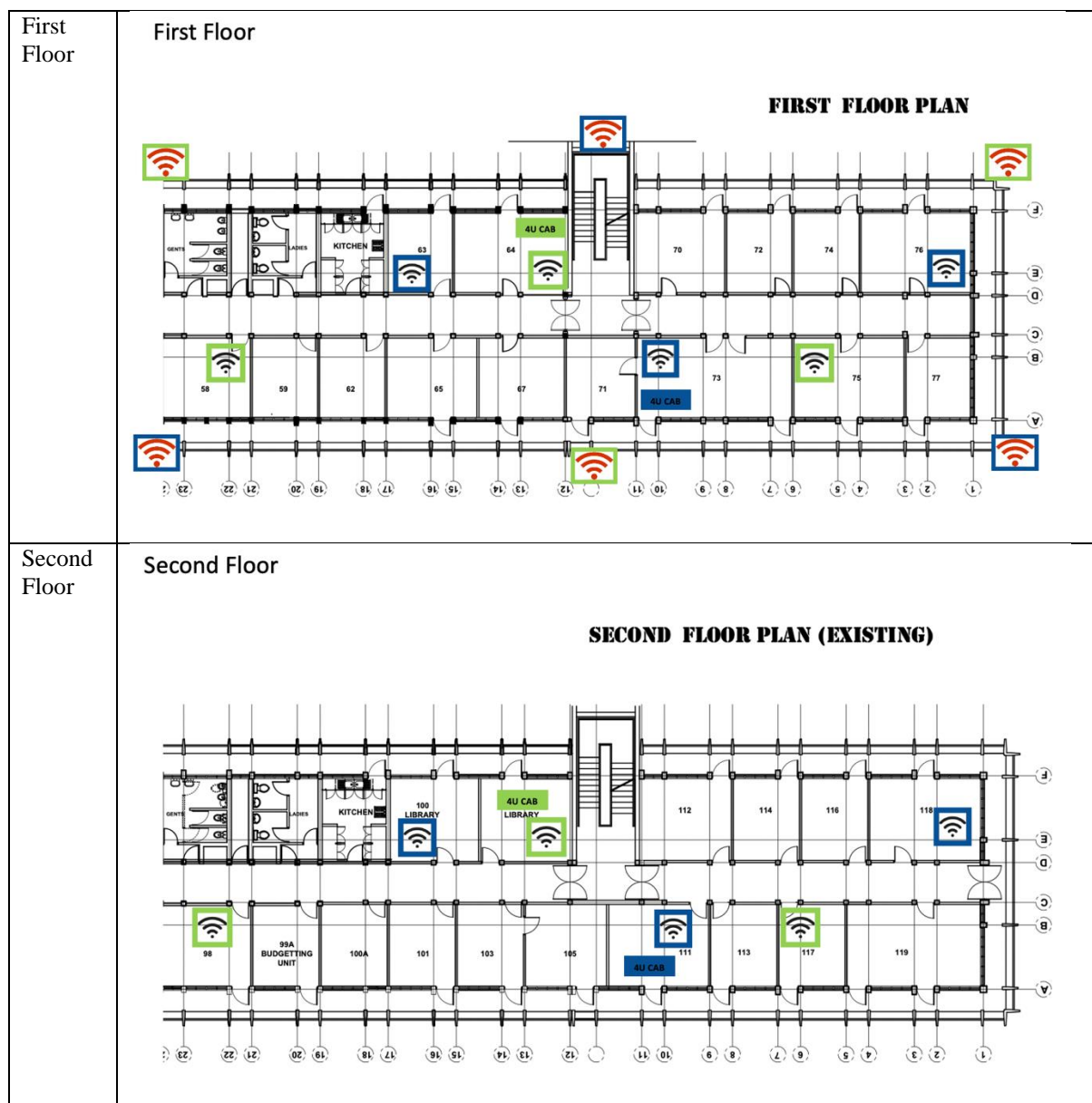
Scope:

No	Building
3.1	Department of Energy
3.2	Department of Fisheries

Department of Energy

Floor Plans

Floor	Floor Plan
Ground	<p>Ground Floor</p> <p style="text-align: center;">GROUND FLOOR PLAN</p>



Indicative Network Equipment

NO	ITEM	QUANTITY
1	Cat6e Unshielded Twisted Pair (UTP) Pure Copper LAN Cable - 305M	3
2	Indoor Access Point (High Performance)	18
3	Long Range Outdoor Access Point (High Performance)	6
4	Access switch (High Performance)	6
5	Aggregation Switch (High Performance)	1
6	Cat6e Shielded Twisted Pair (STP) Pure Copper LAN Cable - 305M	2
7	50X50 Trunking	6
8	Brush Panel	6
9	4U Wall Mount Network Cabinet	6
10	Universal gang Surge Power Extension 6 Sockets	6
11	Standard PVC Pipe 25mm 3 metres	25
12	25mm PVC Coupling	30

NO	ITEM	QUANTITY
13	25mm PVC Bracket	50
14	RJ-45 Cat6 Connectors 1000 Pack	1
15	RJ-45 Cat6 Boots	1
16	8mm Fish plugs (white)& 8mm wood screws (50/box) complete	12
17	Cable ties - 6" Pack of 100	1
18	Cable ties - 8" Pack of 100	1
19	Cable ties - 12 " Pack of 100	1
20	Cable clips - 6mm	1
21	Cable clips - 8mm	1
22	Cable clips 12mm	1
23	8mm concrete drill bits	3
24	12mm concrete drill bits	3
25	Plastic Spiral Cable Manager	1
26	Optic Fibre Multimode (Uplinks to Building Aggregation Switch/Routers) Per 100M with assumption of 110M/uplink	6

Department of Fisheries

Floor Plans

Floor	Floor Plan
Ground	<p>Ground Floor</p> <p style="text-align: center;">GROUND FLOOR PLAN</p>



Indicative Network Equipment

NO	ITEM	QUANTITY
1	Cat6e Unshielded Twisted Pair (UTP) Pure Copper LAN Cable - 305M	3
2	Indoor Access Point (High Performance)	18
3	Long Range Outdoor Access Point (High Performance)	6
4	Access switch (High Performance)	6
5	Aggregation Switch (High Performance)	1
6	Cat6e Shielded Twisted Pair (STP) Pure Copper LAN Cable - 305M	2
7	50X50 Trunking	6
8	Brush Panel	6
9	4U Wall Mount Network Cabinet	6
10	Universal gang Surge Power Extension 6 Sockets	6
11	Standard PVC Pipe 25mm 3 metres	25
12	25mm PVC Coupling	30

NO	ITEM	QUANTITY
13	25mm PVC Bracket	50
14	RJ-45 Cat6 Connectors 1000 Pack	1
15	RJ-45 Cat6 Boots	1
16	8mm Fish plugs (white)& 8mm wood screws (50/box) complete	12
17	Cable ties - 6" Pack of 100	1
18	Cable ties - 8" Pack of 100	1
19	Cable ties - 12 " Pack of 100	1
20	Cable clips - 6mm	1
21	Cable clips - 8mm	1
22	Cable clips 12mm	1
23	8mm concrete drill bits	3
24	12mm concrete drill bits	3
25	Plastic Spiral Cable Manager	1
26	Optic Fibre Multimode (Uplinks to Building Aggregation Switch/Routers) Per 100M with assumption of 110M/uplink	6