Action Plan to reduce water loss to less than 20% in Five Years

AMRUT MISSION 2015- 2020

GHAZIABAD MUNICIPAL CORPORATION

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1 INTRODUCTION

Water is a vital resource no matter where in the world we live. Fresh water is not only essential for humans but also an important primary product for industrial and agricultural production. Therefore, the availability of fresh water is directly linked to the welfare and prosperity of our society. However, fresh water is a limited, sometimes even scarce, resource and rapid global changes, such as population growth, economic development, migration and urbanisation, are placing new strains on water resources and on the infrastructure that supplies drinking water to citizens, businesses, industries and institutions. Political, financial and/or technical barriers can also prevent equal water distribution, even in regions where the physical presence of water is sufficient. This effect, which is known as economic water scarcity, affects a large number of countries.

Urbanisation and the impact of climate change are accelerating water scarcity for cities around the world. Securing enough water for a growing population requires more efficient management of freshwater supply. The Urban population in India is growing at a rate faster than ever and the services in cities are crumbling to the increasing pressure. Along with other key services of the city, water supply is also struggling to maintain adequacy and quality of services provided to the citizens

For many water utilities it is important to close the considerable gap between the volume of water they supply and that which is billed to the customers. This difference is known as **Non Revenue Water (NRW)**, or urban water loss, and it amounts to between 25 and 50 percent of the total water distributed. It is caused by inaccurate billing and metering systems, leakage from deteriorating distribution infrastructures, excessive water pressure in distribution systems, reservoir overflow, unnecessary flushing and illegal connections to the water network. To overcome the challenge the cities need to identify the losses and take necessary measures to reduce it. Non-Revenue Water (NRW) is good indicators to measure the losses and high NRW typically indicate a poorly managed water utility.

Non-revenue water (NRW) is water which is supplied (produced and purchased) but not paid for, including technical losses (leakage), not billed water, Illegal connections, poor water meter performance and inaccurate reading and accounting of metered flows. The impacts of NRW are the loss of scarce resources and financial revenue in a cash strapped water sector. The central government under AMRUT mission has aimed to reduce the NRW in cities, and has included the same as a priority reform. The extent of NRW in Ghaziabad municipal area is not accurately measured, however it has been estimated approximately 23% i.e. 76 MLD. This is unacceptable and for that reason Action Plan has been prepared to reduce the NRW to less than 20% in next 5 years.

1.1 WATER BALANCE INDICATORS –

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The elements of the water balance are defined as:

System input volume: The measured system input to a defined part of the water supply system. In systems with substantial exports of water it is also very important to determine the volume of water supplied (system input volume minus billed water exported).

Authorised consumption: The volume of metered and/or un-metered water taken by registered customers, the water utility and other authorised parties. It includes billed authorised consumption (such as billed metered consumption, billed unmetered consumption and water exported) and unbilled authorised consumption (such as unbilled metered consumption and unbilled unmetered consumption). This part of the water balance also comprises leaks and overflows after the point of customer metering as well as the own requirements of the water utility, e.g. for flushing pipes or filter back-wash.

Revenue water (corresponding to billed authorised consumption): The volume of water successfully delivered and billed to the customer and which thus generates revenue for the water utility.

Non-revenue water (NRW): The volume which remains unbilled and therefore does not generate any revenue for the water utility. It can be expressed as the difference between the system input volume and billed authorised consumption or as the sum of unbilled authorised consumption and water losses.

Water losses: The volume of water lost between the point of supply and the customer meter due to various reasons. It can be expressed as the difference between system input volume and authorised consumption, and consists of apparent and real losses. Apparent losses can be subdivided into unauthorised consumption, meter inaccuracies and data handling errors. Real losses are made up of leakage from transmission and distribution pipes, leakage from service connections and losses from storage tanks.

1.2 KEY FACTORS INFLUENCING LEAKAGE

1.3 REAL LOSSES

Classification - Real losses are water volumes lost within a given period through all types of leaks, bursts and overflows. Real losses can be classified according to **(a)** their location within the system and **(b)** their size and runtime.

(a) Location

Leakage from the transmission and distribution mains may occur at pipes (bursts due to extraneous causes or corrosion), joints (disconnection, damaged gaskets) and valves (operational or maintenance failure) and usually have medium to high flow rates and short to medium runtimes.

Leakage from service connections up to the point of the customer meter: service connections are sometimes referred to as the weak points of water supply networks, because their joints and fittings exhibit high failure rates. Leaks on service connections are difficult to detect due to their comparatively low flow rates and thus often have long runtimes.

Leakage and overflows from storage tanks are caused by deficient or damaged level controls. In addition, seepage may occur from masonry or concrete walls that are not watertight. Water losses from tanks are often underestimated and, though easy to detect, repair is usually elaborate and expensive.

(b) **Size and runtime**

Reported or visible leaks primarily come from sudden bursts or ruptures of joints in big mains or distribution pipes. Leaking water will appear at the surface quickly depending on water pressure,

leak size as well as on soil and surface characteristics. Special equipment is not required to locate the leak.

Unreported or hidden leaks by definition have flow rates greater but due to unfavourable conditions do not appear at the surface. The presence of hidden leaks can be identified by analysing trends in water consumption behaviour within a defined water supply zone.

Background leakage comprises water losses with flow rates less pressure, which do not appear at the surface. These very small leaks (seeping or dripping water from leaky joints, valves or fittings) cannot be detected using acoustic leak detection methods. Therefore it is assumed that many background leaks are never detected and repaired but leak until the defective part is eventually replaced. Background leaks often cause a major share of real water losses due to their great number and their long runtimes.

While apparent losses can be nearly totally eliminated, a certain level of real losses will always remain in any water supply system. This amount is known as unavoidable annual real losses. Real losses must be valued at the cost of producing water or at the purchase price, if water is imported.

1.4 MEASUREMENT OF NRW

NRW reduction must be an agreed strategy for the whole organization, based on a holistic master plan, so that results can be achieved by the implementation of an ambitious programme. The 'Smart NRW Management' concept works on the principle of breaking the distribution system down into smaller more manageable units. A hydraulic model is used to calculate the optimal number and design of these areas, enabling the utility to focus on conducting the most economically advantageous activities. Furthermore, advanced management support systems secure overview and full control of the water distribution.

This indicator highlights the extent of water produced which does not earn the utility any revenue. This is computed as the difference between the total water produced (ex-treatment plant) and the total water sold expressed as a percentage of the total water produced.

NRW comprises of:

a) Unbilled Authorized Consumption: Unbilled authorized consumption used by the utility for operational purposes, water used for fire fighting, and water provided for free to certain customer groups.

b) Commercial (or apparent) losses: Apparent losses, also termed 'commercial losses' that are caused by inaccurate customer metering, data-handling errors and illegal tapping into the network.

c) Physical (or real) losses: Real losses, also termed 'physical losses', which comprise leakage from all parts of the system and overflows at the utility's storage tanks. Real losses are caused by poor operations and maintenance, the lack of an active leakage control system, and poor quality of underground assets.

1.5 EXTENT OF NON REVENUE WATER

Performance Indicator		
Indicator	**Unit**	**Definition**
Extent of Non-Revenue Water	%	This indicator highlights the extent of water produced which does not earn the utility any revenue. This is computed as - Difference between total water produced (ex-treatment plant) and total water sold expressed as a percentage of total water produced.
Data Requirements		
Data required for calculating the indicator	**Unit**	**Remarks**
a) Total water produced and put into the transmission and distribution system	million litres per day (or) month	Daily quantities to be measured through metering, and records should be maintained. Total supply for the month should be based on aggregate of daily quantum. Only treated water input into the distribution system should be measured. If water is distributed from multiple points, aggregate of that quantity should be considered. This quantum should include water purchased directly from any other sources and put into the distribution system, if any. Water may have been purchased from neighbouring ULBs, Cantonment Boards, etc.
b) Total water sold	million litres per day (or) month	Actual volume of water supplied to customers who are billed for the water provided. Ideally, this should be the aggregate volume of water consumed as per which consumers have been billed. However, in the absence of a complete and functionally effective metering regimen, alternate methods of measurement need to be evolved, with lower but acceptable levels of reliability.
Non Revenue Water	%	**Non-Revenue Water = [((a - b) / a)*100]**

2 ANALYSING EXISTING SITUATION

2.1 DATA FOR EXISTING WATER SUPPLY SYSTEM

WATER SUPPLY DATA FOR GHAZIABAD MUNICIPAL CORPORATION – SLB 2017		
WATER SUPPLY INDICATOR	**Unit**	**Value**
Coverage of water supply connections	**%**	**77.3**
Per capita available of water at consumer end	**Lpcd**	**139.5**
Extent of metering of water connections	**%**	**0.0**
Extent of Non Revenue Water	**%**	**23.5**
Continuity of water supply	**Hours/Day**	**4.3**
Efficiency in redressal of customer complaints	**%**	**95.5**
Quality of water supplied	**%**	**94.0**
Cost recovery in water supply services	**%**	**85.6**
Efficieny in collection of water supply related charges	**%**	**53.4**
WATER SERVICE COVERAGE - NUMBER OF CONNECTIONS		
Domestic connections (Total)	Number	227676
Bulk supply Apartments (Total)	Number	264
Bulk supply Layouts/Societies (Total)	Number	9612
Total Number of Water Supply Connections	Number	237552
WATER SERVICE COVERAGE - HOUSEHOLDS SERVED		
Households served by Domestic Connections	Number	227676
Households served by Bulk supply - Apartments	Number	264
Households served by Bulk supply - Layouts/Societies	Number	9612
Total Households served with Water Supply	Number	237552
WATER PRODUCTION CAPACITY		
PER CAPITA SUPPLY OF WATER	LPCD	139.48
Installed Capacity of Treatment Plants for Surface Water Sources	MLD	120
Volume of water produced through Surface Water Sources	MLD	56
Installed Capacity of Treatment Plants for Ground Water Sources	MLD	0
Volume of water produced through Ground water (power pumps)	MLD	269.4
Volume of water produced through any Other Sources	MLD	0
Total Installed Capacity	MLD	120
Total Volume of water produced	MLD	325.4
WATER CONSUMPTION		
Volume of water billed from Domestic Connections	MLD	210
Volume of water billed from Bulk supply Apartments	MLD	21
Volume of water billed from Bulk supply Layouts/Societies	MLD	18
Volume of water billed from Non domestic Connections	MLD	0
Volume of water billed from Public taps	MLD	0
Volume of water billed from any other sources	MLD	0
Total Volume of water billed	MLD	249
Total Volume of water unbilled (free supplies to Public taps)	MLD	4
Total Volume of water unbilled (free connections eg. Religious institutions etc)	MLD	3

EXTENT OF NON REVENUE WATER (NRW)	%	23.48
Total Volume of Water Produced	MLD	325.4
Total Volume of Water Billed	MLD	249
EXTENT OF METERING OF WATER SUPPLY CONNECTIONS	%	--
Non domestic incl. commercial/Indus/Instl. (Metered Functional)	Number	0
Non domestic incl. commercial/Indus/Instl. (Metered Non-Functional)	Number	0
Non domestic incl. commercial/Indus/Instl. (Unmetered)	Number	0
Non domestic incl. commercial/Indus/Instl. (Total)	Number	0
Public taps (Metered Functional)	Number	0
Public taps (Metered Non-Functional)	Number	0
Public taps (Unmetered)	Number	205
Public Taps (Total)	Number	205
Total number of metered and functional connections (domestic, bulk supply, others)	Number	0
Total number of Water Supply Connections	Number	9817
WATER SUPPLY FREQUENCY		
CONTINUITY OF WATER SUPPLY	Hours per Day	4.30
Days of supply per month	Number	30
Average duration of each supply	Hours	4.3
CONSUMER SERVICES		
EFFECIENCY OF REDRESSAL OF COMPLAINTS	%	95.5
Complaints received during the year	Number	5700
Complaints resolved within 24 hours during the year	Number	5445
TREATED WATER QUALITY SURVEILANCE		
QUALITY OF WATER SUPPLIED		94.00
Total Number of Samples taken for all types of tests	Number	5214
Total Tests Passed	Number	4901
FINANCIAL INFORMATION - OPERATING EXPENSES		
COST RECOVERY IN WATER SUPPLY SERVICES	%	-
Regular Staff and administration	Rs. Lakhs	1088.83
Outsourced/Contract Staff Costs	Rs. Lakhs	164.70
Electricity Charges/Fuel Costs	Rs. Lakhs	1502.00
Chemical Costs	Rs. Lakhs	28.00
Repairs/Maintenance Costs	Rs. Lakhs	284.11
Bulk (Raw/Treated) Water Charges	Rs. Lakhs	150.00
Other Costs	Rs. Lakhs	0.00
Total Operating Expenditure	Rs. Lakhs	3217.64
FINANCIAL INFORMATION - OPERATING REVENUES		
Arrears at the beginning of previous year (2015-16)	Rs. Lakhs	682.55
Revenue demand from user charges	Rs. Lakhs	5.00
Revenue demand from tax/cess - Water Service only	Rs. Lakhs	2750.00
Revenue demand from other revenues (eg. connection costs/Donations etc)	Rs. Lakhs	0.00
Total Revenue Demand for previous year	Rs. Lakhs	2755.00
COLLECTION EFFICIENCY OF WATER SUPPLY RELATED CHARGES	%	53.43
Total Revenue Demand for previous year (from user charges, taxes etc)	Rs. Lakhs	2755.00
Collection against arrears (2015-16)	Rs. Lakhs	203.00
Collection against the current demand of previous year (2015-16)	Rs. Lakhs	1472.00

2.2 WATER LOSSES AND NRW

Transmission and Distribution Losses (Physical or Real Losses)

At present the actual transmission and distribution losses cannot be calculated as flow meters and check meters are not installed in the distribution network. However based upon the estimation and experience it is assumed that 23.5% of the total water supplied from water treatment plant is lost in transmission and distribution network. This includes leakages, overflow, supply line burst, water loss in maintenance etc. This accounts for 11 MLD.

Illegal Connections (Commercial or apparent losses)

Unbilled Authorized Consumption

Other Losses

Sr.	Basic Information on Water-Supply	Quantity	Unit
A	Total Area of the ULB in Sq.Kms	220	Sq. Kms
B	Population of the ULB (as on 2011)	1648643	No.
C	Water Demand (In litre / Day)	272	MLD
D	Water Generated (In litre / Day)	325	MLD
E	Total Water Generated (In litre/ Day)	325	MLD
F	Water Supplied (Litre / Day)		
F 1	Domestic Use (Litre/ Day) (considering 63% as no recorded data available)	246	MLD
F 2	Industrial Use (Litre / Day) (Considering 35% as on recorded data available	0	MLD
F 3	Commercial use (litre / Day)	3	MLD
F 4	Social Use (Litre / Day) (considering 2% as no recoreded data available)	7	MLD
G	Volume of water Losses (Quantity of water produced less quantity of water delivered to users) in litres	76	MLD
H	Percentage of water lossess per day :- (Estimated)	23.38	%
I	Water loss to be reduced per day	11	MLD

3 ACTION PLAN TO REDUCE WATER LOSS AND NRW

3.1 METHODS TO REDUCE NRW

Components	Counteractive Measures
Unbilled authorised consumption	Increase the collection rate Observe and reduce the number of unbilled customers
Metering inaccuracies	Set up meter population demographics Arrange regular meter accuracy testing Introduce meter rotation and maintenance programme
Meter reading and data transfer errors	Analyse billing records for unusual consumption patterns and missing meter readings Audit samples of suspect accounts change from manual to automatic meter reading (AMR)
Data handling errors	Prepare the flowchart for the billing system process Conduct a billing process analysis Introduce the use of computerised billing systems Adopt correct annualising of consumption data Improve customer account management of online payments Compile customer account demographics and search for irregularity in consumption
Unauthorised consumption	Conduct inspections for meter tampering, bypassing and illegal connections Contain misuse of fire hydrants and other forms of illegal consumption Prevent fraud by water utility meter readers Use prepayment structures
Leakage from detectable bursts and breaks	Conduct a campaign to repair the backlog of reported/visible pipe breaks Reduce number of bursts and leaks by: • implementing pressure management (short-term) • developing a rehabilitation strategy (long-term) Reduce runtime by: • Introducing continuous network monitoring • Improving active leakage control • Improving speed and quality of repairs

3.2 STEPS OF ACTION PLAN

Stage	Objectives	Measures/tools
Preparation	Understand principal reasons and factors influencing water losses	Pilot studies, literature review
	Collect information about the water supply system	Network register, hydraulic network model, measurement of flows and pressures
	Assess current level of real and apparent losses	Top-down water balance, component analysis, bottom-up water balance
	Check reliability of water balance calculations	Accuracy bands, 95% confidence limits
	Analyse potential savings	

Target Setting	Calculate relevant performance indicators	
	Define economic level of leakage	
	Select appropriate intervention methods	Active leakage control (ALC), pressure management, pipe rehabilitation and replacement
	Determine short-term and long-term targets	
	Elaborate an investment plan	
Procurement	Provide support services, equipment, materials, IT systems	
Project Execution	Deploy own personnel or contract specialised firms	
	Manage works	
	Train personnel	
Monitoring & Maintenance	Review budgets	
	Monitor leakage development, maintain facilities and equipment	Failure database, network register
	Evaluate results	Water balance, network register

3.3 PRIORITY WISE ACTIONS REQUIRED

A. WATER AUDIT AND PLANNING:

For the purpose of accurate calculation of losses and NRW a Water Audit is proposed to be conducted. The scope of work will involve Assessment of existing water supply system, conducting water audit proposal for coverage of gap and detail project report (DPR) for SCADA system.

The assessment of existing situation will help in mapping the existing distribution network; identify the physical coverage and gap in the system. The detail project report for SCADA system will help in implementing the SCADA system for first phase.

B. SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) SYSTEM:

The SCADA system in first phase will be installed for monitoring the water at water Source, intake wells, Treatment Plants, Water distribution Rising Mains, Ground Service Reservoirs and Feeder Mains.

The system will monitor the water consumption, flow rate pressure etc. on a live basis. This will help identify the location of water loss and area of high demand. Further based upon location, consumption status, revenue collected from that location, NRW from illegal connections, water theft, wastage of water and exempted connections can be focused to a location. The system will also help estimate the location wise losses so that the supply can be planned accordingly.

C. REGULAR MONITORING FOR ILLEGAL CONNECTIONS AND CITIZEN INVOLVEMENT

Illegal connections involve the physical installation of a connection to water distribution pipelines without the knowledge and approval of the municipal corporation. Illegal connections can occur during the installation of a new supply connection, or sometimes the customer's supply is cut off after non-payment and the customer cannot afford, or does not want to pay, to be reconnected. During customer awareness programmes, customers should be encouraged to report illegal connections, and regulations should be in place to penalise the water thieves.

Because large customers tend to steal large volumes of water, the discrepancy will show up when the GNN conducts a flow balance analysis through SCADA system.

The ward wise usage or location wise usage shall be displayed in public forum which will encourage the citizens to go for a legal connection. Local public representatives shall also be persuaded to reduce the illegal connections.

D. METERING OF CONSUMER

At present the Industrial, Non-Residential and Residential Connections are not being charged for the consumption of water. This results in overdraw of water and thus increased NRW.

Since metering of water supply is discouraged by citizens, at **first** only the Industrial and non-residential connections will be metered. **Secondly** the area selected for Smart City Mission will be completely metered. **Lastly** for the remaining area (if any).This shall create acceptability for metering among the citizens and thus 100% metering of water connections shall be persuaded.

The rates of water charges should be fixed considering the standard supply of approx 165 LPCD. This will ensure that the users consuming more water will pay more and hence reducing the NRW.

E. REDUCTION OF AUTHORIZED UNBILLED WATER

Water for city services and urban poor are unaccounted and unbilled these results in misuse of water and thus increasing NRW. It is proposed that water used for City Services such as gardening and cleaning shall be metered. Though the usage is not billed however an account of used water will create a conscience for misuse. Reuse of water has also been proposed for city services. Decentralized treatment plant can be used to provide water for gardening purpose and other city services.

F. INCREASING COVERAGE WITH COMPLETE SCADA SYSTEM

The present physical coverage is approx. 80%. The new connections will be completely metered and will be covered under SCADA system (Supervisory Control And Data Acquisition). A complete SCADA system for old connections is also proposed with monitoring till individual connections. This system will further reduce the NRW as the revenue from new connections will be 100% and from old connections will tend to increase more than 90%.

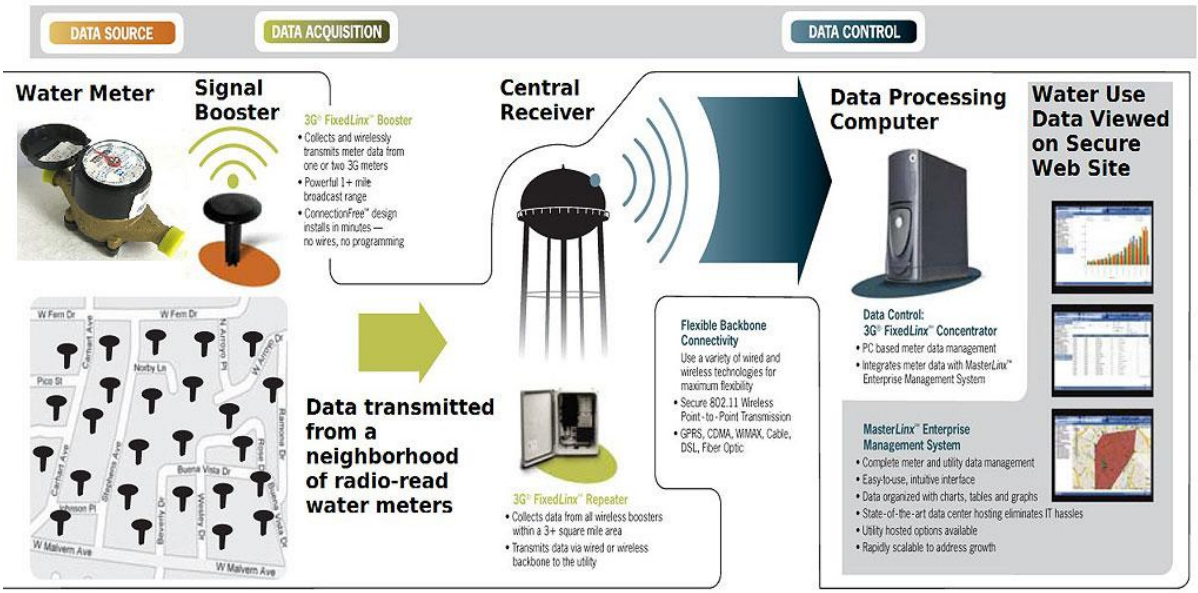

Figure 1: SCADA System

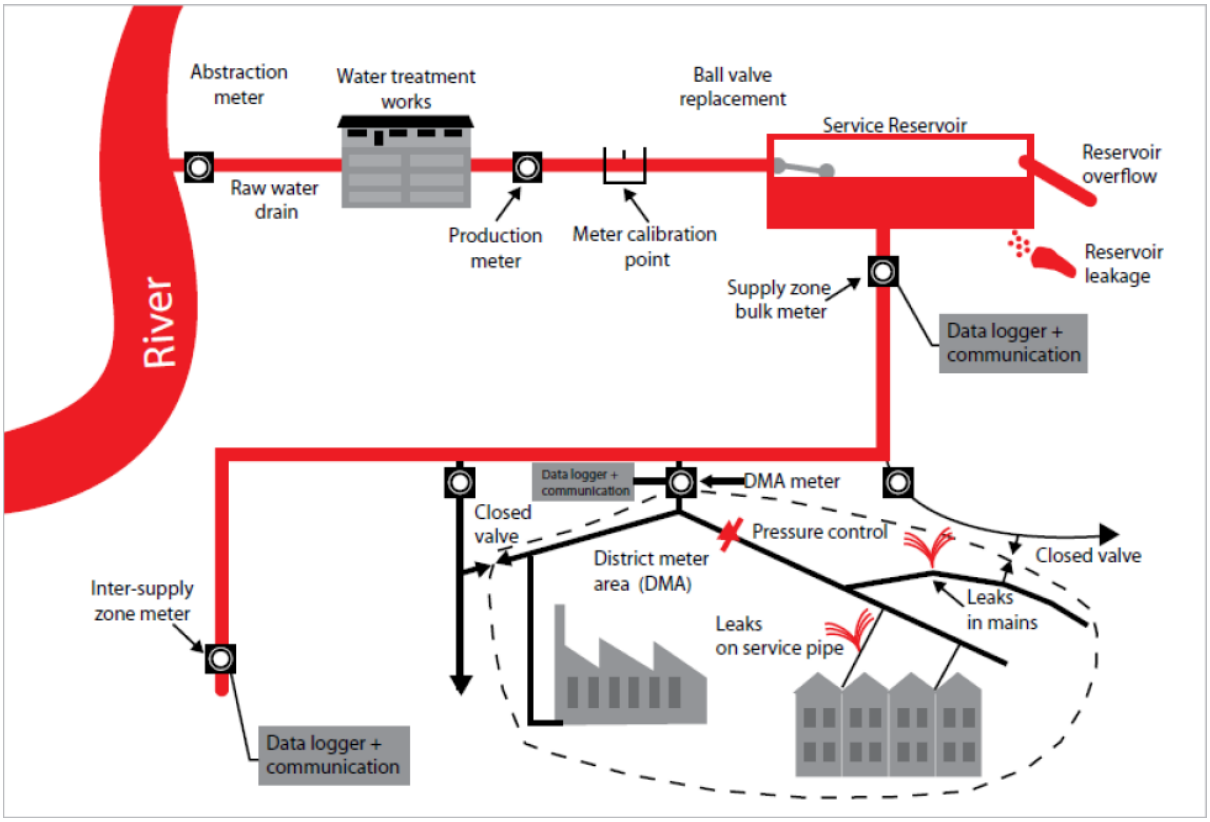

Figure 2: Layout diagram for metering in SCADA

G. MUNICIPAL REVENUE ENHANCEMENT AND WATER LOSS REDUCTION USING GIS

Geographical Information Systems (GIS) has proven to be an exceptionally strong management tool in the war against water loss and associated municipal revenue losses. GIS modelling and data analysis increases efficiency in services management and delivery, data processing, calculations, reporting and decision making, thus creating a powerful platform for water loss management interventions.

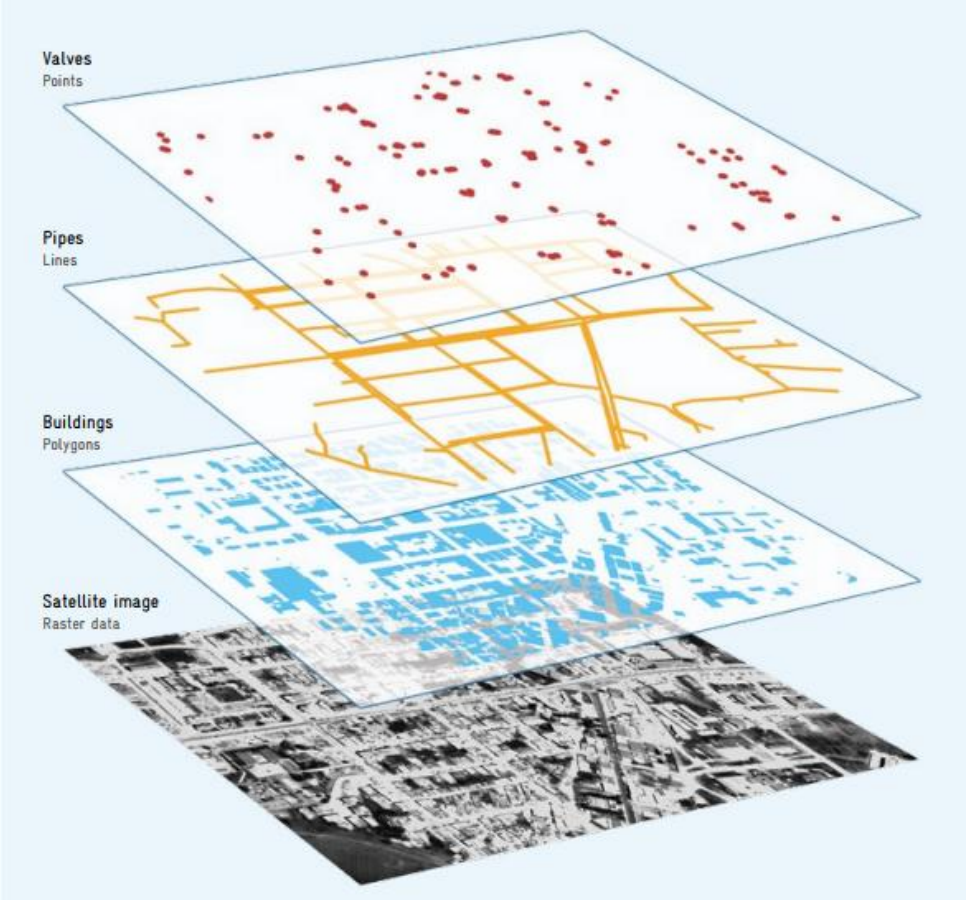

Figure 3: GIS mapping layers for data extraction of services

3.4 LIST OF POTENTIAL CORRECTIVE MEASURES TO REDUCE WATER LOSSES IN ULB AREA

Sr.	List of Potential corrective measures to reduce water losses in ULB Area	Volume of water losses expected to be reduced in litres	Reduction of water losses expected (%)
1	Repairing of Major leakages or water losses area in the City 1. Pump House 2. Pumps and Values 3. Storage Reservoirs	1 MLD	9.09
2	Repairing and Maintenance of Distribution System 1. Leak Defection 2. Timely response to visible maintenance issues 3. Development of System Zones 4. Release Valves & Wash out valves 5. Replacement or repair of service connections and water mains 6. Corrosion control	3 MLD	27.27
3	Installations of Automatic Shut-off valves for automatic closer of storage tanks in 1. Individual Households 2. Educational institutions 3. Industrial Areas 4. Commercial Areas (Hotels, Restaurants etc.,) 5. Social Areas (Hospital, bus stop etc.,)	1 MLD	9.09
4	Consumer Education 1. Aid consumers by producing understandable and informative water bill 2. Plumbing retrofits and replacements 3. Importance of water conservation	1 MLD	9.09
5	Monitoring of Metering Systems 1. Identification and reduction of unauthorized connections 2. Prevention of water losses in street taps 3. Installation of new meters at consumer level 4. Testing of production and sales meters 5. RE-Specifying, re-sizing and replacement of meters 6. Improvements to meter reading methods 7. Billing improvements	5 MLD	45.45

3.5 ONGOING PROJECTS UNDER AMRUT FOR THE INCREASE IN WATER PRODUCTION AND DISTRIBUTION

Sr.	Financial Year of Commencement	Sector/ Subject	Project Title	Work Description	Implementing Agency
1	2015-16	Water Supply	Estimate of House Connection in Water Supply Lines of Ghaziabad.	53431 Nos. of Domestic Connections in Various Wards of Ghaziabad along with road reinstatement work.	UP Jalnigam
2	2015-16	Water Supply	Ghaziabad CHA (Part-2) Reorganisation of Water Supply Scheme (i) Phase-1	Tube well- 12 Nos.Distribution System- 30.576 Kms. OHT- 1Nos. CWR- 5 Nos. Rising Main - 31 Km.	UP Jalnigam
3	2016-17	Water Supply	Ghaziabad CHA (Part-2) Reorganisation of Water Supply Scheme (ii) Phase-2	Tube well- 36 Nos. Distribution System- 158.408 Kms. OHT- 5 Nos. CWR- 5 Nos. Rising Main - 12.27 Km.	UP Jalnigam
4	2016-17	Water Supply	Ghaziabad T.H.A. W/s. Reorganisation Scheme Part-II	Ranney Well-03 Nos. Rising Main-10.045 Km. Pumping Plant-15 Nos. Staff Quarter-03 Nos.	UP Jalnigam

3.6 FUNDING STRATEGIES

Various sources identified for funding of proposed activities are AMRUT mission and internal sources. Under AMRUT mission funds have been approved for water supply sector for mission period of 5 years.

Proposed funding and sharing pattern for priority projects : Sector Wise

(amount in Cr.)

Project Title	Project cost (in Cr.)	Share (in Cr.)				
		GOI	State	ULB	Santage	Total
Estimate of House Connection in Water Supply Lines of Ghaziabad.	29.02	8.61	9.47	7.75	3.20	29.02
Ghaziabad CHA (Part-2) Reorganisation of Water Supply Scheme (i) Phase-1	37.05	11.08	12.19	9.98	3.80	37.05
Ghaziabad CHA (Part-2) Reorganisation of Water Supply Scheme (ii) Phase-2	89.28	-	-	-	-	-
Ghaziabad T.H.A. W/s. Reorganisation Scheme Part-II	44.41	-	-	-	-	-
TOTAL	**199.76**					

The revenue from user charges collection is assumed to improve in next five years and shall be utilized for maintenance and up gradation of water Supply System. Further, PPP model can also be explored for Viability Gap Funding if required.