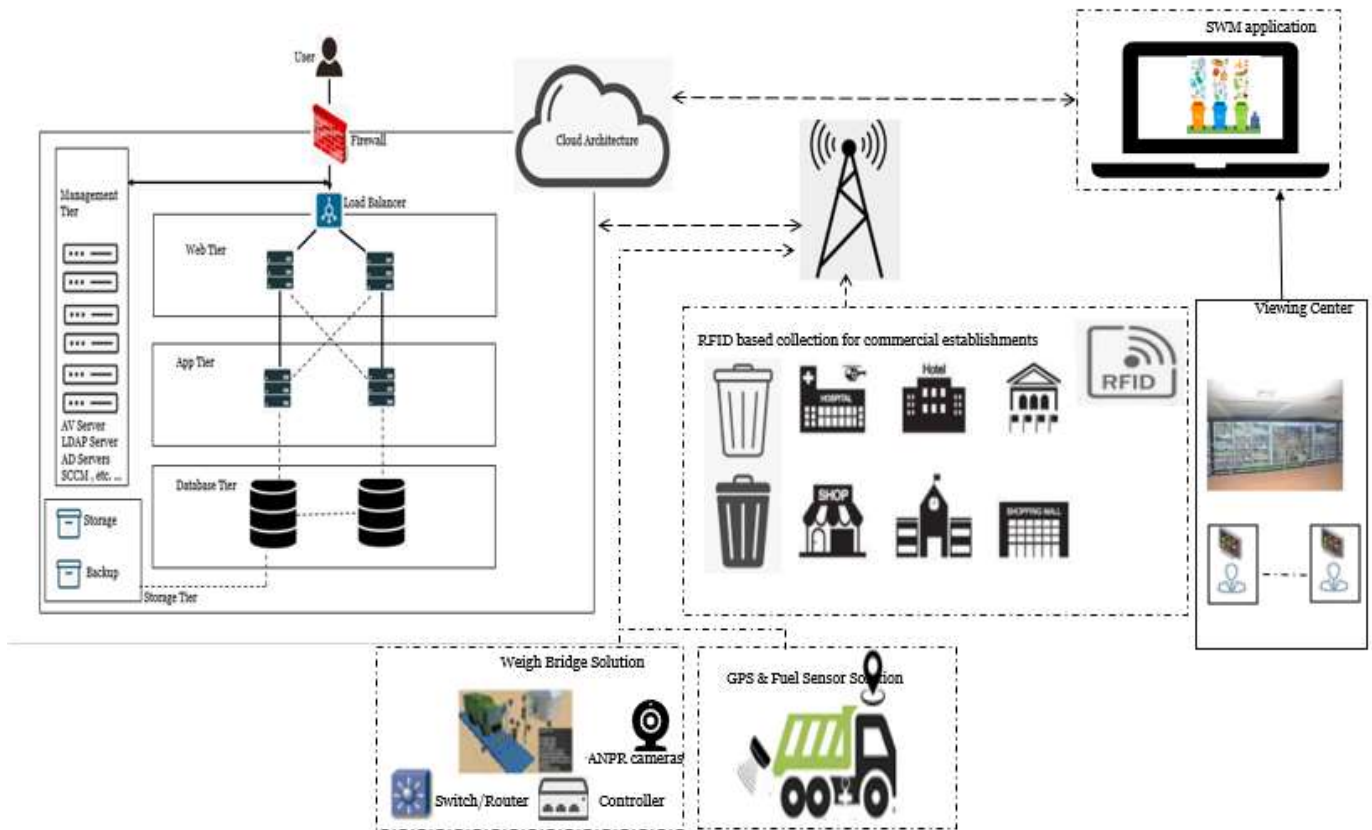


**Karimnagar Smart City Corporation Limited
(KSCCL)**

Solid Waste Management System

Proposed System Architecture



Indicative/Tentative Bill of Materials

Solid Waste Management System

Field Equipment BoM

S. No	Line Item	Unit	Qty	Cost per Unit	GST	Total Cost
1	RFID for establishments	Nos	1			
2	RFID Readers	Nos	1			
3	GPS Tracking unit	Nos	1			
4	GPS Tracking Existing - Integration with existing fleet management system	Nos	1			
5	4G enabled SIM Cards (For Auto, Trackers and Trucks)	Lot	1			
6	Fuel Sensor	Lot	1			
7	Development and Commissioning of Integrated SWM Application (web/mobile Compatible), SMS integration, Geocoding / Geofencing/ Survey of sites (Offices / dumping grounds / stations / bins), asset tracking including cameras, weigh bridge and MSI application for Project health checkup/audit and complain redressal system. This is Master view for Staff and Administrators.	Nos	1			
8	ANPR Camera	Nos	1			
9	ANPR Camera software	Nos	1			
10	Boom Barrier	Nos	1			
11	Automated Weigh Bridge Controller	Nos	1			
12	IP Camera	Nos	1			
13	Desktop	Nos	1			
14	SIM card/Broadband at Weigh bridge location	Nos	1			
15	Ruggedized 4G Supported Router with 8 port switches	Nos	1			
16	UPS (Offline 1 KVA)	Nos	1			
17	Poles including mounting structure and foundation	Nos	1			
18	Other Accessories (Electric and Network Cabling Infrastructure)	Nos	1			
19	Integration with existing Weigh bridge	Nos	1			
20	Civil work for movement of existing Weigh Bridge	Lot				

Cloud and Viewing center equipment BoM

S. No	Line Item	Unit	Qty	Cost per Unit	GST	Total Cost
1	Production Servers	Nos	1			
2	Database	Nos	1			
3	Storage - Drives - 1000 Gb	Nos	1			
4	Storage - Application (4000 GB)	Nos	1			
5	Antivirus for servers (for 3 years subscription)	Nos	1			
6	Cloud Network	Lot	1			
7	Network Connectivity – On field connection to IT Cloud components and viewing center	Lot	1			
8	Load Balancer	Nos	1			

Technical Specifications

Suggested Specifications

RFID Tag Specification

RFID Tag Specification		
S.No	Parameter	Specification
1	Type	ABS, High Quality Engineering Plastic
2	Supported	11S018000-6C EPC Class 1 GEN2
3	Transponders Frequency Range	ISM865-928MHz
4	Operation Mode	I Fixed Frequency or FHSS Software Programmable
5	Memory capacity	The tag should support I5018000-6C protocol standard 2K Bits storage capacity, 1728 Bits (216bytes) writable user area; MR6730B metal supports EPC C1 GEN2 (I5018000-6C), with 96Bits writable EPC Code area, 512Bits writable user area, and 32Bits password area, EPC 128-bit user 512-bit TID 96 bits.
6	Reading Rate	Software Programmable, Average Reading per 64Bits <10ms
7	Tags material	Metal material
8	Reading Range	Should be able to be calibrated. (to be kept as 2-4m max) based on the site visit.
9	Operation Temp	85°C to -35°C
10	IP Classification	IP 68
11	Weather	Heat, dust proof, UV resistant & sea water resistant.
12	Chemical Resistance	No physical or performance changes in 168-hour Motor oil exposure 168-hour Saltwater exposure (salinity 10%) 5 hrs Sulfric acid (10 %Ph 2) 1 h Naoh (10 % Ph 14) exposure
13	Size	110x60x2mm
14	Fixing Details	Shall be able fix with two screws on both sides and adhesive to hold on object.

15	Logo:	Logo printing using Laser engraving
16	Weight:	< 40 gm
17	Write Endurance	1,00,000 Cycle

RFID Reader Specification

RFID Reader Specification		
S.No	Parameter	Specification
1	Protocol	I5018000-6C EPC GEN2 , Configurable for mixed or single tag-type operation. Air interface software on IV7 is downloadable to add Gen 2 and Class 1 air interfaces and to "future-proof" the product as standards evolve and new features become available.
2	Frequency Range	Standard ISM 902 928MHz or 915 MHz (US FCC), 865 MHz (ETSI 302208), and 869 MHz (ETSI 300-220)
3	Operation Mode	FHSS
4	RF Power	10-30dBm, software adjustable
5	Reading Speed	Software Programmable Average Reading per 64Bits <6ms
6	Reading Mode	Timing or Touch, Software Programmable (reading should be such that the reader does reads two tags at a time)
7	Communication Mode with central server	TCP/IP and GPRS or higher
8	Data Input Port	Trigger input one time
9	Reading Range	Max 12 m(able to calibrate)
10	Communication Interface	RS232
11	Accessories	Vehicle-mount DC power cable kit Antennas, and antenna cables
12	Environmental Rating	IP65 or better
13	Humidity	10% - 90%

14	Shock and Vibration Protection	Withstands standard material handling vehicle environments. Meets or exceeds MIL STD 810F
15	Operating Temperature:	-25°C to 55°C (-13°F to 131°F)
16	Storage Temperature:	-30°C to 75°C (-22°F to 167°F)
17	Humidity	10% to 90%
18	Power Supply	Vehicle DC power 12 to 60V, 4.5 A maximum
19	Reading Indication	Buzzer , LED
20	Antenna	Circular polarization Gain 12dBi

Vehicle tracking system - GPS technical specifications

The vehicle is tracked based on GPS tracking mechanism, Scope of work includes the integration of vehicle GPS monitoring with the Viewing center/ICCC (whenever ready), the solid waste management application/software to monitor/track both existing GPS system and new vehicle tracking system

Integration of existing GPS system is part of the project and to be integrated and implemented by the Service Provider

GPS		
S.No	Parameter	Specification
1	Digital input	4
2	Analog input	2
3	Digital Output	2
4	Accelerometer	Yes
5	Remote SMS operation	Yes
6	SOS alarm	Yes
7	Running backup time	4 hours.
8	GPS and GSM antenna	Inbuilt in device
9	Power supply disconnection alert	Yes

10	Device temper alert	Yes
11	Internal memory to store logs	40,000 logs minimum
12	Speed log	Yes
13	Angle log	Yes
14	Distance travelled calculation	Yes
15	SMS command to get locations	Yes
16	SMS command to set ip and port	Yes
17	SMS command to set apn	Yes
18	Panic Alert	Yes
19	Shock acceptance criteria	Severity Level = 15g, Impact duration = 11ms, Impact Type = Half Line, Total number of impacts = 9 (3 on each axis)
20	Vibration acceptance criteria	Frequency range of 10-55-10 Hz in a sweep period of 1 min with continuously varying frequencies. For 1 Hrs(on each axis)
21	Ingress Protection (IP)	Water ingress according to IP 65 rating.
22	EMI /EMC	The device shall not generate electromagnetic disturbances that may influence other equipment in the vicinity.
23	Reverse polarity protection	Reversed voltage of 14 V for 12 V systems and 27 V for 24 V systems for 2 min after connecting the system to the suitable circuit.
24	Insulation Resistance	A voltage of 500 V DC. Acceptance Criteria: Insulation Resistance shall be > 1 MΩ.
25	Load Dump	Voltage spike of 123V, 8 Ohms 200ms
26	Dry Heat / High Temperature	Temperature of 70 ± 2°C for 16 h in high temperature. Test with device in working condition. The recovery period shall be 2 h.
27	Cold acceptance	Temperature of -10 ± 2°C for 2 h with device in working condition. The recovery period shall be 2 h.

28	Damp Heat acceptance	At +25° to +55° C, Humidity 95%. Six cycles (each test cycle of 24 h) shall be run with device in off condition. Functional test shall be carried out with power in 'On condition' at start of 2nd, 4th and 6th cycle.
29	Temperature Shock	Temperature shock test is carried out to determine if the device can withstand sudden changes in the temperature of the surrounding atmosphere without experiencing physical damage or deterioration in performance.
30	High Temperature	The device shall be subjected to temperature of 70 ± 2°C for 16 h in high temperature. Test with device in working condition. The recovery period shall be 2 h.
31	Salt Spray	The salt spray test is conducted to check corrosion resistance of device. The device shall be tested for 96 h.
32	High Voltage	The device under shall be operated for 36 V for 24 V systems, 18v for 12-volt system
33	Free Fall	Free fall at 500 mm.

4G SIM card specifications

4G enabled SIM Cards for autos, Trackers and Trucks for GPS system tracking

SIM Card		
S.No	Parameter	Specification
1	Cellular network	Any
2	Size	Micro/Mini
3	LTE	Yes

Fuel Sensor technical specifications

Fuel sensor is a device designed to make accurate measurements of fuel level in vehicle tanks. It helps in understanding and maintaining accuracy of the distance travelled and the fuel consumed by the vehicle

Fuel Sensor		
S.No	Parameter	Specification
1	Type	Fuel Sensor
2	Material	Metal , Stainless Steel
3	Float Material	Polypropylene
4	Max Pressure	100 PSIG
5	Application	Fuel Levelling
6	Weight	0-300gm
7	Color	Black, Brown, Dark Brown, Silver
8	Voltage	0-15VDC
9	Frequency	50Hz
10	Automatic Grade	Automatic
11	Protection class	IP67/IP68 or above
12	Operational temperature range	-40° to 100 ° C
13	Resistance	10-180 Ω
14	Resolution	5 mm (i.e. Output for level change by every 5 mm)
15	Calibration	All sensors calibrated to give 0-5 V DC Starting from Bottom to TOP of Sensor.

Application and Mobile App specification

Application development, customization, commissioning, SMS integration with the app, availability of app to be on both Web and Mobile with mobile version for Android and IOS users

S.No	Component	Specifications
1	Compatible	Application to be web and mobile compatible

2	GUI	User friendly
3	Mobile App	To be available for Android and Apple users
4	Security	HTTPS
5	Cloud	Application to be hosted on Public Cloud

Weigh Bridge

Automatic Number Plate Recognition (ANPR)

ANPR Cameras are capable of recording the number plates of the vehicles passing by its Field of view (FOV). These shall be strategically placed in junctions and on the streets in such a way that they are capable of capturing the vehicle number plates which are violating the traffic rules such as Red light, stop line, no helmet, speed and wrong direction based on the backend analytics configured. The evidence camera shall at the same time of generation of the violation snap shall capture the point of violation covering a wider FOV. The minimum specification of the cameras to be used is as below.

S No.	Particular	Technical Specification
1	Video Compression	H.264, MJPEG
2	Video Resolution	1920 X 1080 or better
3	Frame rate	Min. 30 fps
4	Image Sensor	1/3" Progressive Scan CCD / CMOS
5	Lens Type	Varifocal, C/CS Mount, IR Correction full HD lens
6	Lens	Auto IRIS 5~50mm /8 – 40 mm, F1.4
7	Minimum Illumination	Color: 0.5 lux, B/W: 0.1 lux (at 30 IRE)
8	IR Cut Filter	Automatically Removable IR-cut filter
9	Day/Night Mode	Color, Mono, Auto
10	S/N Ratio	≥ 50 Db

S No.	Particular	Technical Specification
11	Auto adjustment + Remote Control of Image settings	Color, brightness, sharpness, contrast, white balance, exposure control, backlight compensation, Gain Control, True Wide Dynamic Range
12	Local storage	Minimum 64 GB Memory card in a Memory card slot. In the event of failure of connectivity to the central server the camera shall record video locally on the SD card automatically. After the connectivity is restored these recordings shall be automatically merged with the server recording such that nonmanual intervention is required to transfer the SD card-based recordings to server
13	Protocol	IPV4, IPV6, HTTP, HTTPS, FTP/SMTP, RTSP, RTP, TCP, UDP, RTCP, DHCP, UPnP, NTP, QoS, ONVIFProfile S & G
14	Security	Password Protection, IP Address filtering, User Access Log, HTTPS Encryption
15	Casing	NEMA 4X / IP-66, IK10 rated
16	Intelligent Video	Motion Detection & Tampering alert
17	Alarm I/O	Minimum 2 Input & 1 Output contact for 3rd party interface
18	Certification	UL/EN, CE, FCC

Boom Barrier

S No.	Particular	Technical Specification
1	Heat Protection	Motor Cooling fan
2	Control	Remote and Switch signal
3	During Obstacle	Reversing
4	Manual release	Yes
5	Communication module	RS485

Weigh Bridge controller

S No.	Particular	Technical Specification
1	Digital display	Yes
2	Automatic reset force	Yes
3	Vehicle number, tare storage	Yes
4	Keyboard Calibration	Yes
5	Tare	Subtract, digital filtering, clear automatic

Fixed Camera

S.No	Parameter	Minimum Specifications
1	Video Compression	H.265 or above
2	Video Resolution	1920 X 1080
3	Frame rate	25 FPS at all resolutions with Controllable Bit
		Rate/ Bandwidth and Frame Rate
4	Operating frequency	50 Hz
5	Image Sensor	1/3" Progressive Scan CCD / CMOS or better
6	Lens Type	Varifocal, IR Corrected Full HD compatible to camera imager, Auto/P-Iris
7	Lens	Varifocal, IR Corrected Full HD lens compatible to camera imager (3-10mm or better)
8	Electronic Shutter	Manual/Automatic
9	Multiple Streams	Minimum Dual streaming with 2nd stream at minimum 720P at 25fps at H.265 or better individually configurable
10	Minimum Illumination	Colour: 0.5 lux, B/W: 0.1 lux

S.No	Parameter	Minimum Specifications
		Internal Illuminator with visibility should be at least 50 Meter or better
11	IR Cut Filter	Automatically Removable IR-cut filter
12	Day/Night Mode	Yes, with IR Cut Filter
13	S/N Ratio	≥ 50 dB
14	Auto adjustment + Remote Control of Image settings	Colour, brightness, sharpness, contrast, white balance, exposure control, backlight compensation, Gain Control, Wide Dynamic Range
15	Wide Dynamic Range	True WDR 120 db. or better
16	Privacy Masks	Minimum 4
17	Audio	Full duplex, line in and line out, G.711/G.726
18	Local storage	Minimum 128 GB Local storage microSDXC/SD slot. In the event of failure of connectivity to the central server the camera shall record video locally on the SD card automatically. After the connectivity is restored these recordings shall be automatically merged with the server recording such that no manual intervention is required to transfer the SD card-based recordings to server
19	Edge Storage	SD Card Slot with minimum 128 GB Support Class 10 speed
20	Protocol	Protocol IPv4/IPv6, IGMP, ICMP, TCP, UDP, DHCP, RTP, RTSP, RTCP, DNS, DDNS, NTP, FTP, UPnP, HTTP, HTTPS, SMTP, 802.1x, ONVIF Profile S & preferably G
21	Security	Password Protection, IP Address filtering, User Access Log, HTTPS encryption
22	Intelligent Video	Motion Detection & Tampering alert
23	Alarm I/O	Minimum 1 Input & Output contact for 3rd part interface
24	Operating conditions	-20 to +60 degree C
25	Interface	RJ 45, 100 Base TX
26	Humidity	Humidity 10–95% RH (condensing)
27	Casing	NEMA 4X / IP-66 rated & IK 08 or higher

S.No	Parameter	Minimum Specifications
28	Certification	UL, CE, FCC
29	Power	802.3af PoE (Class 0) and 12VDC/24AC// POE+ IEEE 902.3at Compliant
30	Physical security	Detection of camera tampering and Detection of Motion should be possible using either camera or VMS

Desktop

Desktops will be used in the Viewing center and Weigh bridge location for respective executive to do their day to day work. These desktops will be high configuration machines with upgradation option and network connection made available to the application (Cloud services)

S.No	Component	Technical Requirement Specification	
1	Desktops	Processor	Intel Core i5 or above Processor
		Generation	10th Gen or higher
		Speed	2.3 GHz with Turbo Boost Upto 2.8 GHz
		RAM	8 GB or higher
		HDD Capacity	Minimum 1 TB
		VGA Port	Yes
		HDMI port	Yes
		Screen Size	14.1 inch or higher
		Graphic Memory Capacity	1GB or higher
		Battery Backup	Up to 3.5 hours
		Wireless LAN	IEEE 802.11b/g/n
		Web Camera	0.9 Megapixel
		OS	64-bit Windows / Equivalent Open Source (With OEM Licenses)
		Processor	Intel Core i5 or above Processor

Switch

The network switch shall be defined in such a way that the cameras, controller and the UPS/DCPS shall be connected to the same to be accessed. The minimum specification is as below

S No.	Parameter	Minimum Specifications or Better
1	Type	Managed Outdoor Industrial grade switch with Industrial Grade power supply (AC/DC)
2	Total Ports	8 ports
3	PoE Standards	IEEE 802.3af, at or better
4	Protocols	IPv4, IPv6, Support 802.1Q VLAN, DHCP support, IGMP, SNMP Management, Loop protection and Loop detection support, Ring Protection support, End point authentication, NTP support
5	Access Control	Support port security, Support 802.1x (port-based network access control), Support for MAC filtering
6	PoE Power per port	Sufficient to operate edge devices connected including VMBs & PAS
7	Enclosure Rating	IP 30 or equivalent Industrial Grade Rating (to be housed in Junction Box)
8	Operating Temp	0 to 50 deg C or better industrial Grade Rating
9	Multicast Support	IGMP Snooping V1, V2, V3; MLD Snooping V1, V2
10	Management	RS-232/USB/RJ45 console port for management via a console terminal or PC; Web GUI; NTP; Syslog for log capturing; SNMP V1, V2, V3
11	Certification	UL/EN/IEC or equivalent

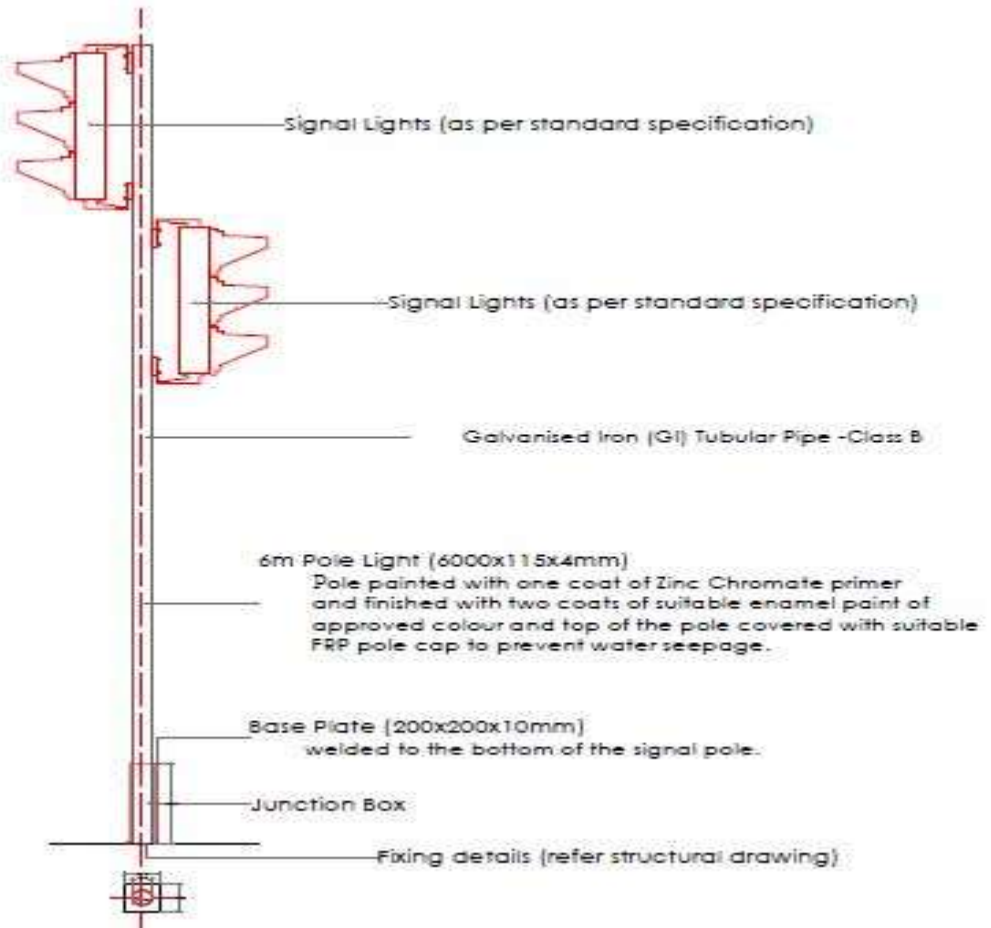
UPS

Uninterrupted Power Supply of 1 KVA to be installed at the weigh bridge location to have a power back arrangement (Min. 2 hrs.) for the smooth functioning of the controller and IT infrastructure at the location at the time of power shortage

S.No	Particular	Technical Specification
1	Capacity	2.5/3 KVA
2	Technology	IGBT based PWM Technology, True Online UPS/DCPS
3	Input Frequency Range	Preferably 45 to 55 Hz
4	Output Frequency Range	Preferably 45 to 55 Hz
5	Output Voltage	230VAC/12VDC/24VDC
6	Voltage Regulation	Preferably +/- 2% (or better) and with built in Over Voltage Cut off facility in the Device
7	Frequency	Preferably 50 Hz +/- 0.1% (free Run Mode)
8	Battery Backup	Minimum 2 hrs backup
9	Battery Type	Preferably Lead acid, Sealed Maintenance Free (SMF)
10	Alarms & Indications	All necessary alarms & indications essential for Performance monitoring of UPS like mains fail, low battery & fault detection
11	Bypass	Automatic, Manual Bypass Switch
12	Certifications	For Safety & EMC as per international standard

Standard Pole specifications for mounting structure

S.No	Technical Specification
1	Pole type Hot Dip Galvanized after Fabrication with Silver coating of 86 micron as per IS:2629; Fabrication in accordance with IS-2713 (1980)
2	Height (ground-clearance): minimum 4.5 up to 6 meters, as per project site requirements. Based on the location requirement suitable size standard pole to be considered.
3	Pole Diameter: Minimum 10cm diameter pole (bidder to choose larger diameter for higher height)
4	Bottom base plate: Minimum base plate of size 30x30x1.5 cm
5	Mounting facilities: To mount Traffic signals, Pedestrian Signals, PA system Switch, etc.
6	Pipes, Tubes: All wiring must be hidden, through tubes/pipes. No wires shall be visible from outside
7	Foundation: Casting of Civil Foundation with foundation bolts, to ensure vibration free erection (basic aim is to ensure that video feed quality is not impacted due to winds in different climatic conditions). Expected foundation depth of min. 100 cms
8	Protection: Lightning arrester shall be provided, to protect all field equipment mounted on pole



Servers and databases

The solid waste management application system needs a server with different tiers like Web tier, App tier and Database tier which will be used in designing the application and for data security and demarcation of each server. The Web Server will be used to launch the client application remotely through web browsers. The servers to be redundant and be on high availability mode

Database will be used for maintaining, managing and solve important queries and to fetch information, a redundant IaaS/PaaS based database server is expected to host the data of Solid Waste Management application

Server		
S.No	Parameter	Minimum Specifications or better
1	Processor	4

2	Memory	16 Gb
3	Internal storage	1 TB SAS/SATA disk with extensible bays
4	OS	Windows preferred
5	Virtualization	Shall support hypervisor like Hyper-V, Zen, etc

Storage

Storage to be on cloud and to be unlimited and can be expanded anytime with just few clicks

Network connection to cloud is the responsibility of SI

Storage		
S.No	Parameter	Minimum Specifications or better
1	Redundant	3 Tb with YoY increment of 500 Gb till end of tenure
2	Availability	Immediate
3	Type	File based

Network

All the data generated via GSM/SIM/GPS have to be stored at a server in redundant mode
 Network connectivity will be the responsibility of the vendor. Server will be situated in the public cloud and to be easily accessible over network/internet. The communication network is the integral part which helps to communicate between the field devices and central application. All the components of the network where all the processing of the information is done are to be interconnected for better communication and data processing

Load balancer

Load Balancer		
S.No	Parameter	Minimum Specifications or better
1	Layer	Either 3/4/7
2	Ports	TCP, HTTP, HTTPS, SSL and others
3	Health Checks	Yes

Antivirus Licenses

It is the responsibility of the Service provider to provide Antivirus licenses on all desktop/laptop/servers/databases provisioned under this project. All the licenses to be valid for full duration of operational period. The anti-virus software should be of renowned brands

Antivirus Solution

S.No	Minimum Specifications
1	The proposed solution should scan files and identifies infections based on behavioral characteristic of viruses (Trojan/ Worm, Joke, Hoax, Virus, other).
2	Ability to scan through all file types and various compression formats. Ability to scan for HTML, VBScript Viruses, malicious applets and ActiveX controls.
3	The proposed solution should be able to record critical endpoint data- even while devices are offline or outside your corporate network to quickly detect infected systems.
4	The proposed solution should provide real time active protection.
5	The proposed solution should auto-quarantine spyware or adware without end-user interaction.
7	The solution should provide the capabilities to log administrative activities such as changes to policies, agent override activities, agent termination and agent uninstall key generation in the management console.
8	Must update itself over internet for virus definitions, program updates etc. (periodically as well as in push-updates in case of outbreaks).
9	Shall provide Real-time product Performance Monitor and Built-in Debug and Diagnostic tools, and context- sensitive help.
10	The solution must provide protection to multiple remote clients.
11	Shall provide for virus notification options for Virus Outbreak Alert and other configurable Conditional Notification.