



REQUEST FOR PROPOSAL

FOR

SELECTION OF AGENCY FOR SETTING UP NETWORK OF SMART ELEMENTS IN PUNE CITY

Volume 2 – Scope of Work

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The Chief Executive Officer

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Table of Contents

1. Glossary.....	4
2. Scope of Work	5
2.1. Component Architecture	5
2.2. Project Implementation Timelines	7
3. Common guidelines / comments regarding the compliance of IT / Non-IT Equipment / Systems to be procured	8
4. Functional & Technical Requirements.....	9
4.1. Smart Element #1: City Wi-Fi	9
4.1.1. Objectives.....	9
4.1.2. Functional Specifications.....	9
4.1.3. Technical Specifications	11
4.2. Smart Element #2: Emergency Box.....	15
4.2.1. Functional Specifications.....	15
4.2.2. Technical Specifications	15
4.3. Smart Element #3: Public Address System	16
4.3.1. Functional Specifications.....	16
4.3.2. Technical Specifications	16
4.4. Smart Element #4: Environmental Sensors	17
4.4.1. Functional Specifications.....	17
4.4.2. Technical Specifications	17
4.5. Smart Element #5: Variable Messaging Displays	19
4.5.1. Functional Specifications.....	19
4.5.2. Technical Specifications	19
4.6. Smart Element #6: Smart City Operations Center (SCOC)	22
4.6.1. Objectives.....	22
4.6.2. Functional & Technical Specifications of the Application Software.....	22
4.6.3. Integration Capabilities	29
4.6.4. Other Requirements	30
4.6.5. Technical Specifications	30
4.7. Common Scope elements (to all Smart Elements).....	33
5. Implementation Timelines and Terms of Operations	42
5.1. Proposed Implementation timelines.....	42
5.2. Advertisement and marketing guidelines	42
6. Annexure #1: List of proposed locations	43
6.1. List of Proposed Locations for Wi-Fi hot spots.....	43
6.1.1. List of Hospitals in Pune City	43
6.1.2. List of Gardens in Pune City	44
6.1.3. Key Road (stretches) in each ward office.....	47
6.2. List of Proposed Locations for Emergency Call Boxes.....	50
6.3. List of Proposed Locations for Public Address System.....	54
6.4. List of proposed Locations for Environmental Sensors.....	58
6.5. List of Proposed Locations for Variable Messaging Display	61

- 7. Annexure #2: List of other smart city projects as part of Pune Smart city program (projects currently in progress as well as proposed projects) 66**
- 8. Annexure #3: List of required manpower/ resources on the project.....71**

1. Glossary

Terms	Meaning
ABB	Aundh Baner Balewadi (Area based development)
BOM	Bill of Material
BEC	Bidders Evaluation Committee
CC	Capital Cost
CCTV	Closed Circuit Television
CEO	Chief Executive Officer
DD	Demand Draft
EMD	Earnest Money Deposit
GIS	Geographical Information Systems
GoM	Government of Maharashtra
GPS	Global Positioning System
HOD	Head of Department
ICT	Information and Communication Technology
INR	Indian Rupee
LoI	Letter of Intent
NPV	Net Present Value
OEM	Original Equipment Manufacture
PBG	Performance Bank Guarantee
PDD	Proposal Due Date
PMC	Pune Municipal Corporation
PoC	Proof of Concept
PQ	Pre-Qualification
PSCDCL	PUNE Smart City Development Corporation Limited
PSU	Public Sector Undertaking
RFP	Request for Proposal
PV	Present Value
SCOC	Smart City Operations Center
SI	System Integrator
SLA	Service Level Agreement
SOP	Standard Operating Procedures
TQ	Technical Qualification
UAT	User Acceptance Testing
VM	Virtual Machine
WSP	Wi-Fi Service Provider
TRV	Total Revenue

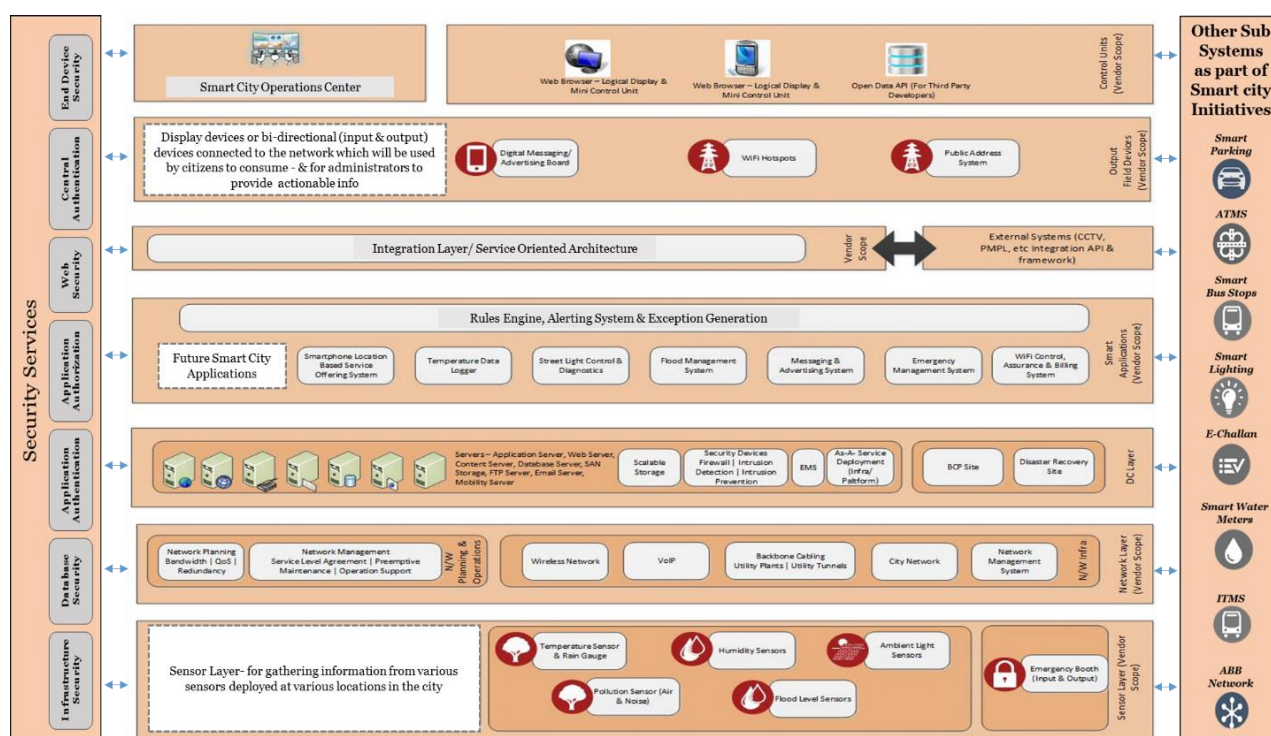
2. Scope of Work

This volume (Vol 2) details out the functional and technical specifications for each identified smart element. It also include details of proposed locations as part of implementation scope. Successful bidder shall be responsible for carrying out the detailed survey in order to finalize the locational coverage and infrastructure requirements; and shall submit the detailed survey report along with detailed project execution plan to PSCDCL.

It is to be noted that the activities defined within functional and technical specifications are to be taken as benchmark requirements and are indicative and may not be exhaustive. For any doubt on these specification, bidders are required to align the requirements to meet Project Objectives and Project Scope Summary, as referred in section 4.4 and section 4.5 respectively of Volume 1.

2.1. Component Architecture

Various components of the project, including expected system users, are shown in the component architecture diagram below. Please note that this component architecture is indicative in nature and is given in the RFP to bring clarity to prospective bidders on the overall scope of project and its intended use. The successful bidder shall carry out the detail requirement analysis and finalize the Technical Architecture in consultation with PSCDCL and it's consultants. As per the figure below, the architecture of the complete network of smart elements is organized into 7+1 layers.



2.1.1. Sensor Layer

The sensor layer will help the city administration gather information about the ambient city conditions or capture information from the edge level devices like emergency call boxes, cameras, etc. Pune city is expected to have multiple environmental sensors across the city, to measure ambient conditions such as light intensity, temperature, water level (for chronic flood spots), air pollution, noise pollution and humidity.

2.1.2. Network Layer

The secured network layer will serve as the backbone for the project and provide connectivity to gather data from sensors and communicate messages to display devices and actuators. It will support the Wi-Fi services and other smart elements (Sensors and displays) at given locations. The network layer will be scalable such that additional sensors, actuators, display devices can be seamlessly added and more Wi-Fi spots created in future.

2.1.3. Data Center Layer

The data center layer will house centralized computing power required to store, process and analyze the data to decipher actionable information. This layer includes servers, storage, ancillary network equipment elements, security devices and corresponding management tools. Similar to the network layer, it will be scalable to cater to the increasing computing and storage needs in future.

2.1.4. Smart Application Layer

The smart applications layer will contain data aggregation and management systems (rules engines, alerting systems, diagnostics systems, control systems, messaging system, events handling system), and reporting / dashboard system to provide actionable information to city administrators and citizens. It will be an ever evolving layer with applications added and integrated in a seamless manner with the existing applications.

2.1.5. Integration Layer

While aspects of ambient conditions within the city will be gathered through various sensors deployed as a part of present RFP, some city specific data will come from other government and non-government agencies. It is through the integration layer – that data will be exchanged to and from the under lying architecture components and other data from system developed by government (such as police department, meteorological department, street lights department, water department, irrigation department, transport organizations within Pune, etc.) and non-government agencies. Please refer to annexure 2 for further details of integration requirements with other sub-systems under smart city implementation.

2.1.6. Output Field Devices Layer

The output field devices layer will contain display devices or bi-directional (input & output) devices connected to the network which will be used by citizens to consume - and for administrators to provide - actionable information. Such field devices include digital messaging boards, environmental data displays, PA systems and emergency boxes.

2.1.7. Control Units & Command Center Layer

The command center and control units will enable citizens and administrators alike to get a holistic view of city conditions. Such control units will take shape of either an exhaustive command center or control applications which can be viewed over a web browser or available in form of a mobile application. The Successful Bidder will have to develop a command center at a site location determined by PSCDCL and web/ mobile based viewing tools for understanding the ambient city conditions.

2.1.8. Security Layer

As ambient conditions, actuators and display devices are now connected through a network, security of the entire system becomes of paramount significance and the system integrator will have to provide:

- Infrastructure security- including policies for identity and information security policies
- Network security- including policies and practices adopted to prevent and monitor unauthorized access, misuse, modification, or denial of a computer network and network-accessible resources, etc.
- Identity and Access Management – including user authentication, authorisation, SSL & Digital Signatures
- Application security- including Hosting of Government Websites and other Cloud based services, connecting to NIXI & Sec. 43A compliance audits, Adoption of Technical Standards for Interoperability Framework and other standards published by GoI for various eGovernance applications
- End device security, including physical security of all end devices such as display boards, emergency boxes, kiosks etc.

Following security parameters should be included for all smart elements, but not limited to:

- Identity and access management
- User/administrator audit log activity (logon, user creation, date-time of PA announcements, voice recording etc.)
- Secured data storage (storage of video/image/voice/location/data captured by various smart elements)
- SSL/TLS encryption for web and mobile application based interfaces for sensitive data transfer
- Protection against Denial of Service (DoS) and Interference attacks to public Wi-Fi Devices

2.2. Project Implementation Timelines

- The project is envisaged to be implemented within **6 months** upon issue of the Work Order.
- Operations and management of the entire system including its sub systems, customer support and responsibility as per SLAs for the duration of **5 years post successful implementation.**

3. Common guidelines / comments regarding the compliance of IT / Non-IT Equipment / Systems to be procured

- The specifications mentioned for various IT / Non-IT components are indicative requirements and should be treated for benchmarking purpose only. Bidders are required to undertake their own requirement analysis and may propose higher specifications that are better suited to the requirements.
- Any manufacturer and product name mentioned in the RFP should not be treated as a recommendation of the manufacturer / product.
- None of the IT / Non-IT equipment proposed by the bidder should be End of Life product. It is essential that the technical proposal is accompanied by the OEM certificate in the format given in this RFP, where-in the OEM will certify that the product is not end of life product & shall support for at least 66 months from the date of Bid Submission.
- Technical Proposal should be accompanied by OEM's product brochure / datasheet. Bidders should ensure complete warranty and support for all equipment from OEMs. All the back-to-back service agreements should be submitted along with the Technical Bid.
- All equipment, parts should be Original and New.
- The User Interface of the system should be a User Friendly Graphical User Interface (GUI).
- Critical / Core components of the system should not have any requirements to have proprietary Platforms and should conform to open standards.
- For the custom made modules, Industry standards and norms should be adhered to for coding during application development to make debugging and maintenance easier. Object oriented programming methodology must be followed to facilitate sharing, componentizing and multiple-use of standard code. The application shall be subjected to Application security audit to ensure that the application is free from any vulnerability.
- The Successful Bidder should also propose the suitable specifications of any additional servers / other hardware, if required for the system.
- The Servers provided should meet industry standard performance parameters (such as CPU Utilization of 60% or less, disk utilization of 75% or less).
- SI is required to ensure that there is no choking point / bottleneck anywhere in the system (end-to-end) to affect the performance / SLAs.
- All the hardware and software supplied should be from the reputed Original Equipment Manufacturers (OEMs). PSCDCL reserves the right to ask replacement of any hardware / software if it is not from a reputed brand and conforms to all requirements specified in tender documents.
- OEMs for Servers, Enterprise Storage and Wired & Wireless LAN Access Infrastructure should be placed in Gartner MQ Leaders Segment as per latest Gartner Report OR should have double digit market share as per latest IDC Report in their respective products.
- All necessary hardware, software, licenses etc. IPR will be in the name of PMC/ PSCDCL.
- Successful bidder shall make the details of new technologies, new hardware available in the market to PSCDCL. Both, PSCDCL and SI, in agreement, will take decision of new technology/ hardware implementation in case any new/ advanced technology comes up during the contract period.

4. Functional & Technical Requirements

The sub-sections specified below shall give the benchmark specifications for each of the scope elements of the project.

#	Smart Element	Functional Specifications	Technical Specifications
4.1.	City Wi-Fi	See Section 4.1.1.	See Section 4.1.2.
4.2.	Emergency Call Box/ Panic button	See Section 4.2.1	See Section 4.2.2
4.3.	Public Address System	See Section 4.3.1.	See Section 4.3.2.
4.4.	Environmental Sensors	See Section 4.4.1.	See Section 4.4.2.
4.5.	Variable Messaging Displays	See Section 4.5.1.	See Section 4.5.2.
4.6.	Smart City Operations Center	See Section 4.6.1.	See Section 4.6.2.

4.1. Smart Element #1: City Wi-Fi

4.1.1. Objectives

- 1) The broad level objectives of the proposed Pune City Wi-Fi project are as follows:
 - To provide easily accessible, cost effective yet highly available Internet connectivity to all residents / visitors of Pune
 - Be yet another enabler to reduce the digital divide and easy accessibility to citizen-centric, interactive model of governance
 - To open up information channels for more citizen engagement and increased transparency
- 2) City Wi-Fi Internet access shall be free at the proposed Wi-Fi hotspots, which are going to be places of high footfalls, major traffic junctions, gardens and areas of key tourist attractions.
- 3) Wi Fi shall be offered to residents / visitors with a maximum download limit of 50 MB per day per user or free for 30 minutes a day whichever is earlier, after which it will be available on a paid basis.
- 4) Offered solution shall allow wireless access through various kinds of devices such as smart phones, laptops, tablets, and desktops. All e-Governance applications by PMC, State Government and Central Government shall be excluded from this download / free time limit.

4.1.2. Functional Specifications

The broad scope of work for the Wi-Fi Service Provider (WSP) would include providing Internet Connectivity to public through Wi-Fi network at selected locations (herewith called as Wi Fi hotspots, locations for the same given in section 5.1 of this document) within the city of Pune. This includes Supply, Installation, Commissioning and Maintenance of software, hardware and networks components required for providing Wi-Fi in these areas. WSP shall be required to undertake following activities for the same:

- 1) Site survey to assess and confirm the exact requirement for each of the sites (in order to adhere to the QoS requirements)
- 2) Take necessary approvals from concerned authorities for the digging requirements or for any field level work
- 3) Supply of necessary hardware / software and their installation, configuration

- 4) Implementation of the Wi-Fi access portal, co-branded with PSCDCL
- 5) Implementation of NOC, necessary tools to monitor and manage the entire system
- 6) Testing and commissioning of the Wi-Fi Network
- 7) Monitoring of the usage, comprehensive maintenance for the period of 5 years post successful Go Live, WSP shall maintain the sufficient spares to ensure 24 X 7 uptime.

a) Broad Features of the Wi-Fi Services

- 1) Provide secure, easy and metered Internet access to different devices through the Wi-Fi network.
- 2) Provide the web based portal for users to login/authenticate for the Wi-Fi Access. The Landing Web Page to be co-branded (between PSCDCL & WSP).
- 3) Provisioning the access control and audit trail mechanism as per industry standard and security norms defined by various regulatory bodies.
- 4) Provide the web based management console to monitor and manage the Wi-Fi access.
- 5) Ensure adherence to the following QoS parameters
 - Bandwidth Commitment: Minimum 512 Kbps per user (1:1) within designated area
 - 24*7*365 Wireless network availability
 - Seamless roaming facility within the Pune City, across all Wi Fi hotspots
- 6) Users must be able to use same access details (login id/ username and password) even if he/she moves from one Wi Fi spot zone to another to provide unified experience of connectivity for the citizen.
- 7) Facility to define rule based access depending on usage, time duration, etc.
- 8) Facility to restrict access based on URL, application, category, signature, etc. Facility to the designated Government agency / agencies to restrict the Wi-Fi access in case of certain circumstances.
- 9) Free Access for the first 30 minutes or 50 MB of download in a day (whichever is earlier) (or within max. 23 hours)
- 10) Seamless facility to extend the usage of Wi-Fi services (beyond free time) through multiple payment mechanisms within the network provided by the WSP
- 11) All e-Governance applications by PMC, State Government and Central Government (the list to be shared / updated by DIT) to be whitelisted on the network for free usage, through-out the day, unlimited use.
- 12) Provision of customizable reports for Wi-Fi Access Logs. Role Based Access Control to all management and reporting functions.
- 13) Facility to enable/disable specific user/system from Wi-Fi Access based on system MAC address, mobile number used for authentication etc.
- 14) Provide Customer Care Toll free number, E-mail ID for support

b) Standards, Policies and Other Compliances

- 1) WSP shall ensure a secure wireless connectivity and Internet access through user name and password or Mobile OTP based to all the subscribers with centralized authentication mechanism.
- 2) WSP shall ensure the uniqueness of usernames. Simultaneous multiple logons shall not be allowed.
- 3) Wireless access points shall be encrypted with cryptographic keys to ensure that only authorized and authenticated users can use the wireless service.
- 4) Proposed wireless network shall be secure and in compliance Indian Laws and DoT directives.
- 5) WSP shall maintain logs of the Internet users for prescribed period as per the DOT guidelines.
- 6) WSP shall suggest and help in deploying required policies at various levels to prevent any intrusion attack in the wireless network.
- 7) Physical security of the equipment and relevant accessories should be the sole responsibility of the Vendor.
- 8) WSP shall impose restrictions on access and download from malicious sites for City Wi-Fi users. Such sites shall be as notified by TRAI/ regulatory agencies and also be notified to Successful Bidder from time to time by PSCDCL.
- 9) PSCDCL will only provide the space for locations. Any infrastructure, furnishings and hardware at each of the locations will be done by the WSP, as part of the proposed service.
- 10) No overhead cables will be allowed

c) Design Requirements

- 1) Hotspots should cover entire area of locations given in RFP document. WSP will be responsible for design and engineering of all the network components to meet coverage and capacity requirements of hotspots based on the parameters: Area of Wi-Fi hotspot, Peak load and Density of user devices/concurrent users/Connections required in the area. Successful bidder should test the entire location and ensure availability of the Wi-Fi services before declaring it ready for rollout to the client.
- 2) Based on the hotspots capacity requirements, WSP shall determine and provide number of Access points per Hotspot as per the: required Internet bandwidth (both per Hotspot and per user) and aggregated total bandwidth per hotspot. WSP can consider the contention ratio of 1:10 per user from day 1 of implementation of the project.
- 3) Successful Bidder must ensure appropriate bandwidth allocation for free and paid Wi-Fi users as well for carrying data for all the sub systems with built in scalability for enhanced usage needs as time goes within the contractual period. Within the contractual period, if Wi-Fi technology is changed, the newer technology to be provided by the WSP to ensure cutting edge solution to the end consumers.

4.1.3. Technical Specifications

Components to be provided and installed by the WSP should perform following functions for throughput and bandwidth requirements.

Component	Function
Access Point	Outdoor Wi-Fi Access Point
WLAN Controller	Wireless Controller to control and manage Wi-Fi Access Points
Edge Level Switch	Field level PoE Switches to connect APs
Wired & Wireless Network Management System	For Network & WLAN infrastructure Management
Backbone Network	Connectivity from the Edge Level

a) Wi-Fi Access points (AP)

- The network and access points should support creation of robust and reliable mesh network topology based on the field surveys of areas of Pune city (PMC Areas).
- The access point should be capable of performing security scanning and serving clients on the same radio. It should be also capable of performing spectrum analysis and security scanning using same radio.
- AP should comply key International and Indian standards for safety, including RF radiations. APs must protect internally stored configuration information.
- To maintain consistent quality of service for users, network traffic should be prioritized according to applications/users and handled in the AP/Controllers or upstream devices so that critical traffic is processed immediately and network congestions are avoided.
- AP itself should be IP66 certified or better for outdoor deployment. Use of external 3rd party casing as workaround for AP's IP66 rating shall not be allowed.
- AP mounting kit should be with locking mechanism so that AP cannot be removed without using special tools.

b) Wi-Fi Controller

- Should be, capable of managing atleast 1500 Wireless AP and should be scalable as and when required. Should be deployed in high availability mode.
- Throughput performance should be at least 40Gbps or more
- The proposed architecture should be based on Centralized Controller deployment model. AP's should download OS and configuration from controller for improved security.
- The controller solution should facilitate monitoring, management, control, and up-gradation from the centralized Wi-Fi Management Center
- The controllers should communicate back and forth with the centralized security system and network management system in real time.
- The WLAN solution should have the hardware/software to implement advance WIDS & WIPS
- The systems should be able to detect malicious attacks such as Evil Twin, Honeypot, Denial of Service, ARP Poisoning-based attacks which can cripple down the public Wi-Fi system

c) Edge Level Switch

- Minimum 4 port,10/100/TX PoE/PoE+ (May require higher port density at some locations, depending upon site conditions; and May require fiber ports at some locations, depending upon site conditions/distances)
- PoE Standard : IEEE 802.3af/ IEEE 802.3at or better
- Protocol Support :
 - IPV4,IPV6
 - Support 802.1Q VLAN
 - DHCP support
 - IGMP
 - SNMP Management
 - Should support Loop protection and Loop detection
 - Should support Ring protection
 - End point Authentication
- Operating Temperature : 0 – 50 degree C or better

d) Wired & Wireless Network Management System

- Manage all Access Points and Controllers proposed under this requirement.
- Provide real-time monitoring, pro-active alerts, historical reporting, efficient troubleshooting through centralized intuitive user interface
- Allow quick location of users and wireless devices for troubleshooting, planning and asset tracking.
- Provide client troubleshooting tools, including showing client Signal to Noise Ratio (SNR), Received Signal Strength Indicator (RSSI) and session throughput.
- Provide tools to help better manage RF coverage, address security issues, location tracking to provide a clear picture of who is on the network, their location and how the network is performing.
- Aggregate, correlate, alerts and logs wireless attacks that have been detected and reported on the network, providing a comprehensive picture of infrastructure.
- Provide detailed performance statistics for WLAN equipment (statistics related with bandwidth, coverage etc.), also provide graphical details of WLAN utilization, average data rate, WLAN traffic etc. on a per AP basis

e) Backbone Network

- The public Wi-Fi network architecture design should follow all the relevant, latest BIS, DeitY, IEEE guidelines, and WPC standards for access points
- The network should support mesh technology and provide seamless and connectivity with the controllers and backhaul network.
- Backbone Network should perform load balancing users' traffic between multiple access points (umbrella coverage) as well as different bands in an access point so that there is a fair allocation of airtime to each user.
- Backbone Network should have built-in encryption mechanism to encrypt all communications and data transfer over the Wi-Fi for all the users of Wi-Fi, for sake of security and privacy.

4.2. Smart Element #2: Emergency Box

4.2.1. Functional Specifications

- a) The emergency box (or panic button) will enable citizens to establish a two way audio (microphone and speaker) & camera (video camera and a video screen) communication link with Police (or / and with PMC's Disaster Management Cell or Smart City operations Center) through a press of a button.
- b) Emergency/ Panic buttons to be strategically located, suitably sized and identified/clearly labelled for "Emergency".
- c) The emergency feature must also be available within the mobile app (sub section of PMC umbrella application to be developed) which will enable the user to initiate a bidirectional audio call with Police /Smart City Operations Center.
- d) The unit shall preferably have a single button which when pressed, shall connect to PSCDCL.

4.2.2. Technical Specifications

#	Parameter	Minimum Specifications or better
1.	Construction	Cast Iron/Steel Foundation, Sturdy Body for equipment
2.	Call Button	Watertight Push Button, Visual Feedback for button press
3.	Speaker & Microphone	VOIP Phone, Hands-free calling, Watertight and industrial grade equipment
4.	Connectivity	3G/4G/Ethernet/Fibre as per solution offered
5.	CCTV Camera	IP based, Color camera with minimum D1 resolution, Day/Night mode operations
6.	Battery	Internal Battery with different charging options (Solar/Mains)
7.	Power	Automatic on/off operation
8.	Casing	IP-65 rated for housing
9.	Operating Conditions	0° to 50°C
10.	Certification	UL/CE/EN

4.3. Smart Element #3: Public Address System

4.3.1. Functional Specifications

- a) The Public Address System (PA) should be capable of addressing citizen at specific locations from Smart City Operations Center.
- b) The proposed system shall contain an IP based announcing control connected to the Smart City Operations Center.
- c) Public Address system shall be used at intersections, public places, market places or those critical locations as identified by PSCDCL to make important announcements for the public. It shall be able to broadcast messages across all PA systems or specific announcement could be made to a particular location supporting single zone / multi zone operations. The system shall also deliver pre-recorded messages to the loud speakers attached to them from CD/DVD Players & Pen drives for public announcements.
- d) The system shall contain an IP based amplifier and uses PoE power that could drive the speakers. The system shall also contain the control software that could be used to control/monitor all the components of the system that includes Controller, Calling Station & keypad, Amplifier (Mixing & Booster).
- e) The SI shall describe in detail the design, operational and physical requirements of the proposed public announcement system to demonstrate compliance with all the specified requirements of RFP.
- f) PA system's master controller should have function keys for selecting the single location, group of locations or all locations, simple operation on broadcasting to any terminal or separated zones.
- g) PA system's master controller should facilitate multiple MIC inputs and audio inputs.

4.3.2. Technical Specifications

#	Parameter	Minimum Specifications or better
1.	PAS system	Should have the capability to control individual PAS i.e. to make an announcement at select location (1:1) or multiple locations (1: many). The PAS should also support both, Live and Recorded inputs
2.	Speakers	<ul style="list-style-type: none"> • Minimum 2 Speaker, to be used in different directions • Minimum 200 Watts of amplification
3.	Connectivity	IP Based
4.	Access Control	Access control mechanism would be also required to establish so that the usage (including sound volume) is regulated.
5.	Integration	Smart City Operations Center, Police Command Control Center, Traffic Control Center
6.	Battery	Internal Battery with different charging options (Solar/Mains)
7.	Power	Automatic on/off operation
8.	Casing	IP-65 rated for housing
9.	Operating conditions	0° to 50°C

4.4. Smart Element #4: Environmental Sensors

4.4.1. Functional Specifications

- a) Smart environment sensors will gather data about pollution, temperature, rains, levels of gases in the city (pollution) and any other events on a daily basis. It is for information of citizens and administration to further take appropriate actions during the daily course / cause of any event.
- b) The environment sensors should have the following capabilities:
 - They should be ruggedized enough to be deployed in open air areas, on streets and parks
 - They should be able to read and report at least the following parameters: Temperature, Humidity, Ambient Light, Sound, CO, NO₂, NO_x, CO₂, SO₂.
- c) Smart environment sensors will enable citizen to keep a check on their endeavours which impact environment and enable the city to take remedial action if required. These environmental sensors can also be connected via 3G or 4G wireless network. It is not mandatory to connect all sensors via MPLS fiber network.
- d) The data should be collected in a software platform that allows third party software applications to read that data. Various environment sensors shall sense the prevailing environment conditions and send the data to the integrated control system where real time data resides and the same shall be made available to various other departments and applications for decision making.
- e) Successful bidder can also make use of the nearby Variable messaging displays wherever possible (need to be finalized post detailed survey of locations).
- f) The sensor management platform should allow the configuration of the sensor to the network and also location details etc.
- g) PMC's Disaster department gets information from Maharashtra's irrigation department on a daily basis at agreed intervals. It currently maintains a real time water level monitoring system which provides information around the following parameters:
 - Reservoir water level and storage status
 - Rain fall status in the dams
 - Dam discharge status
 - River discharge status
- h) PMC will make this information available to successful bidder to be integrated with the environmental monitoring system. (Further information can be viewed at: <http://punefloodcontrol.com/>). Bidder need to make relevant information available on the displays along with other environmental sensor data in consultation with PSCDCL.
- i) Additionally, the bidder should install water level monitoring (flood sensors) at low lying areas of the city. These locations may differ from the locations of other environmental sensors and need to be finalized after the detailed location survey by the successful bidder, in consultation with PSCDCL. The bidder should consider implementation of these sensors atleast at 50 locations.
- j) The environment sensors will measure and log the data from locations described in section 5.4. The list of existing environmental sensors is also given in section 5.4 of this volume.

4.4.2. Technical Specifications

#	Parameter	Specification
1.	Measurement principle	<ul style="list-style-type: none"> • Temperature, Humidity, Ambient Light, Sound, CO, NO₂, NOX, CO₂, SO₂
2.	Measurement component Measurement range	<ul style="list-style-type: none"> • NO₂: 0 to 10 ppm • NOX : 0 to 50ppm , 5000ppm • SO₂ : 0 to 500 ppm • CO : 0 to 50ppm, 5000ppm • O₃: up to 1000 ppb • CO₂ : 0 to 10% / 0 to 20% • PM 2.5: 0 to 230 micro gms / cu.m • PM 10: 0 to 450 micro gms / cu.m • Light: up to 10,000 Lux • UV: up to 15 mW/ cm² • Noise: up to 120 dB (A)
3.	Rain Water measurement	<ul style="list-style-type: none"> • Rainfall in millimetres (mm)
4.	Water levels (for flood monitoring)	<ul style="list-style-type: none"> • Data integration with existing system (APIs will be provided)
5.	Repeatability	<ul style="list-style-type: none"> • $\pm 0.5\%$ FS
6.	Zero drift	<ul style="list-style-type: none"> • $\pm 1.0\%$ FS max./week ($\pm 2.0\%$ FS/week max. if range is less than 200ppm) • $\pm 2.0\%$ FS max./month for O₂ meter
7.	Temperature and Humidity Sensor	<ul style="list-style-type: none"> • Real-time Temperature Range: Indoor -10°C ~ +70°C (+14°F ~ +122°F) • Real-time in Air Humidity Level Display (up to 100%)
8.	Span drift	<ul style="list-style-type: none"> • $\pm 2.0\%$ FS max./week • $\pm 2.0\%$ FS max./month for O₂ meter
9.	Response speed	<ul style="list-style-type: none"> • 120 seconds max. for 90% response from the analyser inlet
10.	Connectivity (Minimum)	<ul style="list-style-type: none"> • USB / Ethernet connectively to graphical display

4.5. Smart Element #5: Variable Messaging Displays

4.5.1. Functional Specifications

- a) VMD will be installed at identified strategic locations. The location of VMDs will be on the key junctions (mostly on the sides without obstructing the traffic) and other strategic locations with large foot fall. The VMD software application will allow user to publish specific messages for managing traffic and also general informative messages.
- b) VMD will enable PSCDCL to communicate effectively with citizens and also improve response while dealing with exigency situations. These will also be used to regulate the traffic situations across the city by communicating right messages at the right time.
- c) The variable message display shall consist of variable message signboard with local controller, for local controls in few situations.
- d) A VMD software system shall be provided to the Smart City Operations Center for message preparation monitoring and control of the variable message signs. IP based Network equipment shall be provided to connect the VMD with the VMD software system.
- e) VMD software application will provide the normal operator to publish predefined sets of messages (textual / image). The application shall have an option for supervisor (someone with appropriate authority) to bypass the control during certain situations and to write in free-text mode.
- f) VMD software application will allow an operator to seamlessly toggle between multiple VMS points at each workstation in order to send specific messages to specific locations, as well as sending common message to all VMDs.
- g) VMD software application will accommodate different access rights to various control unit functionalities depending on operator status and as agreed with the client. Software should be GUI based, and capable to handle 200 VMS signage. User should be able to select desired location in Map and this should enable user to see the live status of that specific VMD. x
- h) The variable messaging displays can also be used for advertisement purposes. Approximately 20% of the total running time will be utilized by PSCDCL for its own discretion whereas the remaining time can be used by the SI for advertisement purpose. Refer section 5.2 for key terms and conditions for advertising and marketing guidelines.
- i) The land for VMDs will be provided to the SI at no extra cost. Also no rental/lease charges will be levied on the bidder for using the land for Variable Message Signboards. The bidder will also have an option to share part of revenue as mentioned in Commercial Evaluation in Volume 1_ Terms of reference.

4.5.2. Technical Specifications

i. Display

#	Specifications	Minimum Requiriements
1.	Location	<ul style="list-style-type: none"> To be installed at locations identified by PSCDCL and the text on the sign must be readable even in broad daylight
2.	Colour	True Colour

3.	Brightness & Legibility	<ul style="list-style-type: none"> To be read even in broad daylight without any shade The displayed image shall not appear to flicker to the normal human eye >6000 cd/m²
4.	Luminance Class	L-3 as per EN 12966
5.	Contrast Ratio	R2-R3 as per EN 12966
6.	Beam Width	B6+ : Viewing angle shall ensure message readability for citizens, motorists, pedestrians, etc on the respective locations
7.	Display capability	<ul style="list-style-type: none"> Fully programmable, full color, full matrix, LED displays Alpha-numeric, Pictorials, Graphical & video
8.	Display Language	<ul style="list-style-type: none"> To support both pictograms and bilingual (English and Devnagari) text
9.	Display Front Panel	<ul style="list-style-type: none"> It shall utilize a front face that is smooth, flat, scratch-resistant, wipe-clean 100% anti-glare
10.	Message Creation	Through both a Central Control Room Application and a local Laptop/Device loaded with relevant software
11.	Language	Multilingual (Marathi/English/Hindi) and all fonts supported by windows
12.	Auto Dimming	Auto dimming adjusts to ambient light level.
13.	In built Sensor	Photoelectric sensor
14.	Storage capacity	Minimum 60 GB
15.	Display Area	Display size of VMD should be 2.88 x 1.92 meters
16.	Number of Lines & Characters	The number of lines and characters can be customized as per the requirement (Min 3 Lines & 10 Characters)
17.	Brightness & contrast	Controlled through software
18.	Display Driving method	Direct current control driving circuit. Driver card of display applies Direct Current Technology
19.	Display Style	Steady, flash, partial flash, right entry, left entry, top entry, bottom entry, canter spread, blank, and dimming
20.	Connectivity	IP Based
21.	Access Control	Access control mechanism would be also required to establish so that the usage is regulated.
22.	Integration	<ul style="list-style-type: none"> Interface with GPRS or Ethernet Integration with Smart City Operations Center and service providers for offering G2C and B2C services
23.	Construction	Mounting structure shall use minimum 6 Mtrs. high hexagonal/octagonal MS Pole or suitable structure with 5.5 mtr. Minimum vertical clearance under the VMS sign from the Road surface.

24.	Battery	<ul style="list-style-type: none"> • 230VAC+ 15%, 50Hz, Single Phase (automatically re-start in the event of an electricity supply failure) • Batteries with solar charging options can also be recommended as back up
25.	Power	Automatic on/off operation
26.	Casing	<ul style="list-style-type: none"> • Weather-proof Display for VMS • IP-66 rated for housing all control equipment
27.	Operating conditions	0° to 55°C
28.	Message Validity	If the controller is unable to connect to the server for the next message, it shall not display the old message, which has passed its expiry time. Instead it shall be programmed to display a default message.

ii. Application Software for VMS (Control Messaging Application at Data Center)

The Application System for Controlling Messaging for VMS shall:

- 1) Be deployable over multiple (3 to 4) workstations.
- 2) Ensure that provision for feeding/updating the following information:
 - a. VMS messages and information
 - b. Types of possible scenarios per VMS
 - c. Types of possible messages to be displayed on each VMS during various scenarios
- 3) Ensure that the normal operator users are not able to publish any custom message and shall only display predefined sets of messages.
- 4) The application shall have an option for Supervisor (someone with appropriate authority) to bypass the control during certain situations and to write in free-text mode.
- 5) Ensure that users can publish specific messages for managing traffic and also general informative messages.
- 6) Allow an operator to seamlessly toggle between multiple VMS points at each workstation in order to send specific messages to specific locations.
- 7) Accommodate different access rights to various control unit functionalities depending on operator status and as agreed with the client.

4.6. Smart Element #6: Smart City Operations Center (SCOC)

4.6.1. Objectives

- 1) The vision of the Smart City Operations Center (SCOC) is to have an integrated view of all the smart initiatives undertaken by PMC / PSCDCL / Other City based Organisations, with the focus to serve as a decision support engine for city administrators in day to day operations or during exigency situations. This dynamic response to situations, both pre-active and re-active will truly make the city operations “SMART”.
- 2) Smart City Operations Center (SCOC) involves leveraging on the information provided by various departments and providing a comprehensive response mechanism for the day-to-day challenges across the city. SCOC shall be a fully integrated, web-based solution that provides seamless incident – response management, collaboration and geo-spatial display.
- 3) SCOC shall facilitate the viewing and controlling mechanism for the selected field locations in a fully automated environment for optimized monitoring, regulation and enforcement of services. The smart city operations center shall be accessible by operators and concerned authorized entities with necessary authentication credentials.
- 4) Various smart elements are able to use the data and intelligence gathered from operations of other elements so that civic services are delivered lot more efficiently and in an informed fashion.

4.6.2. Functional & Technical Specifications of the Application Software

Various functional requirements of the SCOC application System are given in the table below:

#	Functions	Minimum Specifications
1.	Solution & Platform	The Command & Control solution should be implemented and complied to the industry open standards based Commercial-of-the-shelf (COTS) products.
2.		Must have built-in fault tolerance, load balancing and high availability & must be certified by the OEM.
3.		Software (Application, Database and any other) must not be restricted by the license terms of the OEM from scaling out on unlimited number of cores and servers during future expansion.
4.		System must provide a comprehensive API (Application Program Interface) or SDK (Software Development's Kit) to allow interfacing and integration with existing systems.
5.		The solution should be network and protocol agnostic and provide option to connect legacy system through API's with either read, write or both options. It should connect diverse on premise and/or cloud platform's and makes it easy to exchange data and services between them.
6.		The system shall allow seamless integration with all of the department's existing and future initiatives (e.g. open source intelligence, situation management war room, etc.)
7.		The platform should be able to integrate with any type of sensor platform being used for the urban services irrespective of the technology used.

8.		The platform should be able to normalize the data coming from different devices of same type (i.e. Different lighting sensor from different OEMs, different energy meters from different OEMs etc.) and provide secure access to that data using data API(s) to application developers
9.	Convergence of Multiple feeds / services	<p>System need to have provision that integrates various services and be able to monitor them and operate them. The solution should provide option to integrate existing deployed solution by City and also need to provide scalability option to implement new use cases.</p> <p>System should have capability to source data from various systems implemented in Pune City (being implemented as part of this project or other projects, as specified in Annexure 2 of this volume) to create actionable intelligence</p>
10.	Industry Standards for the Command & Control Center	The solution should adhere to the Industry standards for interoperability, data representation & exchange, aggregation, virtualization and flexibility
11.		IT Infrastructure Library (ITIL) standards for Standard Operations Plan & Resource Management
12.		Geo Spatial Standards like GML & KML etc.
13.		Business Process Model and Notation (BPMN) or equivalent for KPI Monitoring.
14.	Command & Control Center Components	Web server to manage client requests. Client should provide web-based, one-stop portals to event information, overall status, and details. The user interface (UI) to present customized information in various preconfigured views in common formats. All information to be displayed through easy-to-use dashboards.
15.		<p>Application server to provide a set of services for accessing and visualizing data. Should be able to import data from disparate external sources, such as databases and files. It should provide the contacts and instant messaging service to enable effective, real-time communication. It should provide business monitoring service to monitor incoming data records to generate key performance indicators. It should also provide the users to view key performance indicators, standard operating procedures, notifications, and reports, spatial-temporal data on a geospatial map, or view specific details that represent a city road, building or a area either on a location map, or in a list view. The application server should provide security services that ensure only authorized users and groups can access data.</p> <p>Analytics functionality can be part of application server or separate server</p>
16.	Incident Management Requirements	The system must provide Incident Management Services to facilitate the management of response and recovery operations:
17.		Should support comprehensive reporting on event status in real time manually or automatically by a sensor/CCTV video feeds.
18.		Should support for sudden critical events and linkage to standard operating procedures automatically without human intervention.

19.		Should support for multiple incidents with both segregated and/or overlapping management and response teams.
20.		Should support Geospatial rendering of event and incident information.
21.		Should support plotting of area of impact using polynomial lines to divide the area into multiple zones on the GIS maps.
22.		Should support incorporation of resource database for mobilizing the resources for response.
23.		Should provide facility to capture critical information such as location, name, status, time of the incident and be modifiable in real time by multiple authors with role associated permissions (read, write). Incidents should be captured in standard formats to facilitate incident correlation and reporting.
24.		The system must identify and track status of critical infrastructure / resources and provide a status overview of facilities and systems
25.		Should provide detailed reports and summary views to multiple users based on their roles.
26.		A Reference Section in the tool must be provided for posting, updating and disseminating plans, procedures, checklists and other related information.
27.		Provide User-defined forms as well as Standard Incident Command Forms for incident management.
28.	Integrated User Specific & Customizable Dashboard	Should provide integrated dashboard with an easy to navigate user interface for managing profiles, groups, message templates, communications, tracking receipts and compliance
29.		<ul style="list-style-type: none"> Collects major information from other integrated City sensors/platforms. should allow different inputs beyond cameras, such as, PC screen, web page, and other external devices for rich screen layout Multi-displays configurations Use of, GIS tool which allows easy map editing for wide area monitoring (Google map, Bing map, ESRI Arc GIS map, etc.).
30.		Should provide tools to assemble personalized dashboard views of information pertinent to incidents, emergencies & operations of command center
31.		Should provide historical reports, event data & activity log. The reports can be exported to pdf or html formats.
32.		Should provide dashboard filtering capabilities that enable end-users to dynamically filter the data in their dashboard based upon criteria, such as region, dates, product, brands, etc and capability to drill down to the details

33.	Integration with Social Media & Open Source Intelligence	Should provide integration of the Incident Management application with the social media. Should Provide analytics based on the social media feed collected from the open source intelligence and collate with the surveillance inputs to alert the responders for immediate action on the ground.
34.		Should extract messages and display it in a operational dashboard.
35.		Should be able to correlate the extracted message from the social media with existing other events and then should be able to initiate an SOP.
36.		Should be able to identify the critical information and should be able to link it to an existing SOP or a new SOP should be started.
37.		Should provide notifications to multiple agencies and departments (on mobile) that a new intelligence has been gathered through open source/social media.
38.	Device Status, Obstruction Detection and Availability Notification	Should provide ICON based user interface on the GIS map to report non-functional device.
39.		Should also provide a single tabular view to list all devices along with their availability status in real time.
40.		Should provide User Interface to publish messages to multiple devices at the same time.
41.	Event Correlation	Command & Control Center should be able to correlate two or more events coming from different subsystems (incoming sensors) based on time, place, custom attribute and provide correlation notifications to the operators based on predefined business and operational rules in the configurable and customizable rule engine.
42.	Standard Operations Procedures (SOP)	Command & Control Center should provide for authoring and invoking un-limited number of configurable and customizable standard operating procedures through graphical, easy to use tooling interface.
43.		Standard Operating Procedures should be established, approved sets of actions considered to be the best practices for responding to a situation or carrying out an operation.
44.		The users should be able to edit the SOP, including adding, editing, or deleting the activities.
45.		The users should be able to also add comments to or stop the SOP (prior to completion).
46.		There should be provision for automatically logging the actions, changes, and commentary for the SOP and its activities, so that an electronic record is available for after-action review.
47.		The SOP Tool should have capability to define the following activity types:

48.		Manual Activity - An activity that is done manually by the owner and provide details in the description field.
49.		Automation Activity - An activity that initiates and tracks a particular work order and select a predefined work order from the list.
50.		If-Then-Else Activity - A conditional activity that allows branching based on specific criteria. Either enter or select values for Then and Else.
51.		Notification Activity - An activity that displays a notification window that contains an email template for the activity owner to complete, and then sends an email notification.
52.		SOP Activity - An activity that launches another standard operating procedure.
53.	Key Performance Indicator	Command & Control Center should be able to facilitate measurement or criteria to assay the condition or performance of departmental processes & policies.
54.		Green indicates that the status is acceptable, based on the parameters for that KPI, no action is required.
55.		Yellow indicates that caution or monitoring is required, action may be required.
56.		Red indicates that the status is critical and action is recommended.
57.	Reporting Requirements	Command & Control Center should provide easy to use user interfaces for operators such as Click to Action, Charting, Hover and Pop Ups, KPIs, Event Filtering, Drill down capability, Event Capture and User Specific Setup
58.		The solution should generate Customized reports based on the area, sensor type or periodic or any other customer reports as per choice of the administrators
59.	Collaboration Tools	Should provide tools for users to collaborate & communicate in real-time using instant messaging features.
60.	Communication Requirements	The solution should adhere to the below mentioned communication requirements.
61.		Provide the ability to search/locate resources based on name, department, role, geography, skill etc. for rapidly assembling a team, across department, divisions and agency boundaries, during emergency
62.		Provide the capability to Invite - Using information provided during the location of those individuals or roles, invite them to collaborate and to share valuable information.
63.		Provide a single web based dashboard to send notifications to target audiences using multiple communication methods including voice-based notification on PSTN/Cellular, SMS, Voice mail, E- mail and Social Media

64.		The solution should provide Dispatch Console integrates with various communication channels. It should provide rich media support for incidents, giving dispatchers the power to consolidate information relating to an incident and instantly share that information among responder teams. It should assess the common operating picture, identify & dispatch mobile resources available nearby the incident location. Augment resources from multiple agencies for coordinated response.
65.	Authentication	Use authentication information to authenticate individuals and/or assign roles.
66.	Instant messaging	Provide ability to converse virtually through the exchange of text, audio, and/or video based information in real time with one or more individuals within the emergency management community.
67.	Events and Directives control	Should provide the capability for the events that are produced from a sub-system and are forwarded to the Command & Control Center. Events could be a single system occurrence or complex events that are correlated from multiple systems. Events could be ad hoc, real-time, or predicted and could range in severity from informational to critical. At the Command & Control Center, the event should be displayed on an operations dashboard and analyzed to determine a proper directive.
68.		Directives issued by the Command & Control Center should depend on the severity of the monitored event. Directives will be designed and modified based on standard operating procedures, as well as state legislation. A directive could be issued automatically via rules, or it could be created by the operations team manually.
69.	What-if Analysis Tool	The solution should provide the capability to manage the emergencies and in-turn reducing risks, salvaging resources to minimize damages and recovering the assets that can speed up recovery.
70.		To take proactive decisions that help minimize risks and damages, the solution should provide Analytical and Simulation systems as part of the Decision Support System. The solution should help simulate what if scenarios. It should help visualize assets/resources at risk due to the pending/ongoing incident, should render impacted region on a GIS/3D map. The solution should help build the list of assets, their properties, location and their interdependence through a easy to use Graphical User Interface. When in Whatif Analysis mode the solution should highlight not only the primary asset impacted but also highlight the linked assets which will be impacted. The user should be able to run the What-if Analysis mode for multiple types of emergency events such as Bomb Blast, Weather events, Accidents etc.
71.	Resource & Route Optimization	Should provide Optimization software that should be the consolidation of the OPL integrated development environment and the CPLEX and CP Optimizer solution engines in a single component
72.		Should provide an optimization engine for solving problems expressed as mathematical programming models.

73.		Should provide a software library of constraint programming tools supporting constraint propagation, domain reduction, and highly optimized solution search.
74.	Alert & Mass Notification Requirements	The system should provide the software component for the message broadcast and notification solution that allows authorized personal and/or business processes to send large number of messages to target audience (select-call or global or activation of pre-programmed list) using multiple communication methods including SMS, Voice (PSTN/Cellular), Email and Social Media.
75.		Provide a single web based dashboard to send notifications to target audiences using multiple communication methods including voice-based notification on PSTN/Cellular, SMS, Pager, Voice mail, E-mail and Social Media
76.		Provide function for creating the alert content and disseminating to end users. Provision of alerting external broadcasting organizations like Radio, TV, Cellular, etc., as web-service.
77.	Security & Access Control	Provide Role based security model with Single-Sign-On to allow only authorized users to access and administer the alert and notification system.
78.	Internet Security	Provide comprehensive protection of web content and applications on back-end application servers, by performing authentication, credential creation and authorization.
79.	Authorization	Comprehensive policy-based security administration to provide all users specific access based on user's responsibilities. Maintenance of authorization policy in a central repository for administration purposes.
80.	User group	Should support to enable assignment of permissions to groups, and administration of access control across multiple applications and resources. Secure, web-based administration tools to manage users, groups, permissions and policies remotely
81.	Provide multi-dimensional access control	Provide policies using separate dimensions of authorization criteria like Traditional static Access Control Lists that describe the principals (users and groups) access to resource and the permissions each of these principals possess.
82.	Flexible single sign-on (SSO)	SSO to Web-based applications that can span multiple sites or domains with a range of SSO options.
83.	Authentication	Support LDAP authentication mechanism
84.	Rule Engine & Optimization	Should have ability to respond to real-time data with intelligent & automated decisions
85.		Should provide an environment for designing, developing, and deploying business rule applications and event applications.
86.		The ability to deal with change in operational systems is directly related to the decisions that operators are able to make

87.	Should have at-least two complementary decision management strategies: business rules and event rules.
88.	Should provide an Integrated development environment to develop the Object Model (OM) which defines the elements and relationships

4.6.3. Integration Capabilities

- 1) The SCOC will aggregate various data feeds from sensors and systems and further process information out of these data feeds to provide interface /dashboards for generating alert and notifications in real time.
- 2) The SCOC would also equip city administration to respond quickly and effectively to emergency or disaster situation in city through Standard Operating Procedures (SOPs) and step-by-step instructions. The SCOC shall support and strengthen coordination in response to incidents/emergencies/crisis situations.
- 3) Single Dashboard for City Infrastructure Management & Smart City Services for Smart Lighting, Parking System, GIS Services and Other Services of Municipality work visualized real time on 2D/3D map of City. This dashboard can be accessed via web application as well as mobile app. The various information that may be accessed from the system but not limited to are as below:
 - Visual alerts generated by any endpoint that is part of the city infrastructure e.g. Surveillance cameras, City lights or any other sensors that manages various city management use cases. (integration with existing city surveillance project by Pune Traffic police)
 - Access information of water management resources (Disaster management cell at PMC will provide the details)
 - Information about waste management resources
 - Various citizen services e.g. Land records, Municipality tax, billing etc.
 - City environmental data
 - Take action based on events generated by any city infrastructure device
- 4) The system shall provide reporting & audit trail functionalities to track all the information and monitor operator interactions with the system and to impart necessary training to the users
- 5) Sample Use Cases describing the need of integrated systems:
 - *Urban Flooding Scenario:* The water level sensors (used for flood detection on streets) will send the ambient water levels accumulated on the street to the SCOC through the available connectivity. The SCOC shall baseline the existing water level and rainfall prediction with erstwhile flood levels to generate an alert for flooding. This alert will then be passed over to the citizens through the variable messaging displays and public address system to warn them of possible flooding in a locality.
 - *Evacuating Hazardous places in event of fire:* As soon as the Command Center is intimated of a fire through any of the available channels, Fire tenders shall be dispatched to the location

along with guidance for shortest path to the accident site. The Fire tender's journey time shall be optimised by providing the best possible green corridor through ATCS (adaptive Traffic Control System). Event trigger shall be also sent to nearest Police Station & nearby hospitals. IP based public address system will be triggered to vacate the nearby fuel stations (if there is any) to reduce the extent of casualty. Information will be passed over trauma centres in the vicinity to prepare for increased number of emergency care patients.

4.6.4. Other Requirements

- 1) The Smart City Operations Center will be the nodal point of availability of all online data and information related to various current and future smart elements and will be connected to other PMC network of services through an integration layer.
- 2) The SCOC will be established with all hardware, software and network infrastructure including switches and routers and will be maintained by the successful bidder throughout the mentioned period. PSEDCL takes the responsibility of necessary civil work including furniture.
- 3) All required Servers, Storage, Software, Firewall, Network Switches for entire project shall be installed in the integrated manner.
- 4) The controls and displays should be mounted in ergonomically designed consoles to keep operator fatigue to a minimum and efficiency high.
- 5) **Security:** In no circumstances this data accumulated and processed by Command and Control should be compromised. Hence provisions will be made to keep all the data stored in this platform highly secured with required Security framework implementation. The platform will be hosted in Data center at location decided by PMC to be provided by successful bidder. Further the platform will provide an open standards based integration Bus with API Management, providing full API lifecycle management with governance and security.

4.6.5. Technical Specifications for the hardware components

1. Video Wall Screen

The Video Wall for SCOC shall be configured with 3x2 formation of the following Professional Display (TV) Screens:

#	Parameter	Minimum Specifications
1	Technology	HD IPS LED Display, Direct LED Backlight Edge-less (end-to-end) Display suitable for use in video wall
2	Screen Size	46" or higher
3	Resolution	Full high definition (1080p) 16:9 Widescreen
4	Contrast ratio	5000:1
5	Brightness	350 nit
6	Viewing angle	178 degree/178 degree (H/V)
7	Response time	8ms
8	Input	HDMI
9	Control	- On Screen Display (OSD) - IR remote control
10	Operations	24 x 7

2. Video Wall Controller

#	Parameters	Minimum Requirements
1	Controller	Controller to control Video wall in a matrix as per requirement along with software
2	Chassis	19" Rack mount
3	Processor	Latest Generation 64 bit x86 Quad Core processor (3.4 Ghz) or better
4	Operating System	Pre-loaded 64-bit Operating System Windows / Linux / Equivalent, with recovery disc
5	RAM	16 GB DDR3 ECC RAM
6	HDD	2x500 GB 7200 RPM HDD (Configured in RAID 0)
7	Networking	Dual-port Gigabit Ethernet Controller with RJ-45 ports
8	RAID	RAID 0, 1, 5, 10 support
9	Power Supply	(1+1) Redundant hot swappable
11	Input/ Output support	DVI/HDMI/USB/ LAN/ VGA/SATA port
12	Accessories	104 key Keyboard and Optical USB mouse
13	USB Ports	Minimum 4 USB Ports
14	Redundancy support	Power Supply, HDD, LAN port & Controller
15	Scalability	Display multiple source windows in any size, anywhere on the wall
16	Control functions	Brightness/ Contrast/ Saturation/ Hue/ Filtering/ Crop/ Rotate
17	Inputs	To connect to minimum 2 sources through HDMI
18	Output	To connect to minimum 16 Displays through HDMI
19	Operating Temperature	10°C to 35°C, 80 % humidity
20	Cable & Connections	Successful bidder should provide all the necessary cables and connectors, so as to connect Controller with LED Display units

3. Video Wall Management Software

#	Parameter	Minimum Specifications
1	Display & Scaling	Display multiple sources anywhere on display up to any size
2	Input Management	All input sources can be displayed on the video wall in freely resizable and movable windows
3	Scenarios management	Save and Load desktop layouts from Local or remote machines
4	Layout Management	Support all Layout from Input Sources, Internet Explorer, Desktop and Remote Desktop Application
5	Multi View Option	Multiple view of portions or regions of Desktop, Multiple Application Can view from single desktop
6	Other features	SMTP support
7		Remote Control over LAN
8		Alarm management
9		Remote management

10	Cube Management	Multiple concurrent client
11		KVM support
12		Cube Health Monitoring
13		Pop-Up Alert Service
14		Graphical User Interface

4.7. Common Scope elements (to all Smart Elements)

a) Data Center and DR Locations

- PSCDCL shall provide the location to house the compute and storage infrastructure, at the Data Center facility being built at the Smart City Operation Center building.
- The DR for the data shall be at the Cloud Data Center provider of PMC - ESDS (<https://www.esds.co.in/>), who is providing colocation, managed hosting and cloud services to PMC. The rate card, for various services offered by the vendor will also be available on request.
- Various ICT equipment to be provisioned and maintained by the SI at the Data Center & DR Sites are given below.

b) WAN / Internet Router

#	Item	Minimum Specifications
1.	Multi-Services	Should deliver multiple IP services over a flexible combination of interfaces
2.	Ports	As per overall network architecture proposed by the bidder, the router should be populated with required number of LAN/WAN ports/modules, with cable for connectivity to other network elements.
3.	Interface modules	Must support up to 10G interfaces as per the design. Must have capability to connect with variety of interfaces.
4.	Protocol Support	<ul style="list-style-type: none"> • Must have support for TCP/IP, PPP, X.25, Frame relay and HDLC • Must support VPN • Must have support for integration of data and voice services • Routing protocols of RIP, OSPF, and BGP. • Support IPV4, IPV6 • Support load balancing
5.	Manageability	Must be SNMP manageable
6.	Traffic control	Traffic Control and Filtering features for flexible user control policies
7.	Bandwidth	Bandwidth on demand for cost effective connection performance enhancement
8.	Remote Access	Remote access features
	Redundancy	<ul style="list-style-type: none"> • Redundancy in terms of Power supply(s). Power supply should be able to support fully loaded chassis • All interface modules, power supplies should be hot-swappable
9.	Security features	<ul style="list-style-type: none"> • MD5 encryption for routing protocol • NAT • URL based Filtering • RADIUS/AAA Authentication • Management Access policy • IPSec / Encryption • L2TP
10.	QOS Features	<ul style="list-style-type: none"> • RSVP • Priority Queuing

	<ul style="list-style-type: none"> • Policy based routing • Traffic shaping • Time-based QoS Policy • Bandwidth Reservation / Committed Information Rate
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c) Data Center TOR (Top of the Rack) Switch

#	Parameter	Minimum Specifications
1.	Ports	<ul style="list-style-type: none"> • 24 or 48 (as per density required) 1G/ 10G Ethernet ports (as per internal connection requirements) and extra 2 numbers of Uplink ports (40GE) • All ports can auto-negotiate between all allowable speeds, half-duplex or full duplex and flow control for half-duplex ports.
2.	Switch type	Layer 3
3.	MAC	Support 32K MAC address.
4.	Backplane	Capable of providing wire-speed switching
5.	Throughput	500 Mpps or better
6.	Port Features	Must support Port Mirroring, Port Trunking and 802.3ad LACP Link Aggregation port trunks
7.	Flow Control	Support IEEE 802.3x flow control for full-duplex mode ports.
8.	Protocols	<ul style="list-style-type: none"> • IPV4, IPV6 • Support 802.1D, 802.1S, 802.1w, Rate limiting • Support 802.1X Security standards • Support 802.1Q VLAN encapsulation, IGMP v1, v2 and v3 snooping • 802.1p Priority Queues, port mirroring, DiffServ • DHCP support • Support up to 1024 VLANs • Support IGMP Snooping and IGMP Querying • Support Multicasting • Should support Loop protection and Loop detection, • Should support Ring protection
9.	Access Control	<ul style="list-style-type: none"> • Support port security • Support 802.1x (Port based network access control). • Support for MAC filtering. • Should support TACACS+ and RADIUS authentication
10.	VLAN	<ul style="list-style-type: none"> • Support 802.1Q Tagged VLAN and port based VLANs and Private VLAN • The switch must support dynamic VLAN Registration or equivalent • Dynamic Trunking protocol or equivalent
11.	Protocol and Traffic	<ul style="list-style-type: none"> • Network Time Protocol or equivalent Simple Network Time Protocol support • Switch should support traffic segmentation • Traffic classification should be based on user-definable application types: TOS, DSCP, Port based, TCP/UDP port number

#	Parameter	Minimum Specifications
12.	Management	<ul style="list-style-type: none"> Switch needs to have a console port for management via a console terminal or PC Must have support SNMP v1,v2 and v3 Should support 4 groups of RMON Should have accessibility using Telnet, SSH, Console access, easier software upgrade through network using TFTP etc. Configuration management through CLI, GUI based software utility and using web interface
13.	Resiliency	<ul style="list-style-type: none"> Dual load sharing AC and DC power supplies Redundant variable-speed fans

d) Monitoring Workstations

#	Parameter	Minimum Specifications
1.	Processor	Latest generation 64bit X86 Quad core processor(3Ghz) or better
2.	Chipset	Latest series 64bit Chipset
3.	Motherboard	OEM Motherboard
4.	RAM	Minimum 8 GB DDR3 ECC Memory @ 1600 Mhz. Slots should be free for future upgrade. Minimum 4 DIMM slots, supporting up to 32GB ECC
5.	Graphics card	Minimum Graphics card with 2 GB video memory (non- shared)
6.	HDD	2 TB SATA-3 Hard drive @7200 rpm with Flash Cache of 64GB SSD. Provision for installing 4 more drives.
7.	Media Drive	NO CD / DVD Drive
8.	Network interface	10/100/1000 Mbps autosensing on board integrated RJ-45 Ethernet port.
9.	Audio	Line/Mic IN, Line-out/Spr Out (3.5 mm)
10.	Ports	Minimum 6 USB ports (out of that 2 in front)
11.	Keyboard	104 keys minimum OEM keyboard
12.	Mouse	2 button optical scroll mouse (USB)
13.	PTZ joystick controller (with 2 of the workstations in SCOC)	<ul style="list-style-type: none"> PTZ speed dome control for IP cameras Minimum 10 programmable buttons Multi-camera operations Compatible with all the camera models offered in the solution Compatible with VMS /Monitoring software offered
14.	Monitor	22" TFT LED monitor, Minimum 1920 x1080 resolution, 5 ms or better response time, TCO 05 (or higher) certified
15.	Certification	Energy star 5.0/BEE star certified
16.	Operating System	64 bit pre-loaded OS with recovery disc

17.	Security	BIOS controlled electro-mechanical internal chassis lock for the system.
18.	Antivirus feature	Advanced antivirus, antispyware, desktop firewall, intrusion prevention (comprising of a single, deployable agent) which can be managed by a central server. (Support, updates, patches and errata for the entire contract/ project period)
19.	Power supply	SMPS; Minimum 400-watt Continuous Power Supply with Full ranging input and APFC. Power supply should be 90% efficient with EPEAT Gold certification for the system.

e) Servers

#	Parameter	Minimum Specifications
1.	Processor	Latest series/ generation of 64 bit x86 processor(s) with Ten or higher Cores Processor speed should be minimum 2.4 GHz Minimum 2 processors per each physical server
2.	RAM	Minimum 64 GB Memory per physical server
3.	Internal Storage	2 x 300 GB SAS (10k rpm) hot swap disk with extensible bays
4.	Network interface	2 X 20GbE LAN ports for providing Ethernet connectivity Optional: 1 X Dual-port 16Gbps FC HBA for providing FC connectivity
5.	Power supply	Dual Redundant Power Supply
6.	RAID support	As per requirement/solution
7.	Operating System	Licensed version of 64 bit latest version of Linux/ Unix/Microsoft® Windows based Operating system)
8.	Form Factor	Rack mountable/ Blade
9.	Virtualization	Shall support Industry standard virtualization hypervisor like Hyper-V, VMWARE and Citrix.

f) Blade Chassis Specifications

The blade chassis shall have the following minimum technical specifications:

- 1) Minimum 6U size, rack-mountable, capable of accommodating minimum 8 or higher hot pluggable blades
- 2) Dual network connectivity of 10 G speed for each blade server for redundancy shall be provided
- 3) Backplane shall be completely passive device. If it is active, dual backplane shall be provided for redundancy.
- 4) Have the capability for installing industry standard flavors of Microsoft Windows, and Enterprise RedHat Linux Oss as well as virtualization solution such as VMware.
- 5) DVD ROM shall be available in chassis, can be internal or external, which can be shared by all the blades allowing remote installation of software
- 6) Minimum 1 USB port

- 7) Two hot-plug/hot-swap, redundant 10 Gbps Ethernet or FCoE module with minimum 16 ports (cumulative), having Layer 2/3 functionality
- 8) Two hot-plugs/hot-swap redundant 16 Gbps Fiber Channel module for connectivity to the external Fiber channel Switch and ultimately to the storage device
- 9) Hot plug/hot-swap redundant power supplies to be provided, along with power cables
- 10) Power supplies shall have N+N. All power supplies modules shall be populated in the chassis.
- 11) Required number of PDUs and power cables, to connect all blades, Chassis to Data Center power outlet.
- 12) Hot pluggable/hot-swappable redundant cooling unit
- 13) Provision of systems management and deployment tools to aid in blade server configuration and OS deployment
- 14) Blade enclosure shall have provision to connect to display console/central console for local management such as troubleshooting, configuration, system status/health display.
- 15) Single console for all blades in the enclosure, built-in KVM switch or Virtual KVM features over IP
- 16) Dedicated management network port shall have separate path for remote management.

g) Storage

#	Parameter	Minimum Specifications
1.	Solution/ Type	<ul style="list-style-type: none"> IP Based/iSCSI/FC/NFS/CIFS
2.	Storage	<ul style="list-style-type: none"> Storage Capacity should be minimum 10 TB (usable, after configuring in offered RAID configuration) RAID solution offered must protect against double disc failure. Disks should be preferably minimum of 3 TB capacity To store all types of data (Data, Voice, Images, Video, etc) Storage system capable of scaling vertically and horizontally
3.	Hardware Platform	<ul style="list-style-type: none"> Rack mounted form-factor Modular design to support controllers and disk drives expansion
4.	Controllers	<ul style="list-style-type: none"> At least 2 Controllers in active/active mode The controllers / Storage nodes should be upgradable seamlessly, without any disruptions / downtime to production workflow for performance, capacity enhancement and software / firmware upgrades.
5.	RAID support	<ul style="list-style-type: none"> RAID 0, 1, 1+0, 5+0 and 6
6.	Cache	<ul style="list-style-type: none"> Minimum 128 GB of useable cache across all controllers. If cache is provided in additional hardware for unified storage solution, then cache must be over and above 128 GB.

7.	Redundancy and High Availability	<ul style="list-style-type: none"> The Storage System should be able to protect the data against single point of failure with respect to hard disks, connectivity interfaces, fans and power supplies
8.	Management software	<ul style="list-style-type: none"> All the necessary software (GUI Based) to configure and manage the storage space, RAID configuration, logical drives allocation, snapshots etc. are to be provided for the entire system proposed. Licenses for the storage management software should include disc capacity/count of the complete solution and any additional disks to be plugged in in the future, upto max capacity of the existing controller/units. A single command console for entire storage system. Should also include storage performance monitoring and management software Should provide the functionality of proactive monitoring of Disk drive and Storage system for all possible disk failures Should be able to take "snapshots" of the stored data to another logical drive for backup purposes
9.	Data Protection	The storage array must have complete cache protection mechanism either by de-staging data to disk or providing complete cache data protection with battery backup for up to 4 hours

h) Server/Networking Rack Specifications

#	Parameter	Minimum Specifications
1.	Type	<ul style="list-style-type: none"> 19" 42U racks mounted on the floor Floor Standing Server Rack - 42U with Heavy Duty Extruded Aluminium Frame for rigidity. Top cover with FHU provision. Top & Bottom cover with cable entry gland plates. Heavy Duty Top and Bottom frame of MS. Two pairs of 19" mounting angles with 'U' marking. Depth support channels - 3 pairs with an overall weight carrying Capacity of 500Kgs. All racks should have mounting hardware 2 Packs, Blanking Panel. Stationery Shelf (2 sets per Rack) All racks must be lockable on all sides with unique key for each rack Racks should have Rear Cable Management channels, Roof and base cable access
2.	Wire managers	Two vertical and four horizontal
3.	Power Distribution Units	<ul style="list-style-type: none"> 2 per rack Power Distribution Unit - Vertically Mounted, 32AMPs with 25 Power Outputs. (20 Power outs of IEC 320 C13 Sockets & 5

		Power outs of 5/15 Amp Sockets), Electronically controlled circuits for Surge & Spike protection, LED readout for the total current being drawn from the channel, 32AMPS MCB, 5 KV AC isolated input to Ground & Output to Ground
4.	Doors	<ul style="list-style-type: none"> The racks must have steel (solid / grill / mesh) front / rear doors and side panels. Racks should NOT have glass doors / panels. Front and Back doors should be perforated with at least 63% or higher perforations. Both the front and rear doors should be designed with quick release hinges allowing for quick and easy detachment without the use of tools.
5.	Fans and Fan Tray	<ul style="list-style-type: none"> Fan 90CFM 230V AC, 4" dia (4 Nos. per Rack) Fan Housing Unit 4 Fan Position (Top Mounted) (1 no. per Rack) - Monitored - Thermostat based - The Fans should switch on based on the Temperature within the rack. The temperature setting should be factory settable. This unit should also include - humidity & temperature sensor
6.	Metal	Aluminium extruded profile
7.	Side Panel	Detachable side panels (set of 2 per Rack)

i) Enterprise Management System (EMS)

To ensure that ICT systems are delivered at the performance level envisaged, it is important that an effective monitoring and management system be put in place. It is thus proposed that a proven Enterprise Management System (EMS) is proposed by the bidder for efficient management of the system, reporting, SLA monitoring and resolution of issues. Various key components of the EMS to be implemented as part of this engagement are –

- Network Monitoring System
- Server Monitoring System
- Helpdesk System

The solution should provide a unified web based console which allows role based access to the users.

• Network Management System

Solution should provide fault & performance management of the server side infrastructure and should monitor IP\SNMP enabled devices like Routers, Switches, PA System, Emergency Call Boxes, Sensors, etc. Proposed Network Management shall also help monitor key KPI metrics like availability, in order to measure SLA's. Following are key functionalities that are required which will assist administrators to monitor network faults & performance degradations in order to reduce downtimes, increase availability and take proactive actions to remediate & restore network services.

- The proposed solution must automatically discover manageable elements connected to the infrastructure and map the connectivity between them. Solution should provide centralized monitoring console displaying network topology map.

- Proposed solution should provide customizable reporting interface to create custom reports for collected data.
- The system must use advanced root-cause analysis techniques and policy-based condition correlation technology for comprehensive analysis of infrastructure faults.
- The system should be able to clearly identify configuration changes and administrators should receive an alert in such cases.
- **Server Performance Monitoring System**
 - The proposed tool should integrate with network performance management system and support operating system monitoring for various platforms supplied as part of this Project.
 - The proposed tool must provide information about availability and performance for target server nodes.
 - The proposed tool should be able to monitor various operating system parameters such as processors, memory, files, processes, file systems, etc. where applicable.
- **Centralized Helpdesk System**
 - Helpdesk system should provide incident management, problem management templates along with helpdesk SLA system for tracking SLA's pertaining to incident resolution time for priority / non-priority incidents.
 - System should also automatically create tickets based on alarm type
 - The proposed helpdesk solution must provide flexibility of logging, viewing, updating and closing incident via web interface for issues related to the project.

j) Centralised Anti-virus Solution

The following features are required for centralized anti-virus solution, to protect all computing resources (servers, desktops, other edge level devices, etc.) :

- 1) Ability to scan through all file types and various compression formats. Ability to scan for HTML, VBScript Viruses, malicious applets and ActiveX controls.
- 2) Must update itself over internet for virus definitions, program updates etc. (periodically as well as in push-updates in case of outbreaks)
- 3) Able to perform different scan Actions based on the virus type (Trojan/ Worm, Joke, Hoax, Virus, other)
- 4) Shall provide Real-time product Performance Monitor and Built-in Debug and Diagnostic tools, and context- sensitive help.
- 5) The solution must provide protection to multiple remote clients
- 6) Shall provide for virus notification options for Virus Outbreak Alert and other configurable Conditional Notification.
- 7) Should be capable of providing multiple layers of defence
- 8) Shall have facility to clean, delete and quarantine the virus affected files.
- 9) Should support online update, where by most product updates and patches can be performed without bringing messaging server off-line.

- 10) Should support in-memory scanning so as to minimize Disk IO.
- 11) Should support Multi-threaded scanning
- 12) Should support scanning of nested compressed files
- 13) Should support heuristic scanning to allow rule-based detection of unknown viruses
- 14) All binaries from the vendor that are downloaded and distributed must be signed and the signature verified during runtime for enhanced security.

5. Implementation Timelines and Terms of Operations

5.1. Proposed Implementation timelines

List of the broad activities to be carried out by the Systems Integrator and the timelines from the date of Work Order are given in the table below. “T” stands for the date of issue of the Work Order.

#	Activity	Timelines
1.	Mobilization of Resources, Preparation of the Inception Report	T + 3 weeks
2.	Prepare the Detailed Technical Architecture of the Overall System in consultation with all the Stakeholders, Completion of detail survey	T + 7 weeks
3.	Prepare FRS for all the work streams, Finalize Reporting Formats / Base Rules	T + 10 weeks
4.	Prepare SRS, SDD for all the Software Components	T + 14 weeks
5.	Supply, Installation, Configuration of various equipment, components, systems	T+18 weeks
6.	Acceptance Testing (AT) for all the systems, equipment	T+22 weeks
7.	Training and Capacity Building for the relevant PSCDCL / PMC officials	T+22 weeks
8.	Final Acceptance Test (FAT) for overall solution	T+24 weeks
9.	Formal Go Live for the Entire Project	T + 26 weeks
10.	Operations and Maintenance post Go-Live	5 years

5.2. Advertisement and marketing guidelines

SI is required to obtain approvals from PMC / PSCDCL before undertaking any advertisement and marketing opportunities through any of the Smart Elements. The SI shall follow following guidelines while undertaking such advertisements or marketing strategies:

- SI shall be responsible for safeguarding the aesthetics of the location and shall not compromise on any tangible or intangible assets of PSCDCL / PMC while undertaking these advertising or marketing campaigns.
- PSCDCL will approve SI's advertisement strategy and execution plan keeping in mind that users are not inundated with advertisements to an extent that it impacts user experience.
- SI shall take approval from PSCDCL on the content, design, size, duration of such advertisements / marketing strategies.
- SI will not self-proclaim the ownership for carrying out activities under the network of Smart Elements project in the form of advertisement or marketing activities.
- The revenue generated from advertising and marketing activities need to be reported to PSCDCL, in the format & periodicity as decided by PSCDCL.
- SI shall take utmost care not to infringe into the privacy of residents / tourists.

6. Annexure #1: List of proposed locations

6.1. List of Proposed Locations for Wi-Fi hot spots

Locations mentioned in the commercial formats are indicative in number (actual number and locations to be defined by the successful bidder after detailed location survey). Commercial for any new location (at the time of implementation) shall be considered based on a similar site pricing.

6.1.1. List of Hospitals in Pune City

#	HOSPITALS	Latitude & Longitude
1	G.B.Indumati Manilal Khanna	18.492514, 73.86659600000007
2	Chris Rock Edward Paul	18.577046,73.899023
3	Late.Dadasaheb Gaikwad	18.52478,73.865128
4	Rajarshi Shahu Maharaj	18.527779,73.866596
5	Late. Lokshahir Annabhau Sathe	18.549639,73.890636
6	Dr.Kotnis Health Centre	18.511916,73.857927
7	Late. Babusaheb Genuji Kawde Patil	18.537865,73.898495
8	Kalas Hospital	18.578065,73.874967
9	BharatRatna Dr.Babasaheb Ambedkar	18.496273,73.870225
10	Late. Savitribai Phule	18.504919,73.861017
11	Late. Namdevrao Shivarkar	18.497288,73.899842
12	Late. Annasaheb Magar	18.503137,73.926533
13	Late. Jayabai Nanasaheb Sutar	18.503696,73.807763
14	Late.Kalavatibai Malave	18.514872,73.84675
15	Late.Balaji Rakhmaji Gaikwad	18.509075,73.86526
16	Siddharth Hospital	18.572202,73.878733
17	PMC Hospital, Bibwewadi, Ward no.72, Pune	18.461455,73.868889
18	Bharatratna Late. Rajiv Gandhi	18.545672,73.883888
19	Kamala Nehru Hospital(General Hospital)	18.52283,73.86199
20	Late.Anandibai Narhar Gadgil	18.50236,73.838381
21	lc,vcm,vcm,	18.571113, 73.83828700000004
22	Late.Bindu Madhav Thakare	18.496546,73.816307
23	Aundh Kutir	18.562849,73.810011
24	Chhatrapati Shahu Maharaj	18.485574,73.899034
25	Hutatma Babu Genu	18.515846,73.859785
26	Late. Bartakke	18.488899,73.795546
27	Dr.Naidu Hospital	18.53139,73.869151
28	Late.Shivshankar Pote	18.476546,73.856028

29	Late. Mukundrao Lele	18.519798,73.854413
30	Lions Club Hospital	18.497499,73.853927
31	Late. Vijayabai Shirke Health Centre	18.487144,73.815247
32	Late.Jangalrao Kondiba Amrale	18.522776,73.852546
33	Late.Rohidas Kirad	18.511283,73.868672
34	Late.Damodarraoji Galande Patil	18.551879,73.896929
35	Late. Baburao Genba Shewale	18.56278, 73.83264899999995
36	Late. Minatai Thakre	18.475938,73.889504
37	Late. Mamasahab Badade	18.515553,73.867725
38	Late. Matoshri Ramabai Ambedkar	18.502957,73.850024
39	Late. Yashwant Vishnu Tharkade	18.506644,73.832802
40	Late. ChanduMama Sonawane	18.505766,73.868816
41	Dr. Homi J. Bhabha	18.529196,73.833358
42	Late. Sakharan Kundlik Kodre	18.533965,73.927263
43	Late. Sahdev Eknath Nimhan	18.53777,73.795969
44	Dr. Dalvi	18.533092,73.848908
45	Late. Sundarabai Ganpat Raut	18.511619, 73.82013699999993
46	PMC Hospital, In front of Gulmohar society, Kharadi	18.551218, 73.93892900000003

6.1.2. List of Gardens in Pune City

#	Garden	Latitude & Longitude
1	Maharashtra Housing Board No.2	18.5613,73.895327
2	Panchavati	18.532692,73.812921
3	Ganpati Mandir	18.57683,73.89431
4	S.No. 37, Santosh Nagar	18.577593,73.885779
5	Chittaranjan Vatika	18.532534,73.838615
6	Kantishalaka Aruna Asaf Ali Udyan	18.492939,73.863033
7	Dr. Babasaheb Ambedkar	18.524864,73.871661
8	Honble. Jyotiba Phule	18.55896,73.879148
9	Late. Sanjay Mahadev Nimhan	18.546552,73.79855
10	Samartha Ramdas	18.527255,73.83249
11	Chhatrapati Shivaji	18.569863,73.832778
12	Chandan Nagar	18.562398,73.935186
13	Matoshri. Ramabai Bhimrao Ambedkar	18.532901,73.878247

14	Chhatrapati Shivaji Maharaj, Sadashiv Peth	18.504527,73.853345
15	Morya	18.576937,73.892642
16	Sh.Abdul Hamid Ayurvedic Udyan	18.473664,73.895746
17	Viman Nagar	18.566227,73.916326
18	Koregaon Park	18.538348,73.897948
19	Mahatma Gandhi Udyan	18.542025,73.884782
20	Shri.Gajanan Maharaj	18.532046,73.821813
21	Maharashtra Housing Board No.1	18.563375,73.895821
22	Hutatma Smarak	18.555787,73.876789
23	Late. Maruttrao Gaikwad	18.562744,73.810137
24	Saras baugh	18.501628,73.852881
25	Kamalnayan Bajaj	18.546185,73.852111
26	Dr. Shama Prasad Mukherjee	18.500285,73.830032
27	Pragati	18.450382,73.863227
28	Late. Smt.Gangubai Bhimale	18.48779,73.87481
29	Dr. Jay Prakash Narayan	18.527092,73.87421
30	Limca Jogging Track	18.541517,73.882701
31	Hazrat Siddiqui Shababa	18.520978,73.874081
32	Shahu Modak	18.533613,73.896112
33	Dr. GaddaSingh Cheema	18.544751,73.883656
34	Anna Hazare Anand Park	18.551302,73.926078
35	Late. Vithabai Pujari	18.493712,73.865995
36	Kishore Udyan	18.579794,73.894407
37	Late. Vitthalrao Shivarkar Udyan Jogging Track	18.498382,73.899974
38	Tirupati Campus, Dhanori	18.577684,73.888441
39	St.Mary Church	18.527458,73.905006
40	Late. Ramchanra Keshav Taware	18.498784,73.852784
41	Ramchandra Mane Rd, Ramkrishna Paramhans Nagar, Kothrud	18.507941, 73.80627000000004
42	Late.Vasantrao Eknath Bagul	18.491361,73.851094
43	Maharshi Valmiki	18.568968,73.880929
44	Late.Madhavrao Shinde	18.540947,73.853379
45	Indraprastha	18.550488,73.879955
46	Sharad Pawar	18.558472,73.898462
47	Lumbini Park	18.561483,73.896486
48	Late. Major Bhaskarrao Sakhojirao Shinde	18.561686,73.925665

49	Late. Prakash Narayan Bahirat	18.53109,73.827861
50	Late.Shakuntala Narayan Nikam	18.526583,73.825372
51	Model Colony Lake	18.529839,73.842468
52	Pankuvar Firodiya Sphurti	18.536298,73.833059
53	Late.Rajiv Gandhi Zoological Park	18.453985,73.860029
54	Shri. Shahu	18.521151,73.868163
55	Gul Poonawala	18.496617,73.876999
56	Late. Shankarrao Ranchandra Kaware	18.487505,73.854858
57	Chhatrapati Sambhaji Raje	18.521304,73.8471550
58	In front of Kalyani Nagar Steel	18.525302,73.909414
59	Late. Kakasaeb Gadgil	18.475986,73.854297
60	Late. Yashwantrao Chavan	18.492979,73.853508
61	Sant. Rohidas Udyan	18.503022,73.873936
62	Okaya Friendship, Late. P.L.Deshpande	18.493,73.837413
63	Lokmanyagar Jogging Park	18.505412,73.846232
64	Shrimant Bhairavsinh Ghorpade Peth	18.50248,73.862309
65	Aaiappa	18.586318,73.887667
67	Shri. Sachin Tendulkar Jogging Track	18.504476,73.840911
68	Late. Vartak Udyan	18.51847,73.847844
69	Jijamata	18.519045,73.856446
70	Maharana Pratap	18.508292,73.853476
71	Late. Raja Mantri	18.506552,73.833336
72	Major. Shahid Pradip Tathawade	18.493773,73.827046
73	Kamla Nehru Park	18.518679, 73.83480699999996
74	Peshwe Urja	18.50235,73.851609
75	Late.Damodar Raoji Galande Patil	18.550539,73.902988
76	Shivaji Udyan	18.49109801181133, 73.9014217989502
77	Tingare Nagar Lane No. 14.	18.581193, 73.89667899999995
78	Sarasbaug	18.507941, 73.80627000000004
79	Late. Tatyasaheb Thorat	18.504008, 73.81228799999997
80	Gandharv garden	18.5185035, 73.90739200000007
81	Katraj Sarpodyan	18.517025661701638, 73.80831767193604
82	Bharatratna Dr. Bhimsen Joshi	18.511476, 73.79134299999998

6.1.3. Key Road (stretches) in each ward office

#	Stretch Details	Start Point	End Point
1	Maldhakka to Sassoon Chowk	18.527664,73.863428	18.523985,73.870163
2	Sassoon Chowk to Railway Station	18.523985,73.870163	18.528207,73.873446
3	Alankar Chowk to Commissioner Police Office	18.528085,73.876209	18.52215,73.876153
4	RTO to Wadia College	18.529892,73.863514	18.533534,73.878803
5	Aurora Towers to Lal Deval	18.518193,73.879758	18.520482,73.872516
6	Blue Nile to Council Hall	18.521448,73.877537	18.528437,73.8792
7	Wadia College to Bund Garden	18.533534,73.878803	18.540888,73.883609
8	Ruby Hall to Akshay Complex	18.532018,73.876807	18.536524,73.875852
9	Ramabai Ambedkar Road	18.534632,73.873803	18.534663,73.879532
10	North Main Road	18.539301,73.885573	18.539118,73.903715
11	Big Cinema Kalyaninagar to Bishops School	18.545832,73.906043	18.554121,73.906118
12	Big Cinema to Central Avenue Kalyaninagar	18.545832,73.906043	18.547388,73.897621
13	Shastrinagar Chowk to Golf Club Chowk	18.552179,73.896473	18.552789,73.879715
14	Shastrinagar Chowk to Weikfield Chowk	18.552179,73.896473	18.558556,73.911172
15	Viman Nagar Chowk to Lunkad Towers	18.560877,73.918344	18.56755,73.918587
16	BSNL Exchange to Symbiosis	18.565079,73.918266	18.565079,73.910826
17	Kharadi Bypass to Sainath Nagar Chowk	18.562159,73.938578	18.539558,73.934566
18	Reilance Mart Kharadi to Kharadi Bus Depo	18.550686,73.937355	18.548448,73.945016
19	Chandan Nagar Water Tank to SundarBai Marathe Vidyalay	18.561194,73.928029	18.557324,73.928206
20	Viman Nagar Chowk to Kharadi Bypass	18.562159,73.938578	18.560877,73.918344
21	Somnath Mandir to Wadgaon Sheri Gaothan	18.55879,73.921182	18.542923,73.923402
22	BT Kawade Road	18.528655,73.90611	18.51718,73.906856
23	Magarpatta Road	18.523544,73.9322	18.502586,73.927501
24	Shankershet Road	18.502159,73.876228	18.50045,73.858772
25	7 Loves Chowk to Power House Chowk	18.501447,73.869243	18.519546,73.868267
26	Narpatgiri Chowk to Apollo Theatre	18.522675,73.867472	18.52031,73.864843

27	Power House Chowk to Apollo Theatre	18.519536,73.868267	18.519526,73.864909
28	Apollo Theatre to Lal Mahal Shaniwarwada	18.519526,73.864909	18.51858,73.856583
29	Quarter Gate to Alpana Theatre	18.516279,73.871134	18.515389,73.864831
30	Ramoshi Gate to Kasturi Chowk	18.510429,73.868329	18.510582,73.8604
31	Ramoshi Gate to Try Luck Restaurant (MG Road)	18.510592,73.868586	18.507067,73.878569
32	Sant Harkadas Vidyamandir to Pudumji Police Chowky	18.505419,73.873178	18.510658,73.872121
33	Pudumji Road	18.510658,73.872121	18.511035,73.876381
34	M G Road	18.507067,73.878569	18.51839,73.87924
35	East Street	18.50695,73.879218	18.518193,73.879758
36	Fulenagar police station to MES Water Pumping Station	18.555107, 73.874342	18.559171,73.875935
37	Agrasen High School to RTO Office Fulenagar	18.557212, 73.876279	18.555631,73.881648
38	Vishrantwadi Police Station to Kalas Bus Stop	18.564475, 73.877515	18.575622,73.876356
39	Vishrantwadi Main Chowk to 509 Chowk	18.57251, 73.878277	18.575358,73.899209
40	Dhanori Lake (Dhanori Main Road) to Dhanori Octroi Naka	18.579831, 73.88182	18.596915,73.906502
41	Appasaheb Betalit Road (Vidyanagar)	18.575152, 73.897298	18.575463,73.8897
42	Gunjan Chowk to Jail Corner	18.545881, 73.888762	18.564774,73.894164
43	Nagpur Chawl Road	18.563091, 73.893161	18.560935,73.897999
44	Gunjan Chowk to Sadalbaba Dargah	18.545881, 73.888762	18.544462,73.87762
45	Loop Road (Golf Course Road Extension)	18.552219, 73.873395	18.55282,73.879747
46	Golf Club Road (Dr. Ambedkar Road)	18.55282, 73.879747	18.552606,73.889671
47	Yerawada Market Road	18.551883, 73.883875	18.549335,73.885811
48	Maharana Pratap Road (Phadke Houd to Kasturi Chowk)	18.519184,73.861537	18.510516,73.862101
49	Alpana Talkies to City Post Office	18.516106,73.862873	18.515664,73.856355
50	Mirza Gailb Road (Govind Halwai Chowk to Shivaji Road)	18.51308,73.861843	18.512652,73.857723
51	Laxminarayan Thetar Chawk to Maharashtra Mandal	18.496608,73.858189	18.496498, 73.867962

52	Poonawala Park to Salisbury Park Road	18.496701,73.877043	18.493384, 73.870874
53	Lullanagar Chowk to Gulmohar Park	18.483917, 73.883936	18.482546, 73.884021
54	Teen Hatti chowk to Panchawati	18.468439, 73.852956	18.473201, 73.855008
55	K.K Market to upper Indira Nagar	18.468337, 73.857929	18.469108, 73.863702
56	Swami Vivekanand Statue to Rajyog Soc Road	18.476995, 73.85716	18.473154, 73.85807
57	Light House to Gangadham (Federal Bank)	18.480866, 73.862874	18.48185, 73.876576
58	Bhagwandas Dugad Chawak to Vasant Bag	18.487081, 73.857585	18.480882, 73.861305
59	Shani Mandir Bibewewadi to State Bank Nagar co. Hsg.Soc	18.468491, 73.864116	18.46249, 73.865197
60	Upper Indiranagar Corner to VIT College Appar Indira Nagar	18.461076, 73.867476	18.464283, 73.867357
61	Dhankwadi Bus Stop to Gulab Nagar Chowk	18.465362, 73.85116	18.46613, 73.853234
62	Vinkar Sabhagraha to Yashwantrao Chavan Kaman	18.474287, 73.853528	18.47448, 73.855762
63	Pune-Satara Road to Balaji Nagar Pawar Hospital Road	18.465713, 73.858125	18.466072, 73.86014
64	Bharti Vidhayapeth (Dental collage) to Shri Ram Mandir	18.46031, 73.858145	18.459867, 73.863044
65	Bharti Vidhayapeth (medical collage road) to Treemurti Chowk	18.457529, 73.853072	18.457037, 73.850355
66	Dhankwadi Road Chaitayan Nagar	18.462464, 73.85668	18.46395, 73.856461
67	Chintamani Dyanepeth Ambegaon Pathar to Tanaji nagar Dhankwadi	18.455994, 73.840035	18.457640, 73.840852
68	Datta Nagar Chowk to Jay Bhavani Chowk	18.449782, 73.849755	18.444592, 73.848465
69	Datta Nagar Bhuyare Marg to Khashaba Jadhav Path	18.450696, 73.851276	18.45404, 73.851103
70	Rajesh Soc to Rajesh Soc BGB Park	18.449491, 73.863102	18.450991, 73.864144
71	Sukhsagar Nagar rod Shri Ambhamata Mandir to Bhairvanath Apartment	18.455781, 73.869464	18.458401, 73.86942

6.2. List of Proposed Locations for Emergency Call Boxes

Below is the indicative list of locations for installation of emergency call boxes (actual number and locations to be defined by the successful bidder after detailed location survey). Commercial for any new location (at the time of implementation) shall be considered based on a similar site pricing.

#	Stretch of Road in PMC Limits	#	Locations where Emergency Call Boxes are required
1	Pune Solapur Road	1	Ravi Darshan
		2	Noble Hopital junction
		3	Bhairoba Nala Square
		4	Mummadevi Square
		5	Golibar Square
2	Magarpatta Road	6	Mundhwa Road Junction
		7	Reliance Mart Junction
3	Pune Saswad Road	8	Hadapsar Gaadital
		9	Fursungi kaman
		10	Matarwadi Phata
4	Bhairoba Nala to Chandralok junction	11	Lulla Nagar Square
		12	Gangadham Square
		13	Chadralok Hospital Square
5	Katraj Mantarwadi Bypass	14	katraj Bypass Square
		15	Khadi machine Square
		16	Undri Junction
		17	Pisoli Square
6	Golibar to Khadi Machine Square	18	Jyoti Hotel Square
7	Seven Loves Square to Gokul Nagar	19	Seven loves Square
		20	Wakhar Mahamandal Square
8	Pune Satara Road	21	Katraj bypass Square
		22	Market Yard Junction
		23	Pushpamangal Square
		24	Jedhe Square
9	Jendhe Chowk Sinhgad Road	25	Sawarkar Square
		26	Sinhgad Road Junction
		27	Rajaram Bridge Junction
		28	Vadgaon Bridge
		29	Nanded City
10	Katraj Mumbai bypass	30	Navale Bridge
		31	Varje Bridge
		32	Chandani Square
		33	Sadanad Hotel Square
		34	Sinhgad Road Junction
		35	Tilak Square

11	Khandojibaba Chowk -Warje junction-Karve Road	36	Khandojibaba Square
		37	Nalstop Square
		38	Karishma Society Square
		39	Karve Statue Square
		40	Ambedkar Square
		41	Warje Square
12	Paud Road- Paud Phata to Chandani Chowk	42	Paud Road junction
		43	Kothrud police Station Junction
13	Nal Stop to Senapati Bapat Road	44	V.S. Khandekar Square
		45	Shivaji Housing Square
14	FC Road Khandojibaba Square to Chafekar Square	46	Goodluck Square
		47	Jnanshware Paduka Square
		48	Chafekar Square
15	JM Road - Sancheti to Khandojibaba Square	49	Sancheti Square
		50	Jhanshi Rani Square
16	Ganeshkhind Road-Simla to University	51	Simla Office Square
		52	Suryamukhi Datta Mandir Square
		53	Range Hills Corner Junction
		54	Pune university Square
17	University Square to Rajic Gandhi Bridge-Aundh Road	55	Bremen Square
		56	Rajiv Gandhi Bridge
18	University Square to Sadanad, Baner Road	57	Abhiman Shree Junction
		58	Baner Phata Junction
		59	Symantec junction
		60	Ganraj Mandal office Junction
19	University Square-Chandani Chowk- Pashan Road	61	Abhiman Shree Junction
		62	Shivaji Square, Pashan
		63	S K Ranwara Square
20	Shivaji Square Pashan - Susgaon, Sus Road	64	Balaji Chowk
		65	Suskhind Bridge
		66	Susgaon
21	Old Pune Mumbai Highway	67	Jahangir Hospital Square
		68	RTO Square
		69	Engineering College Square
		70	Church Khadki Railway Station
		71	Bopodi square
23	Shahir Amar to Lashkar	72	Shahir Amar Shaikh Square
		73	Maldhakka Square
		74	Bolhai Square Collector Office
		75	Nehru Square
		76	Sadhu Wasvani Square
		77	Alankar Square

24	Jedhe Square Tilak Square-Tilak Road	78	Puram Square
		79	SP College Square
25	Jamnalal Bajaj Statue- Gadgil Square Bajiroa Road	80	Bajaj Statue Square
		81	Shanipar Square
		82	Appa Balwant Square
		83	Gadgil Statue Square
26	Gadgil Statue Jedhe Shivaji Road	84	Jijamata Square
		85	Budhwar Square
		86	Belbaug Square
		87	Gotiram Bhaiyya Square
		88	Phadgate Police Station
		89	Raashtrabhushan Square
27	Tilak Square to Nehru Road Junction Laxmi Road	90	Saint Kabir Square
		91	Nanapeth Square
		92	Tamboli Masjid Square
		93	Moti Square
		94	Sevasadan Square
28	Tilak Road Tilak Square to Budhwar Square -Kelkar Square	95	Takle Havli Square
29	Tilak Square to Chitale Bandhu Corner- kumthekar Square	96	Chitale Bandhu Corner
30	Pune Station Seven Loves-Nehru Road	97	Power House Square
		98	Ramoshi Gate Police Station
		99	Bahubali Square
32	Pune Ahmednagar Road (Parnakuti- Kharadi Bypass)	100	Parnakuti Square
		101	Gunjan Square
		102	Shastrinagar Square
		103	Vadgaon Sheri Square
		104	Viman nagar Square
		105	Kharadi Bypass Junction
33	Bund Garden Road- Jahangir Square to Tarkeshwar Square	106	Mangaldas Square
		107	Dr. Ambedkar Setu Square
34	Mobaj Square to Koregaon Park junction- mundhwa Junction	108	Hotel blue Diamond Square
		109	Koregaon Park junction
		110	ABC Farm house Square
		111	Tadigutta Square
35	Patil Estate to Dighi -Alandi Road	112	Patil Estate Square
		113	Sadalbaba Square
		114	Chandrama Square
		115	Mental Corner Square
		116	Vishrantwadi Junction
36		117	Golf Club Junction

	Gunjan to Airport -New Airport Road	118	In front of Yerwada Post office
		119	509 Square
		120	Petrol Satha Square
		121	Square in front Airport
37	New Airport Road	122	Dorabji mall Square
		123	Symbiosis college Square
		124	Datta Mandir Square
		125	Shri krishna Hotel Square
38	Other Imporatant Locations	126	Dr. Ambedkar College Square, yerwada
		127	In front of PMC
		128	Kumbhar Ves Square
		129	Rajarshi shahu bus Stand, Swargate
		130	PMPML Bus Depot Deccan
		131	PMPML Bus Depot Katraj
		132	Pune Railway Station
		133	Shivaji Nagar Railway Station
		134	Swargate ST Stand
		135	Shivaji Nagar ST Stand
		136	Pune Station ST Stand

6.3. List of Proposed Locations for Public Address System

Below is the indicative list of locations for installation of public addressing system (actual number and locations to be defined by the successful bidder after detailed location survey). Commercials for any new location (at the time of implementation) shall be considered based on a similar site pricing.

#	Stretch of Road in PMC Limits	#	Locations where PA system required
1	Pune Solapur Road	1	Ravi Darshan
		2	Noble Hopital junction
		3	Bhairoba Nala Square
		4	Mummadevi Square
		5	Golibar Square
2	Magarpatta Road	6	Mundhwa Road Junction
		7	Reliance Mart Junction
3	Pune Saswad Road	8	Hadapsar Gaadital
		9	Fursungi kaman
		10	Matarwadi Phata
4	Bhairoba Nala to Chandralok junction	11	Lulla Nagar Square
		12	Gangadham Square
		13	Chadralok Hospital Square
5	Katraj Mantarwadi Bypass	14	katraj Bypass Square
		15	Khadi machine Square
		16	Undri Junction
		17	Pisoli Square
6	Golibar to Khadi Machine Square	18	Jyoti Hotel Square
7	Seven Loves Square to Gokul Nagar	19	Seven loves Square
		20	Wakhar Mahamandal Square
8	Pune Satara Road	21	Katraj bypass Square
		22	Market Yard Junction
		23	Pushpamangal Square
		24	Jedhe Square
9	Jendhe Chowk Sinhgad Road	25	Sawarkar Square
		26	Sinhgad Road Junction
		27	Rajaram Bridge Junction
		28	Vadgaon Bridge
		29	Nanded City
10	Katraj Mumbai bypass	30	Navale Bridge
		31	Varje Bridge
		32	Chandani Square
		33	Sadanad Hotel Square
		34	Sinhgad Road Junction
		35	Tilak Square
11	Khandojibaba Chowk -Warje junction-Karve Road	36	Khandojibaba Square
		37	Nalstop Square
		38	Karishma Society Square
		39	Karve Statue Square
		40	Ambedkar Square

		41	Warje Square
12	Paud Road- Paud Phata to Chandani Chowk	42	Paud Road junction
		43	Kothrud police Station Junction
		44	V.S. Khandekar Square
13	Nal Stop to Senapati Bapat Road	45	Shivaji Housing Square
		46	Goodluck Square
14	FC Road Khandojibaba Sqaure to Chafekar Sqaure	47	Jnanshware Paduka Square
		48	Chafekar Square
		49	Sancheti Sqaure
15	JM Road - Sancheti to Khandojibaba Square	50	Jhanshi Rani Square
		51	Simla Office Square
16	Ganeshkhind Road-Simla to University	52	Suryamukhi Datta Mandir Square
		53	Range Hills Corner Junction
		54	Pune university Square
		55	Bremen Square
17	University Square to Rajic Gandhi Bridge-Aundh Road	56	Rajiv Gandhi Bridge
		57	Abhiman Shree Junction
18	University Square to Sadanad, Baner Road	58	Baner Phata Junction
		59	Symantec junction
		60	Ganraj Mandal office Junction
		61	Abhiman Shree Junction
19	University Square-Chandani Chowk-Pashan Road	62	Shivaji Square, Pashan
		63	S K Ranwara Square
		64	Balaji Chowk
20	Shivaji Sqaure Pashan - Susgaon, Sus Road	65	Suskhind Bridge
		66	Susgaon
		67	Jahangir Hospital Sqaure
21	Old Pune Mumbai Highway	68	RTO Sqaure
		69	Engineering College Square
		70	Church Khadki Railway Station
		71	Bopodi square
23	Shahir Amar to Lashkar	72	Shahir Amar Shaikh Sqaure
		73	Maldhakka Square
		74	Bolhai Sqaure Collector Office
		75	Nehru Square
		76	Sadhu Wasvani Square
		77	Alankar Sqaure
24	Jedhe Sqaure Tilak Square-Tilak Road	78	Puram Sqaure
		79	SP College Square
25	Jamnalal Bajaj Statue- Gadgil Square Bajiroa Road	80	Bajaj Statue Square
		81	Shanipar Square
		82	Appa Balwant Square
		83	Gadgil Statue Square
26	Gadgil Statue Jedhe Shivaji Road	84	Jijamata Square
		85	Budhwar Square

		86	Belbaug Sqaure
		87	Gotiram Bhaiyya Sqaure
		88	Phadgate Police Station
		89	Raashtrabhushan Sqaure
27	Tilak Sqaure to Nehru Road Junction Laxmi Road	90	Saint Kabir Sqaure
		91	Nanapeth Square
		92	Tamboli Masjid Square
		93	Moti Sqaure
		94	Sevasadan Square
28	Tilak Road Tilak Square to Budhwar Sqaure -Kelkar Sqaure	95	Takle Havli Square
29	Tilak Sqaure to Chitale Bandhu Corner- kumthekar Sqaure	96	Chitale Bandhu Corner
30	Pune Station Seven Loves-Nehru Road	97	Power House Square
		98	Ramoshi Gate Police Station
		99	Bahubali Square
32	Pune Ahmednagar Road (Parnakuti-Kharadi Bypass)	100	Parnakuti Sqaure
		101	Gunjan Sqaure
		102	Shastrinagar Sqaure
		103	Vadgaon Sheri Sqaure
		104	Viman nagar Sqaure
		105	Kharadi Bypass Junction
33	Bund Garden Road- Jahangir Sqaure to Tarkeshwar Sqaure	106	Mangaldas Sqaure
		107	Dr. Ambedkar Setu Sqaure
34	Mobaj Square to Koregaon Park junction- mundhwa Junction	108	Hotel blue Diamond Sqaure
		109	Koregaon Park junction
		110	ABC Farm house Sqaure
		111	Tadigutta Sqaure
35	Patil Estate to Dighi -Alandi Road	112	Patil Estate Square
		113	Sadalbaba Sqaure
		114	Chandrama Sqaure
		115	Mental Corner Square
		116	Vishrantwadi junction
36	Gunjan to Airport -New Airport Road	117	Golf Club Junction
		118	in front of Yerwada Post office
		119	509 Square
		120	Petrol Satha Sqaure
		121	Square in front Airport
37	New Airport Road	122	Dorabji mall Square
		123	Symbiosis college Square
		124	Datta Mandir Sqaure
		125	Shri krishna Hotel Sqaure
38	Other Important Locations	126	Dr. Ambedkar College Square, yerwada
		127	In front of PMC
		128	Kumbhar Ves Square

	129	Rajarshi shahu bus Stand, Swargate
	130	PMPML Bus Depot Deccan
	131	PMPML Bus Depot Katraj
	132	Pune Railway Station
	133	Shivaji Nagar Railway Station
	134	Swargate ST Stand
	135	Shivaji Nagar ST Stand
	136	Pune Station ST Stand

6.4. List of proposed Locations for Environmental Sensors

○ List of exiting environmental sensors installed by IITM, Pune

1. Sensor Locations in PMC Limits: total 5

- IITM Pashan
- IMD Shivaji Nagar
- Pune Airport- Air Force Base
- Katraj- Bhati Vidyapeeth
- Hadapsar- Lohiya Garden

2. LED Display Board Locations: total 8

- IITM Pashan
- IMD Shivaji Nagar
- Pune Airport- Air Force Base
- Katraj- Rajiv Gandhi Zoo
- PMC Main Building
- Swargate- PMPML Bus Stand
- Alka Talkie Chowk- Sambhaji Police Station
- Mandai- Parking, In front of Mandai

○ List of certain locations for proposed environmental sensors

Below is the indicative list of locations for installation of environmental sensors. Locations for Water level monitoring (flood sensors) at low lying areas of the city shall be finalized after the detailed location survey by PSCDCL along with the SI.

#	Stretch of Road in PMC Limits	#	Location of required Environmental Sensors
	Pune Solapur Road	1.	Noble Hopital junction
		2.	Golibar Square
	Bhairoba Nala to Chandralok junction	3.	Lulla Nagar Square
	Seven Loves Square to Gokul Nagar	4.	Seven loves Square
	Pune Satara Road	5.	Market Yard Junction
	Jendhe Chowk Sinhgad Road	6.	Sinhgad Road Junction
		7.	Nanded City
1.	Katraj Mumbai bypass	8.	Chandani Square (CHANDANI CHOWK)
		9.	Sadanad Hotel Square
2.	Khandojibaba Chowk -Warje junction-Karve Road	10.	Nalstop Square
		11.	Karve Statue Square
3.	Nal Stop to Senapati Bapat Road	12.	V.S. Khandekar Square
4.	FC Road Khandojibaba Square to Chafekar Square	13.	Goodluck Square

5.	JM Road - Sancheti to Khandojibaba Square	14.	Jhanshi Rani Square
6.	Ganeshkhind Road-Simla to University	15.	Simla Office Square (IMD, available)
		16.	Pune university Square
7.	University Square to Rajic Gandhi Bridge-Aundh Road	17.	Bremen Square
8.	University Square to Sadanad, Baner Road	18.	Symantec junction
9.	Shivaji Square Pashan - Susgaon, Sus Road	19.	Susgaon
10.	Old Pune Mumbai Highway	20.	RTO Square
11.	Shahir Amar to Lashkar	21.	Sadhu Wasvani Square
12.	Jedhe Square Tilak Square-Tilak Road	22.	SP College Square
13.	Jamnalal Bajaj Statue- Gadgil Square Bajirao Road	23.	Bajaj Statue Square
		24.	Appa Balwant Square
14.	Tilak Square to Chitale Bandhu Corner- kumthekar Square	25.	Chitale Bandhu Corner
15.	Pune Station Seven Loves-Nehru Road	26.	Power House Square
16.	Pune Ahmednagar Road (Parnakuti- Kharadi Bypass)	27.	Gunjan Square
		28.	Vadgaon Sheri Square
		29.	Viman nagar Square
17.	Bund Garden Road- Jahangir Square to Tarkeshwar Square	30.	Dr. Ambedkar Setu Square
18.	Mobaj Square to koregaon Park junction- mundhwa Junction	31.	Hotel blue Diamond Square
		32.	ABC Farm house Square
19.	Patil Estate to Dighi -Alandi Road	33.	Vishrantwadi junction
20.	Gunjan to Airport -New Airport Road	34.	Golf Club Junction
		35.	Square in front Airport (already installed)
21.	New Airport Road	36.	Ramwadi Square
		37.	Datta Mandir Square
		38.	Shri krishna Hotel Square
22.	Other Important Locations	39.	Dr. Ambedkar College Square, Yerwada
		40.	Rajarshi shahu bus Stand, Swargate
		41.	PMPML Bus Depot Deccan
		42.	PMPML Bus Depot Kothrud

	43.	PMPML Bus Depot Katraj
	44.	BRTS Terminal 1 Sangamwadi
	45.	BRTS Terminal Vishrantwadi
	46.	Pune Railway Station
	47.	Shivaji Nagar Railway Station
	48.	Swargate ST Stand
	49.	Shivaji Nagar ST Stand
	50.	Pune Station ST Stand

6.5. List of Proposed Locations for Variable Messaging Display

Below is the indicative list of locations for installation of variable messaging displays (actual number and locations to be defined by the successful bidder after detailed location survey). Commercial for any new location (at the time of implementation) shall be considered based on a similar site pricing.

Sr. No.	Stretch of Road in PMC Limits	#	Location of required Variable Messaging Display
1	Pune Solapur Road	1.	Ravi Darshan
		2.	Noble Hopital junction
		3.	Bhairoba Nala Square
		4.	Mummadevi Square
		5.	Golibar Square
2	Magarpatta Road	6.	Mundhwa Road, Magarpatta Square
		7.	Reliance Mart Junction
3	Pune Saswad Road	8.	Hadapsar Gaadital
		9.	Fursungi Kaman
		10.	Matarwadi Phata
4	Bhairoba Nala to Chandralok junction	11.	Lulla Nagar Square
		12.	Gangadham Square
		13.	Chadralok Hospital Square
5	Katraj Mantarwadi Bypass	14.	Katraj Bypass Square
		15.	Khadi machine Square
		16.	Undri Junction
		17.	Pisoli Square
6	Golibar to Khadi Machine Square	18.	Jyoti Hotel Square
		19.	In front of kondhwa Police Station
7	Seven Loves Square to Gokul Nagar	20.	Seven loves Square
		21.	Dayas plot Square
		22.	Wakhar Mahamandal Square
8	Pune Satara Road	23.	Katraj bypass Square
		24.	Market Yard Junction
		25.	Pushpamangal Square
		26.	Jedhe Square
9	Jendhe Chowk Sinhgad Road	27.	Sawarkar Square
		28.	Sinhgad Road Junction
		29.	Rajaram Bridge Junction

		30.	Vadgaon Bridge
		31.	Nanded City
10	Katraj Mumbai bypass	32.	Navale Bridge
		33.	Varje Bridge
		34.	Chandani Square
		35.	Sadanad Hotel Square
		36.	River Bridge, opposite to Holiday Inn Hotel
		37.	Sinhgad Road Junction
		38.	Sendatta Square
		39.	Tilak Square
11	Khandojibaba Chowk -Warje junction-Karve Road	40.	Khandojibaba Square
		41.	Nalstop Square
		42.	Karishma Society Square
		43.	Karve Statue Square
		44.	Ambedkar Square
		45.	Warje Square
		46.	Ganapati Matha Square
12	Paud Road- Paud Phata to Chandani Chowk	47.	Paud Road junction
		48.	Anand Nagar Square
		49.	Kothrud police Station Junction
13	Nal Stop to Senapati Bapat Road	50.	V.S. Khandekar Square
		51.	Shivaji Housing Square
14	FC Road Khandojibaba Square to Chafekar Square	52.	Goodluck Square
		53.	Jnanshware Paduka Square
		54.	Chafekar Square
15	JM Road - Sancheti to Khandojibaba Square	55.	Sancheti Square
		56.	Jhanshi Rani Square
		57.	Natraj Square
16	Ganeshkhind Road-Simla to University	58.	Simla Office Square
		59.	Suryamukhi Datta Mandir Square
		60.	Range Hills Corner Junction
		61.	Pune university Square
17	University Square to Rajiv Gandhi Bridge-Aundh Road	62.	Bremen Square
		63.	Rajiv Gandhi Bridge
18		64.	Abhiman Shree Junction

	University Square to Sadanad, Baner Road	65.	Baner Phata Junction
		66.	Symantec junction
		67.	Balewadi Junction
		68.	Ganraj Mandal office Junction
19	University Square-Chandani Chowk- Pashan Road	69.	Abhiman Shree Junction
		70.	Shivaji Square, Pashan
		71.	S K Ranwara Square
20	Shivaji Square Pashan - Susgaon, Sus Road	72.	Balaji Chowk
		73.	Suskhind Bridge
		74.	Susgaon
21	Old Pune Mumbai Highway	75.	Jahangir Hospital Square
		76.	RTO Square
		77.	Engineering College Square
		78.	Poultry farm Square
		79.	Church Khadki Railway Station
		80.	Bopodi square
22	Bopodi Holkar Bridge- Khadki Bajar	81.	Aathmula Road Junction
		82.	Holkar Bridge
23	Shahir Amar to Lashkar	83.	Shahir Amar Shaikh Square
		84.	Maldhakka Square
		85.	Bolhai Square Collector Office
		86.	Nehru Square
		87.	Sadhu Wasvani Square
		88.	Alankar Square
24	Jedhe Square Tilak Square-Tilak Road	89.	Puram Square
		90.	SP College Square
		91.	Sahitya Parishad Square
25	Jamnalal Bajaj Statue- Gadgil Square Bajiroa Road	92.	Bajaj Statue Square
		93.	Maharana Pratap Garden
		94.	Shanipar Square
		95.	Appa Balwant Square
		96.	Gadgil Statue Square
26	Gadgil Statue Jedhe Shivaji Road	97.	Jijamata Square
		98.	Budhwar Square
		99.	Belbaug Square

27	Tilak Square to Nehru Road Junction Laxmi Road	100.	Gotiram Bhaiyya Square
		101.	Phadgate Police Station
		102.	Raashtrabhushan Square
		103.	Saint Kabir Square
		104.	Nanapeth Square
		105.	Tamboli Masjid Square
		106.	Moti Square
		107.	Sevasadan Square
28	Tilak Road Tilak Square to Budhwar Square -Kelkar Square	108.	Vijay Talkies
		109.	Takle Havli Square
29	Tilak Square to Chitale Bandhu Corner- kumthekar Square	110.	Chitale Bandhu Corner
30	Pune Station Seven Loves- Nehru Road	111.	Power House Square
		112.	Ramoshi Gate Police Station
		113.	Bahubali Square
31	Ramoshi Gate, Gotiram Bhaiyya Square- Mirza Galib Square	114.	Govind Halwai Square
		115.	Dawre Square
32	Pune Ahmednagar Road (Parnakuti- Kharadi Bypass)	116.	Parnakuti Square
		117.	Gunjan Square
		118.	Shastrinagar Square
		119.	Vadgaon Sheri Square
		120.	Viman nagar Square
		121.	Kharadi Bypass Junction
		122.	Old Kharadi Jakat Naka
33	Bund Garden Road- Jahangir Square to Tarkeshwar Square	123.	Mangaldas Square
		124.	Dr. Ambedkar Setu Square
		125.	Tarkeshwar Square
34	Mobaj Square to Koregaon Park junction- mundhwa Junction	126.	Hotel blue Diamond Square
		127.	Koregaon Park junction
		128.	ABC Farm house Square
		129.	Tadigutta Square
35	Patil Estate to Dighi -Alandi Road	130.	Patil Estate Square
		131.	Sadalbaba Square
		132.	Chandrama Square

		133. Mental Corner Square
		134. Vishrantwadi junction
36	Gunjan to Airport -New Airport Road	135. Golf Club Junction
		136. In front of Yerwada Post office
		137. In front of Jail Road Police Station
		138. 509 Square
		139. Petrol Satha Square
		140. Square in front Airport
37	New Airport Road	141. Dorabji mall Square
		142. Symbiosis college Square
		143. Ramwadi Square
		144. CCD Square, Viman Nagar
		145. Datta Mandir Square
		146. Shri Krishna Hotel Square
38	Other Important Locations	147. Dr. Ambedkar College Square, Yerwada
		148. In front of PMC
		149. Kumbhar Ves Square
		150. Rajarshi shahu bus Stand, Swargate
		151. PMPML Bus Depot Deccan
		152. PMPML Bus Depot Kothrud
		153. PMPML Bus Depot Katraj
		154. BRTS Terminal 1 Sangamwadi
		155. BRTS Terminal Vishrantwadi
		156. BRTS Terminal Old Kharadi Octroi Post
		157. Pune Railway Station
		158. Shivaji Nagar Railway Station
		159. Swargate ST Stand
		160. Shivaji Nagar ST Stand
		161. Pune Station ST Stand

7. Annexure #2: List of other smart city projects as part of Pune Smart city program (projects currently in progress as well as proposed projects)

#	Projects	Type & Component	Integration with SCOC platform
1.	SCo1 Road and road widening (ABB)	Transport, Reduce congesting and travel time w.r.t. the present situation (include measurable indicator)	Tracking of road assets as applicable
2.	SCo2 Electric busses (ABB)	Transport, Green initiative	Electric buses tracking
3.	SCo3 Redesign of streets (ABB)	Transport, 27 Km streets to be redesigned (10 km in Phase I, 9 Km in Phase II and 8 Km in Phase III)	Tracking of road assets as applicable
4.	SCo4 & 38 Smart Parking (ABB) Total Smart parking (City-wide)	Transport, Reduction in unauthorized parking along road. Increased available road width and capacity. It will reduce congestion and travel time (include measurable indicator)	Integration with parking systems
5.	SCo5 Footpaths (additional and retrofit) (ABB)	Transport, Total 70 km of Pedestrian Friendly footpath of 2m width to be created	Tracking of road assets as applicable
6.	SCo6 Place making (ABB)	Transport, 20+ locations to be identified and transformed public spaces to improve citizen experience	Tracking of road assets as applicable
7.	SCo7 Bicycles (ABB)	Transport, Smart Public Bicycle Sharing System will be developed by accommodating demarcated cycle tracks through redesign of 27 km of streets with 1230 bicycles and 112 cycle stops.	Tracking of Bicycle system
8.	SCo8 Bus stops (revamp 54 stations)(ABB)	Transport, Refurbishment of 100% of bus stops to improve look and feel increase adoption of bus by higher income group	Bus stops integration through Bus ITMS system
9.	SCo9 Junction redesign (ABB)	Transport, Redesign for 14 junctions in ABB area	Tracking of road assets as applicable
10.	SCo10 Non-motorised street (ABB)	Transport, Pedestrianization of Half ROW of DP road by Redesign	Tracking of road assets as applicable
11.	SCo11 BRT (ABB)	Transport, Encourage people to more use of public transport due to saving in cost and time. Reduce pollution and parking demand of Private vehicles (include measurable indicator)	Integration with bus ITMS system
12.	SCo12 Express Airport Service (ABB)	Transport, Define dedicated service lines to the airport from important junctions	Vehicle tracking & integration
13.	SCo13 E-rickshaws (ABB)	Transport, Green Initiative	E-rickshaw buses tracking

#	Projects	Type & Component	Integration with SCOC platform
14.	SC14 Waste water recycling (ABB)	Water, 100% of waste water treatment requirement for population forecast up to 2031 is met and 70-80% of water coming from drains/nalas is treated.	Integration with SWM system
15.	SC15 Storm Water Use (ABB)	Water, The city of Pune is prone to flooding when rainfall is >50mm per day Make ABB area 100% flood free	Integration with environmental sensors and detection system
16.	SC16 Adequate Water Supply (ABB)	Water, Build key infrastructure i.e. pipelines, reservoirs and pumps to ensure adequate distribution throughout the ABB region	Integration with water metering system
17.	SC17 Rainwater harvesting (ABB)	Water, Rainwater harvesting through 3.75 lac litre sumps in housing societies across ABB	-----
18.	SC18 Smart Metering (ABB)	Water, Smart metering for all domestic, bulk and commercial connections	Integration with water metering system
19.	SC19 River Water Cleaning (ABB)	Water, Utilize root zone technology to transform the riverfront in the ABB region	-----
20.	SC20 Solid Waste Management (ABB)	Water, Achieve Zero waste society with 100% collection, segregation and disposal through ICT solutions and scientific disposal solutions	Integration with SWM system
21.	SC21 Sanitation (ABB)	Water, Improve Sanitation in ABB area	-----
22.	SC22 Electricity distribution - Smart grid and net metering (ABB)	Electricity & Solar, Deploy smart grid technology and net meters in ABB to support the greater energy independence, efficiency and decarbonisation	Integration with Smart Grid and Net metering system
23.	SC23 Solar Energy Supply (ABB)	Electricity & Solar, Solar roof tops to contribute 10% of energy requirements in ABB area, at Zero cost model	Integration with Smart Grid and Net metering system
24.	SC24 Street lighting (ABB)	Electricity & Solar, To Provide Smart Street Lights with LED Lamps and lamp posts with air-pollution sensors, panic button, Wi-Fi-access point and CCTV camera.	Integration with Smart lighting system
25.	SC25 Security (ABB)	Liveability, An advanced surveillance solution with 100% CCTV coverage integrated with a 911 dispatch call center will ensure maximum safety	Integration with existing and future surveillance & security systems

#	Projects	Type & Component	Integration with SCOC platform
26.	SC26 Riverfront development (ABB)	Liveability, ABB's 3.5Km stretch of river front would be developed to become a world class recreation hub	-----
27.	SC27 Open spaces (ABB)	Liveability, Improve existing parks and transform vacant land parcels into places of possibilities	Tracking of road assets as applicable
28.	SC28 Fire stations (ABB)	Liveability, 2 new state-of-art fire stations for high rise cum compact development	Tracking of road assets and fire station emergency systems as applicable
29.	SC29 Low income skill development and healthcare (ABB)	Slum dev and affordable housing, Address key issues identified across slums in Pune - Sanitation, Livelihood, Education and Healthcare	Integration with respective web portal services
30.	SC30 Build Affordable Housing (ABB)	Slum dev and affordable housing, Creation of affordable houses for 400 economically weaker and low income group households in PMC owned land	Integration with respective web portal and database
31.	SC31 e-gov (ABB)	eGov, Intelligent Operation Centre, Citizen App, Pune Smart "Digi-Tel" Card, Digital SPV, e-Municipality and Citizen Desk	Integration with respective web portal and App services
32.	SC32 IT Connectivity (ABB)	Creating the fibre back-bone and Wi-Fi network in the city	Integration with respective web portal and Wi-Fi services
33.	SC33 Transit Hub (ABB)	Transit hub, Multi-modal transit hub at entry point of Pune with access to long distance buses	Integration with respective web portal services
34.	SC34 Start-up Zone (ABB)	Transit hub, Start-up zone to create ~45k jobs	Integration with respective web portal services
35.	SC35 Adaptive Traffic Control System(Pan city)	Transport, 319 signals, solar Panel & UPS, Emergency response sys data analytics	Integration with ATCS, RLVD, e-Challan systems
36.	SC36 Bus System ITMS (Pan city)	Transport, GPS, real-time tracking, health monitoring in buses, Smart bus stops with PIS, Mobile apps for real time tracking	Integration with Bus ITMS system
37.	SC37 Command Control Center (Pan city)	Transport, Camera Installation, Emergency Response Centre, Gun Shot sensors, cyber patrolling and GPS on cars, Increase patrol cars from 8 to 15 and integrate GPS on cars with emergency centre	-----

#	Projects	Type & Component	Integration with SCOC platform
38.	SC39 Intelligent Road Management (Pan city)	Transport, Mobile GPS based traffic analysis, Intelligent road asset mgmt., Smart Parking	Tracking of road assets and intelligent road management systems as applicable
39.	SC40 Traffic modelling system (Pan-city)	Transport, Develop a reliable traffic model to understand Traffic movement, its pattern, its variation (hourly, daily, weekly, seasonal). It will help in determining widening requirement, one-way/two-way decision, Real time traffic control, ATMS basis, advance planning and preparation of seasonal or occasional variation in the traffic demand.	Integration with traffic modeling system
40.	SC41 e-challan (Pan city)	Transport,	Integration with ATCS, RLVD, e-Challan systems
41.	SC43 Pilot DMA for 24x7 water (Pan-city)	Water, Convert 5 DMA's (6000 connections) in to 24x7 water supply zones with full pipeline construction, DMA deployment, metering and SCADA	Integration with water metering system as applicable
42.	SC44 Bulk Meters (Pan-city)	Water, Install bulk meters at the outlet of WTP's, elevated reservoirs and across different zones with SCADA and then conduct Water audit	Integration with water metering system as applicable
43.	SC45 Helium Leak Identification (Pan-city)	Water, Use advanced helium leak identification technology for identifying invisible leaks across 2688 Km	Integration with water metering system as applicable
44.	SC46 Smart Commercial Meters (Pan city)	Water, Make smart metering compulsory for all commercial connections	Integration with water metering system as applicable
45.	SC47 Smart Domestic Meters (Pan-city)	Water, Introduce domestic metering via voluntary "Give up water subsidy" scheme with telescopic tariff across all households	Integration with water metering system as applicable
46.	SC48 Customer Mapping & Survey (Pan-city)	Water, Conduct a comprehensive customer survey to document all legal and illegal connections	Integration with water metering system as applicable
47.	SC49 Naidu STP (Pan-City)	Water, Make Naidu STP (115 MLD) energy neutral by installing a Gas Engine and Screw Conveyor to generate 1.92 million units of electricity every year	Integration with smart grid system as applicable

#	Projects	Type & Component	Integration with SCOC platform
48.	SC50 Mobile app and website (Pan city)	Water, Online Bill Payment, Online Grievance System	Integration with respective web portal and App services
49.	SC52 Consumer Awareness (Pan-city)	Water, Initiate widespread consumer awareness programs across the city	Integration with respective web portal and App services

Note: The Smart City Operations Center platform should have capability to integrate various smart city solutions (as result of many of above mentioned initiatives) in seamless manner, with minimal effort. Necessary integration details, API and SDK interfaces will be provided for necessary integration.

8. Annexure #3: List of required manpower/ resources on the project

#	Manpower	Minimum Qualifications
1	Program Director	<ol style="list-style-type: none"> 1. Minimum Education: MCA/ MBA/ M.Tech. from a reputed institute 2. Total Exp: At least 20 yrs. 3. Languages known (Read, Write and Speak): Hindi, English 4. Should have good knowledge of computers and networking 5. Prior project management experience of at least 15 years of handling large and complex projects, with at least one large scale project with project value of minimum INR 30 crores. 6. Excellent writing, communication, time management and multi-tasking skills 7. Project Experience of managing various components of Smart City Projects, covering at least 3 initiatives mentioned in this RFP.
2	Program Manager	<ol style="list-style-type: none"> 1. Minimum Education: MCA/ MBA/ M.Tech. from a reputed institute 2. Total Exp: At least 15 yrs. 3. Languages known (Read, Write and Speak): Hindi, English 4. Should have good knowledge of computers and networking 5. Prior project management experience of at least 10 years of handling large and complex projects, with at least one large scale project with Project Cost of minimum INR 20 crores. 6. Excellent writing, communication, time management and multi-tasking skills 7. Project Experience of managing components of Smart City Projects covering at least 3 of the initiatives mentioned in this RFP.
3	Functional Lead	<ol style="list-style-type: none"> 1. Minimum Education: MCA/ MBA/M. Tech & B.Tech / B.E. from a reputed institute 2. Total Exp: At least 10 yrs. 3. Languages known (Read, Write and Speak): Hindi, English 4. Should have operating knowledge of computers and networking 5. Prior project management experience of at least 8 years of handling large and complex projects, with at least one large scale project with Project Cost of minimum INR 10 crores. 6. Excellent writing, communication, time management and multi-tasking skills 7. Project Experience of managing components of Smart City Projects covering at least the initiatives mentioned in this RFP. 8. Proficient in MS Project (Word, Excel, PowerPoint)
4	Subject Matter Experts	<ol style="list-style-type: none"> 1. Minimum Education: MCA/ MBA/M. Tech & B.Tech / B.E. from a reputed institute 2. Total Exp: At least 12 yrs. 3. Languages known (Read, Write and Speak): Hindi, English 4. Should have expert subject matter knowledge of Smart City related components 5. Prior project management experience of at least 8 years of handling large and complex projects, with at least one large scale project with Project Cost of minimum INR 10 crores. 6. Excellent writing, communication, time management and multi-tasking skills

		7. Project Experience of managing components of Smart City Projects covering at least the initiatives mentioned in this RFP.
5	Technical lead	<ol style="list-style-type: none"> 1. Minimum Education: MCA/ MBA/M. Tech & B.Tech. / B.E. from a reputed institute 2. Total Exp: At least 10 yrs. 3. Languages known (Read, Write and Speak): Hindi, English 4. Should have operating knowledge of computers and networking 5. Prior project management experience of at least 8 years of handling large and complex projects, with at least one large scale project with Project Cost of minimum INR 10 crores. 6. Excellent writing, communication, time management and multi-tasking skills 7. Project Experience of managing components of Smart City 8. Projects covering at least the initiatives mentioned in this RFP.
6	Full Time- on project- Project Manager	<ol style="list-style-type: none"> 1. Minimum Education: MCA/ MBA/M. Tech & B.Tech. / B.E. from a reputed institute 2. Total Exp: At least 10 yrs. 3. Languages known (Read, Write and Speak): Hindi, English 4. Should have operating knowledge of computers and networking 5. Prior project management experience of at least 7 years of handling large and complex projects, with at least one large scale project with Project Cost of minimum INR 10 crores. 6. Excellent writing, communication, time management and multi-tasking skills 7. Project Experience of managing components of Smart City Projects covering at least the initiatives mentioned in this RFP.
7	Full Time- on project- Functional Manager	<ol style="list-style-type: none"> 1. Should have fundamental comprehension across areas such as Integrated Industry Standard Open Platform, Database management Systems, Wi-Fi, and related wired network infrastructure implementation and management, network management, security management, design and deployment of Citizen App and Citizen Portal, integration of Third Party Shared Services, Help-desk Services Management, Smart Parking, Command and Control Centre. 2. Should be BE / B. Tech or higher from a premier institute with more than 7 years of work experience 3. Should have experience of at least three projects in the area of Public Wi-Fi, Smart Streetlights, Smart Parking, Command and Control Centre and Citizen Apps. 4. Proficient in MS Project (Word, Excel, Powerpoint)

8	Full Time- on project- Technical Manager	<ol style="list-style-type: none"> Should be BE / B. Tech or higher from a premier institute with more than 8 years of work experience Should have fundamental comprehension across areas such as Integrated Industry Standard Open Platform, Database management Systems, Wi-Fi, and related wired network infrastructure implementation and management, network management, security management, design and deployment of Citizen App and Citizen Portal, integration of Third Party Shared Services, Help-desk Services Management, Smart Parking, Command and Control Centre. Should have experience of at least three projects in the area of Public Wi-Fi, Smart Streetlights, Smart Parking, Command and Control Centre, CCTV Surveillance and Citizen Apps. Proficient in MS Project (Word, Excel, Powerpoint)
9	Project Support	<ol style="list-style-type: none"> Should be BE / B. Tech or higher from a premier institute with more than 5 years of experience in technology projects Proficient in MS office and MS Project. Should have experience in government projects. Should have worked in similar roles and at large scale IT/ITES Setup. Should have experience in government projects. Effective verbal communication skills (English, Marathi and Hindi).
10	Helpdesk Manager (Dedicated On premise)	<ol style="list-style-type: none"> Should have Bachelors in Computer Science or an equivalent IT degree Should have working knowledge of technical support services IT, Service desk model and software Proficient in MS office and MS Project Should have experience in government projects Should have worked in similar roles and at large scale IT Setup. Effective verbal communication skills (English, Marathi and Hindi)
11	System Analyst	<ol style="list-style-type: none"> Should have Bachelors in Computer Science OR an equivalent IT degree and should have minimum one year experience in software project operations and maintenance Proficient in MS office and MS Project Effective verbal communication skills (English, Marathi and Hindi)
12	Security Engineer	<ol style="list-style-type: none"> MCA/ BE/ B.Tech with specialization in computers with minimum five year experience in Security Administration of large and complex IT/ITES/Telecom projects Should have industry certifications for Security Administration Should have experience in government projects Effective verbal communication skills (English and Hindi)
13	Security Administrator	<ol style="list-style-type: none"> BE/ B.Tech or Diploma with specialization in computers with minimum three year experience in Security Administration of large and complex IT/ITES/Telecom projects Should have industry certifications for Security Administration Should have experience in government projects Effective verbal communication skills (English, Marathi and Hindi)

14	Solution Architect	<ol style="list-style-type: none"> 1. B.E/ B.Tech/ MCA/ M.Tech. with minimum 8 years of experience involving solution design, Should have been involved in installation of hardware and operating system, database and configuration, system maintenance 2. Should have experience in government projects 3. Should have worked in similar roles and at large scale IT Setup. 4. Proficient in MS office and MS Project 5. Effective verbal communication skills (English, Marathi and Hindi)
15	Database Developer	<ol style="list-style-type: none"> 1. BE Computers or Diploma with specialization in computers with minimum three years of experience in Database development and database management 2. Minimum five years of experience in Database management and administration 3. Should have experience in government projects. 4. Effective verbal communication skills (English and Hindi)
16	Database Administrator	<ol style="list-style-type: none"> 1. MCA/ BE/ B.Tech with specialization in computers with minimum five years' experience in Database Administration 2. Minimum five years of experience in Database management and administration 3. Should have experience in government projects. 4. Effective verbal communication skills (English and Hindi)
17	Network Engineer	<ol style="list-style-type: none"> 1. Diploma in Computer Hardware and Networking with course duration of minimum 1 year from Govt. recognized institution. 2. Minimum three years of experience in network implementation and network administration 3. Should have experience performing network testing, equipment testing, fault analysis, network repairs, etc. 4. Should have experience in government projects
18	Network Administrator	<ol style="list-style-type: none"> 1. Master or Engineering Degree in Computer Hardware and Networking with course duration of minimum 1 year from Govt. recognized institution. 2. Minimum five years of experience in network implementation and network administration of large and complex IT/ITES/Telecom projects 3. Should have certifications of industry leading network administration solutions 4. Should have experience in government projects
19	Server Administrator	<ol style="list-style-type: none"> 1. Diploma in Computers with minimum three years of experience in server administration for large and complex IT/ITES/Telecom projects 2. Should have OEM certification in server administration (Windows/ Linux) 3. Should have experience in government projects 4. Effective verbal communication skills (English and Hindi)
20	Server Engineer	<ol style="list-style-type: none"> 1. BCA/ BE/ B.Sc in Computers with minimum five years of experience in server administration for large and complex IT/ITES/Telecom projects 2. Should have OEM certification in server administration (Windows/ Linux) 3. Should have experience in government projects 4. Effective verbal communication skills (English and Hindi)

21	Quality Assurance Manager	<ol style="list-style-type: none"> 1. B.E/ B.Tech/ MCA/ M.Tech with minimum five years of experience in Systems/Software Quality Assurance 2. Experience devising and establishing a project's quality procedures, standards and specifications, increasing operational efficiency, setting up and maintaining controls and standard operating procedures, creating performance matrix and monitoring performance by gathering relevant data and producing statistical reports, etc. 3. Should have experience setting standards for quality as well as health and safety of the project and its resources 4. Should have experience in government projects 5. Should have knowledge of leading testing tools 6. Proficient in MS office and MS Project 7. Effective verbal communication skills (English, Marathi and Hindi)
22	Software Developer	<ol style="list-style-type: none"> 1. B.E/ B.Tech/ MCA/ M.Tech with minimum 4 years of experience in Software application development, programming languages and databases 2. Should have experience in government projects 3. Proficient in MS office and MS Project 4. Effective verbal communication skills (English, Marathi and Hindi)
23	Testing Engineer	<ol style="list-style-type: none"> 1. B.E/ B.Tech/ MCA/ M.Tech with minimum 4 years of experience in Software and Web Application testing, JAVA Applications. 2. Should have experience in government projects 3. Should have experience with different forms of testing like unit testing, system testing, integration testing, performance testing, load testing, network testing, equipment testing, etc. 4. Should have at least 4 years of experience in manual or automated testing 5. Should have knowledge of leading testing tools 6. Proficient in MS office and MS Project 7. Effective verbal communication skills (English, Marathi and Hindi)
24	Helpdesk Support	<ol style="list-style-type: none"> 1. Graduate in any discipline with experience of diagnosing hardware and software malfunctions, troubleshooting problems, replacing hardware and installing new software. 2. Should have experience in government projects 3. Proficient in MS office and MS Project 4. Effective verbal communication skills (English, Marathi and Hindi)
25	Web/ Portal Designer	<ol style="list-style-type: none"> 1. Should be a Graduate with 1 year Web designing and graphic designing diploma course from a Government recognized Institute and should have minimum 3 years of experience and proficiency in working with software such as Adobe Photoshop, Coral Draw, Macromedia Flash, and Dreamweaver 2. Should have experience in design and development software like Macromedia Flash, Photoshop, Corel Draw, Dreamweaver, etc. 3. Should have experience in government projects 4. Proficient in MS office and MS Project 5. Effective verbal communication skills (English, Marathi and Hindi)