



DELHI JAL BOARD



Towards Rational Capital Water Supply System

- V K Babbar, Chief Engineer
- Vikram Singh, Suptd. Engineer

DELHI'S DEMOGRAPHY: Uniqueness

- **Total Area** : 1486 Sq Km
- **Fully developed Urban area** : 525 Sq Km
 - **NDMC** : 42.7 Sq Km
 - **DELHI CANTT** : 42.8 Sq Km
- **Outer Delhi Area**
(Including Urban Ext.) : 961 Sq Km
- **Population (2010)** > 180 Lac
- **PROJECTED POPULATION 2021: 230 lac**

- **ANNUAL IN-MIGRATION FROM NEIGHBOURING STATES** : 14 lac (Approx)
- **FLOATING POPULATION** : 15 lac (Approx)
- **Decadal population growth rate of 47% v/s national rate of 26%**
- **50-60 Lac people live in unplanned habitations**



SOURCES OF RAW WATER

a) Surface Water:

i) River Yamuna	750 Cusecs (About)
ii) Ravi- Beas through BBMB	496 Cusecs (Ex- Nangal)
iii) Ganga Water	500 Cusecs

Total : 1746 Cusecs

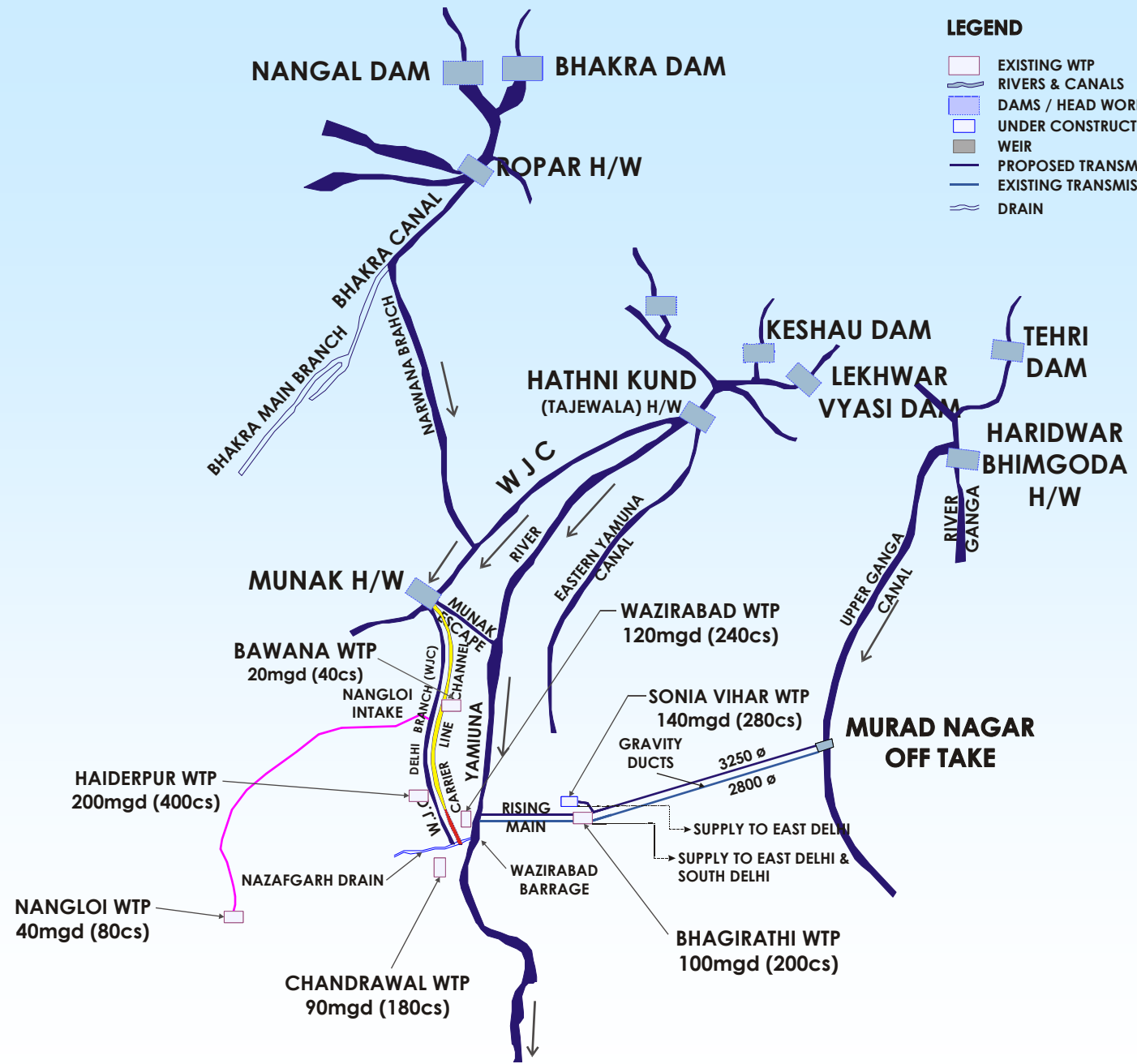
b) Ground Water

i) From Tube wells, Renny wells etc. 185cusec (100 MGD)



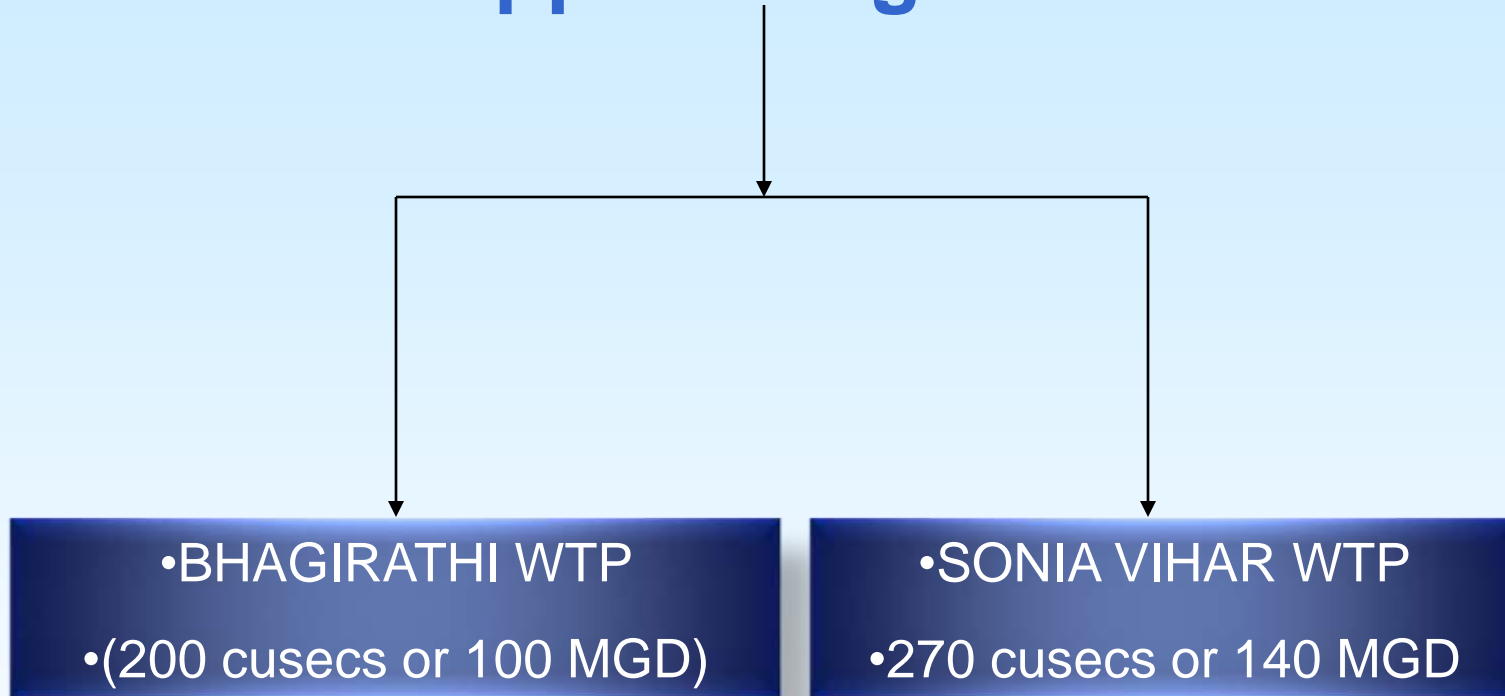
LEGEND

- EXISTING WTP
- RIVERS & CANALS
- DAMS / HEAD WORKS
- UNDER CONSTRUCTION
- WEIR
- PROPOSED TRANSMISSION MAIN
- EXISTING TRANSMISSION MAIN
- DRAIN



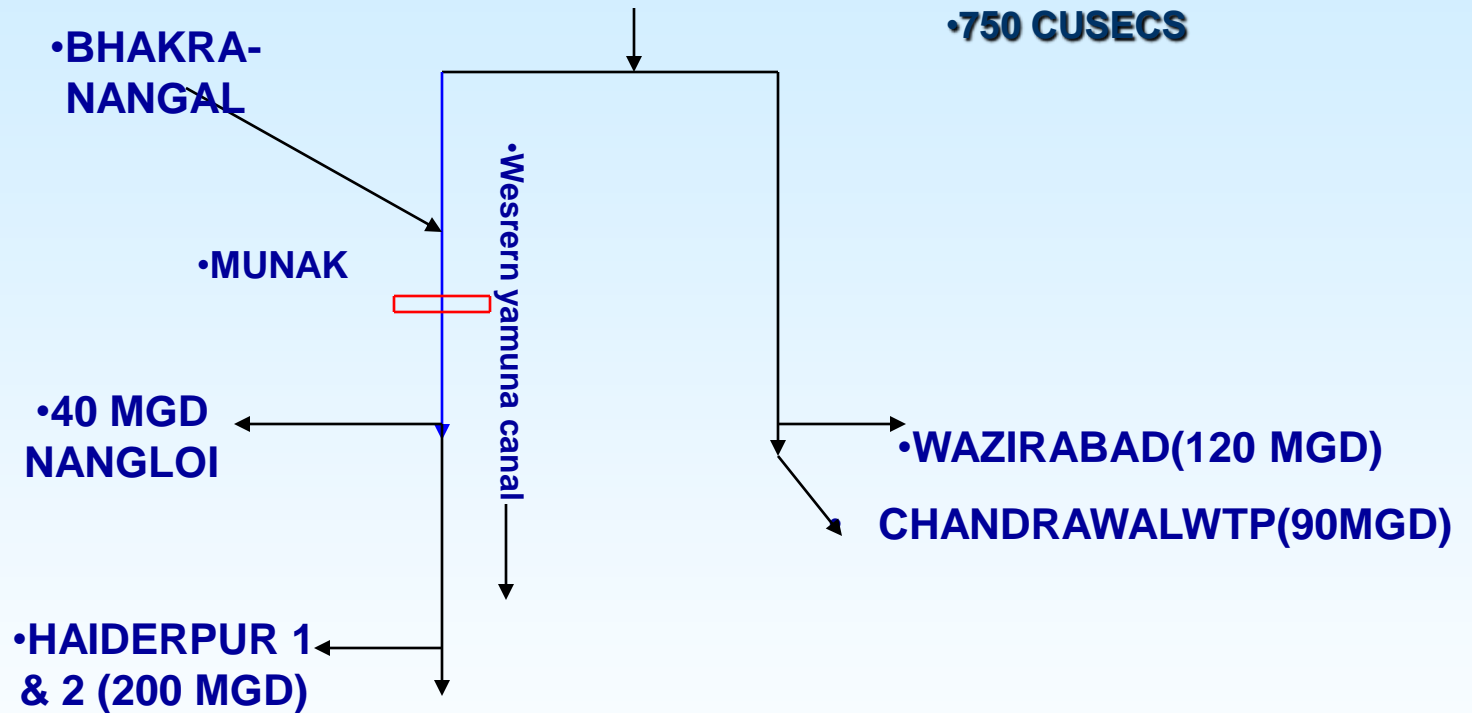
RAW WATER SOURCES

Water From UP through Upper Ganga Canal



Water Through Haryana

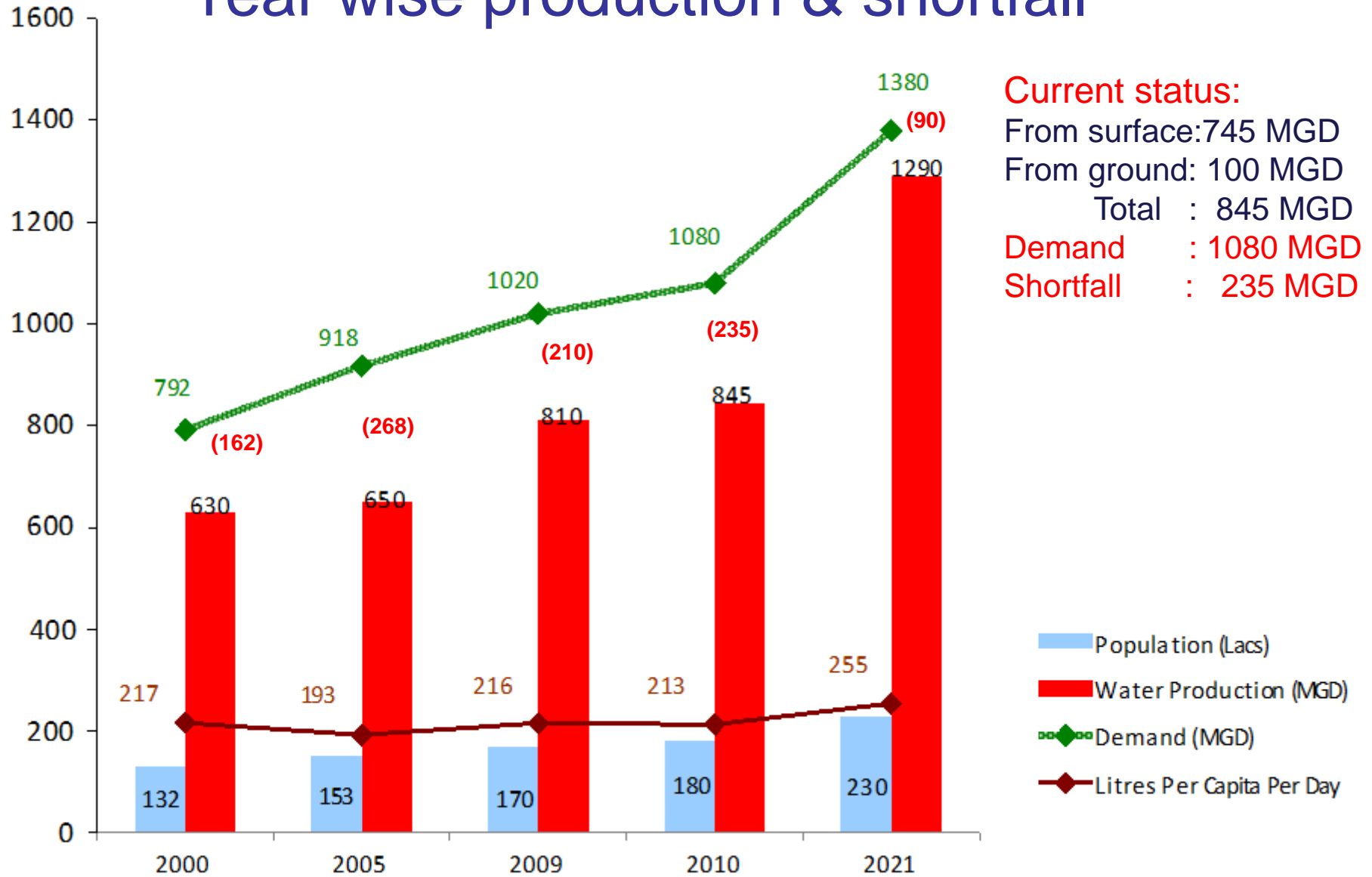
TAJEWALA



CURRENT TREATMENT STATUS

- **FROM ALL SOURCES** : 845 MGD (about)
 - FROM SURFACE WATER : 745 MGD
 - FROM GROUND WATER : 100 MGD
 - **TOTAL REQUIREMENT (2010)** : 1080 MGD
 - **SHORT FALL** : **235 MGD**
- EXPECTED DEMAND IN 2021** : **1380 MGD**

Year wise production & shortfall



Current status:

From surface: 745 MGD

From ground: 100 MGD

Total : 845 MGD

Demand : 1080 MGD

Shortfall : 235 MGD

- Population (Lacs)
- Water Production (MGD)
- ◆ Demand (MGD)
- ◆ Litres Per Capita Per Day

EXISTING INFRASTRUCTURE

- **WATER TREATMENT PLANTS** : **8**
(WAZIRABAD, CHANDRWAL, BHAGIRATHI, SONIAVIHAR, HAIDERPUR, NANGLOI, OKHLA & CWG VILLAGE)
- **TOTAL INSTALLED CAPACITY** : **755 MGD**
- **MAJOR STORAGE & BOOSTER PUMPING STATIONS:** **90**
- **WATER SUPPLY NETWORK** : **12000 KM**
Includes
 - **WATER TRUNK MAINS OF SIZES FROM** : **750 KM**
900 – 1900 MM DIA IN PSC, M.S., C.I. & D.I.
- **MATERIAL FOR DISTRIBUTION LINES** : **C.I. & D.I.**

Additional Raw Water: Short Term Bliss

80 MGD

- Savings from carrier lined channel (approximately 160 Cusecs)
- Paid Rs. 380 crores to Haryana, likely to be completed by June 2011.
- Water from reduced enroute losses will run WTPs at Dwarka (40 MGD), Okhla (20MGD) & Bawana (20 MGD)

60 MGD

- Approx. 60 MGD from flood plain of River Yamuna
- Study under progress in C.G.W.B. and National Institute of Hydrology, Roorkee - likely to be completed in next six months.

45 MGD

- Reclamation of waste water @ 8-10% from treatment process
- Plants at Haiderpur, Wazirabad, & Bhagirathi - already commissioned and around 37 MGD water added to the system.
- 8 MGD recycling plant at Chandrawal likely to be commissioned by June 2011.

TOTAL EXPECTED : 148 MGD



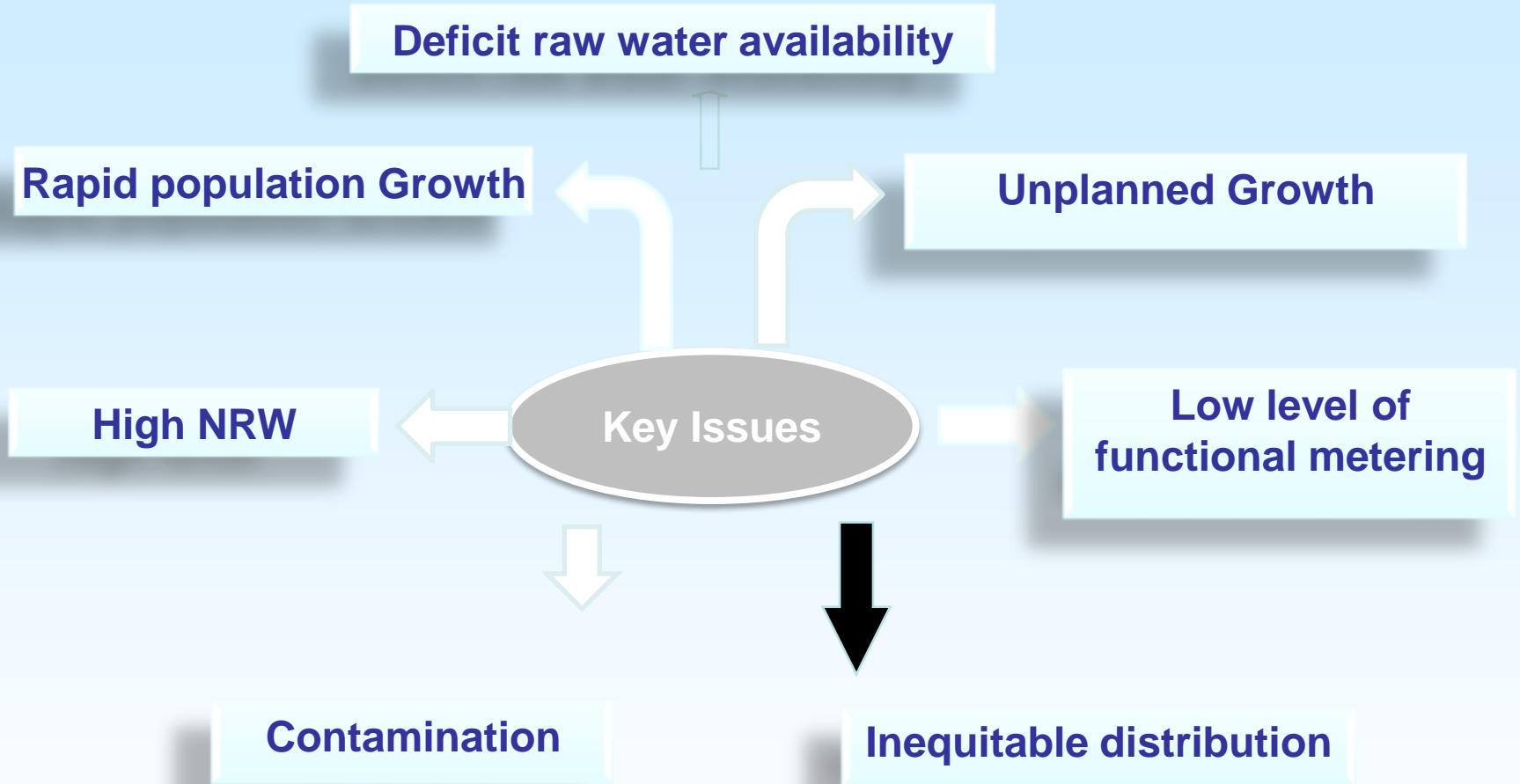
Additional Raw Water: Long Term Potential

- 1. Upstream Storages on River Yamuna: As on today there are no upstream storages on River Yamuna. As a result, Delhi is able to utilize only about 1/3rd of its Yamuna allocation. Three storages namely Renuka, Kishau & Lakhwar Vyasi already identified.**
- 2. Renuka is likely to happen first to yield 275 MGD to Delhi. DJB has paid about Rs. 215 crores to HPPCL and there is an additional demand of about Rs. 170 crores for the project.**
- 3. Through sharing of Ganga Water: Till now, Ganga water is not shared. Delhi aspires to get additional Ganga water if formal sharing of River water is decided.**
- 5. Delhi has share of 0.2 MAF from Rabi Beas River. It can be increased to 0.60 MAF, 0.2 MAF coming from share of Punjab, Haryana & Rajasthan. Delhi has already requested ministry of water resources to help.**

Water Supply Indicators

Performance Indicator	Benchmark (CPHEEO: MoUD)	Current Status DJB
Coverage	100%	72 %
Per Capita Supply of Water (lpcd)	135	191
Extent of Metering	100%	55%
Efficiency in Complaint Redressal	80%	73 %
Extent of Non-revenue Water	15%	52%
Quality of Water Supplied	100%	99%
Cost Recovery	100%	42%

Water Sector: Key challenges for DJB

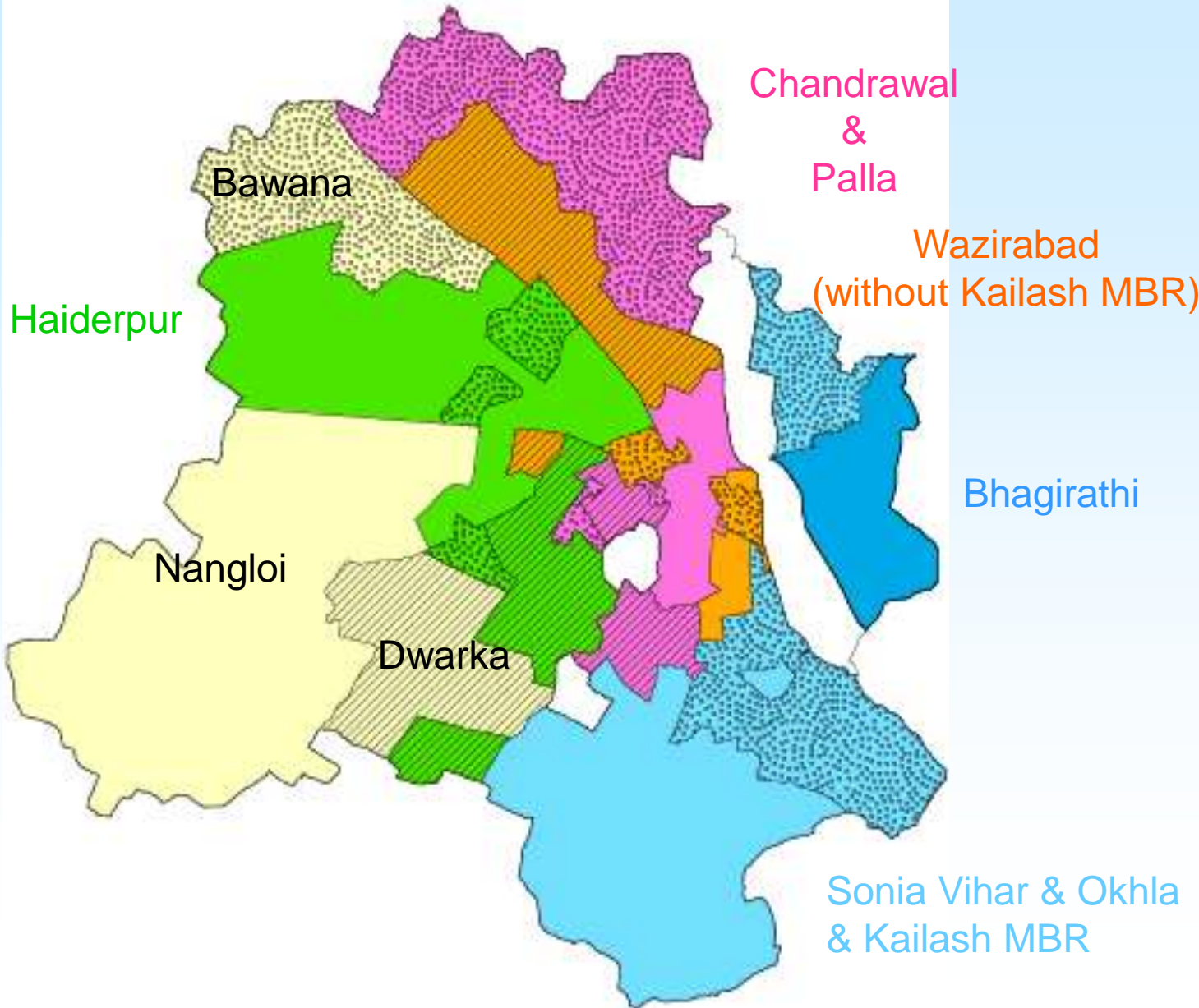


INTRA-CITY DISTRIBUTION OF WATER

- Earlier water supply distribution network consisted Direct tapings from the rising mains from WTPs.
- Distribution abnormalities - excess availability near source & short supply at tail ends.
- In 2000 TCE prepared Plan for Rationalization of distribution of water across the city for the year 2011.
- Underground Reservoir (UGR) based distribution in place of direct tapings.
- Entire Delhi divided in to 107 UGR Hydraulic Command Zones.
- WTP to feed only up to UGRs. Further distribution through pumping from UGRs.



WTP Command Area Existing (TCE+Dwarka WTP)



TCE-2011:UGR COMMAND AREA



RATIONALIZATION/EQUITABLE DISTRIBUTION

Equitable Distribution

Most of the Plants are located in East & North Part of Delhi. Therefore to ensure uniformity and quality supply all over city, storages are planned:

Total storage required	: 520 MG
Already available storage capacity	: 365 MG

Total UGRs constructed/ to be constructed in all Districts : 107
(Already about 90 UGRs are functioning, 12 UGRs under construction and 5 UGRs being taken up for construction)

Challenge: Disconnect all direct tapings from rising mains



Leakage Management/ Water Audit

Presently NRW > 50%.

•Comprises both Technical (20-25%) & Commercial Losses (25-30%)

Bulk meters installed at plants:86

Bulk meters at distributions : 305

Domestic meters being purchased: 4 L

Total domestic meters required: 8 lacs

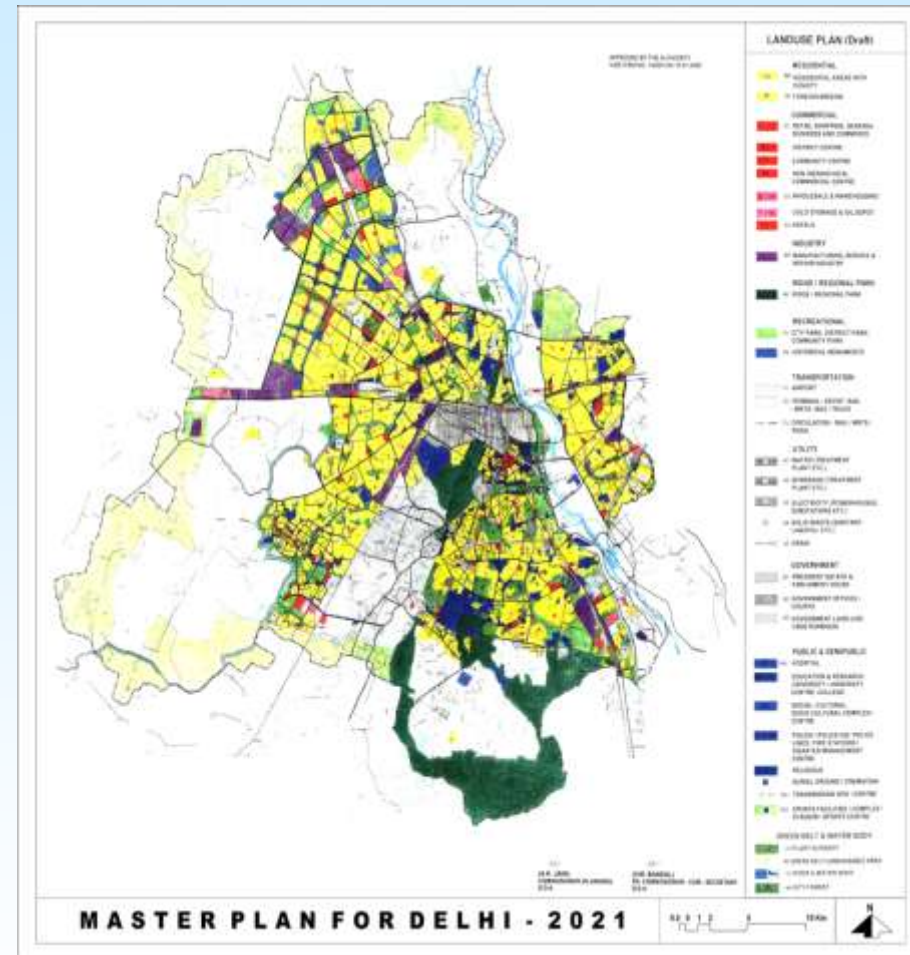
In collaboration of JICA, 3 Pilot areas viz command areas of Nangloi Water Treatment Plant, Malviyanagar & Vasant Kunj UGRs planned to be taken up to reduce NRW

Leakage Management/
Water Audit

A program is being launched for comprehensive leak management in the distribution system.

Preparation of Water Master Plan for 2021

With the help of JICA, DJB is preparing Water Master Plan for year 2021 i/c Zonal Plans, Demand Projections, GIS Mapping and Water Availability etc.



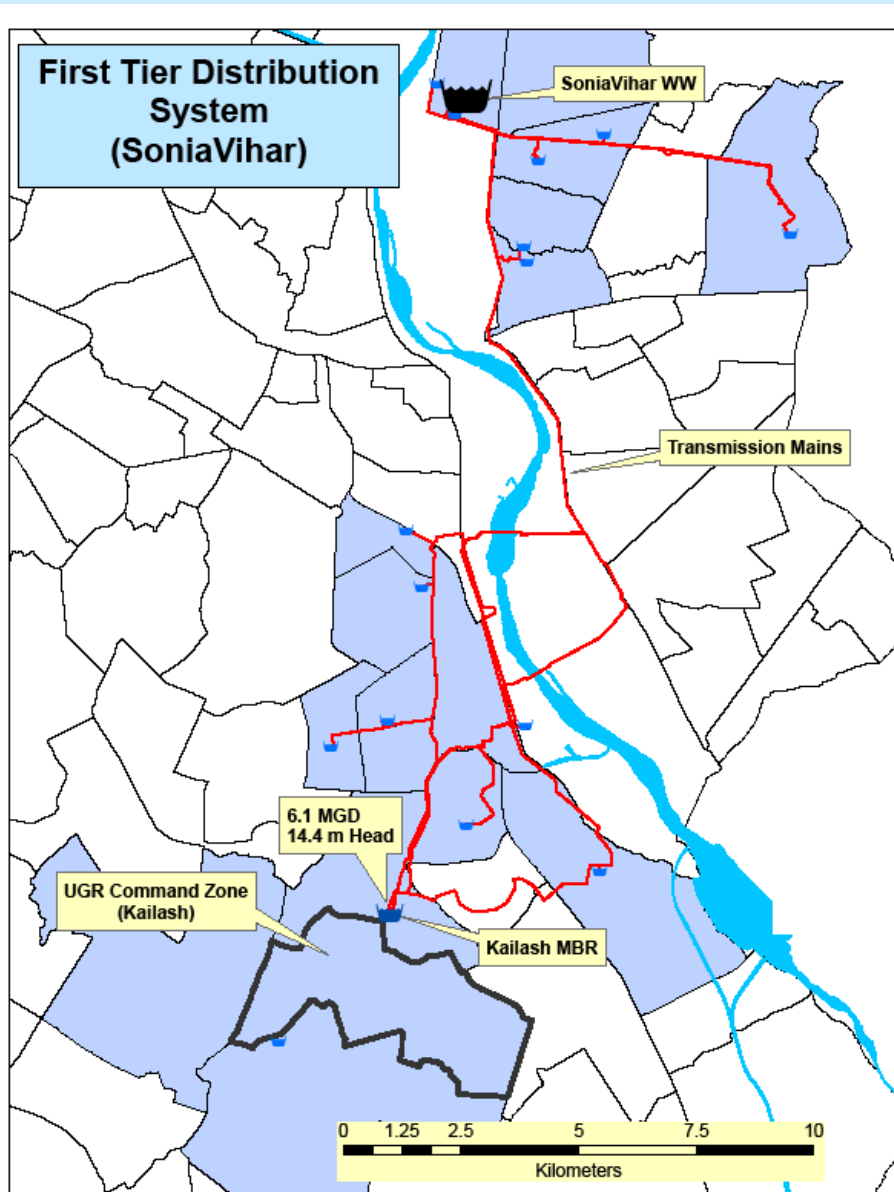
Master Plan Objectives

- Equitable Water Supply
- Extension of Water Supply to Outer Area
- Demand Management
- Energy Management
- 24 X 7 Supply

Proposed Measures

- Three-Tier System Facilities for Equitable Distribution
 - WTP Command Area
 - UGR Command Area
 - DMA (District Metered Area)
- Water Resources
 - New dam (275 MGD ?)
 - NRW reduction (15% level: 200MGD)
- SCADA for Flow Monitoring and Control

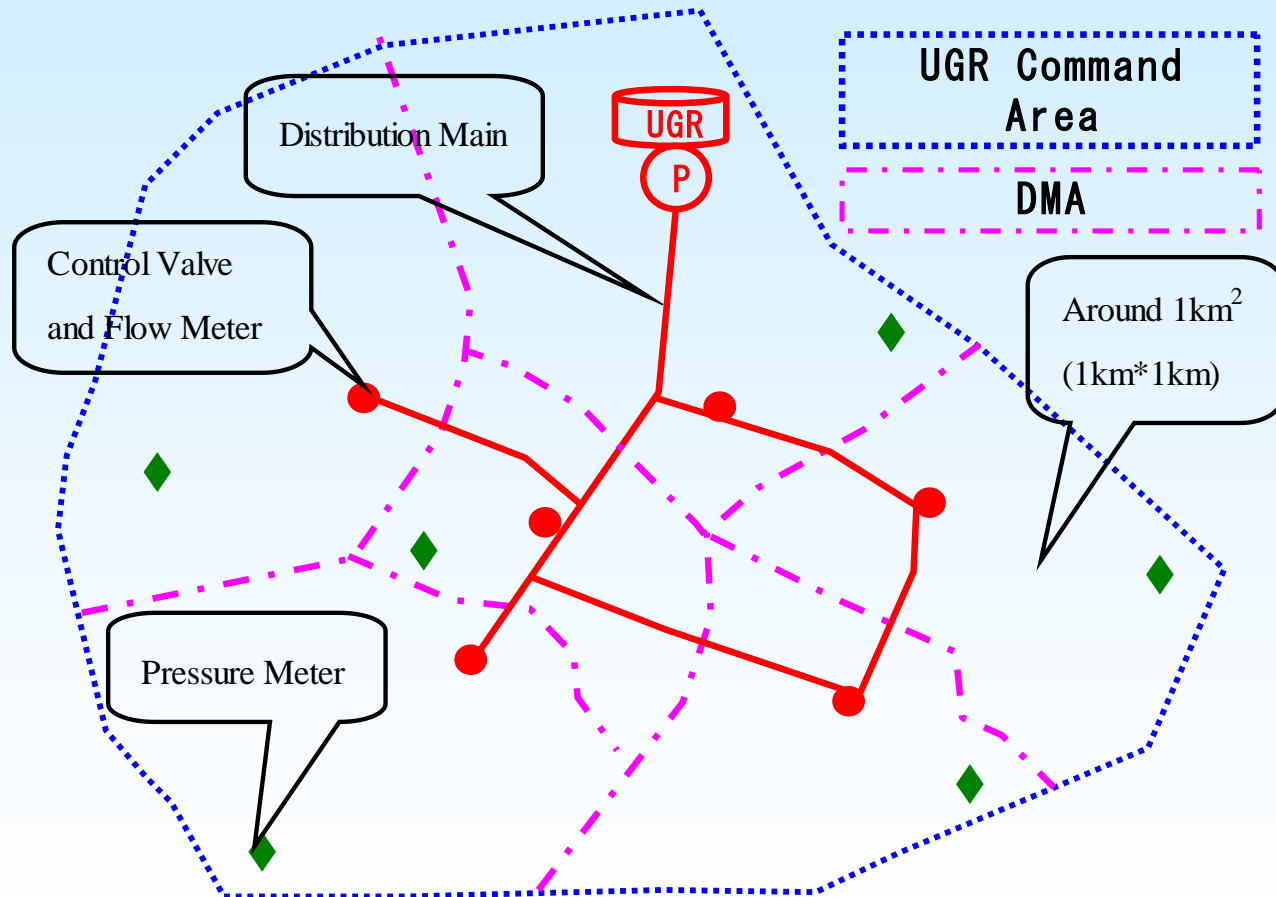
First Tier- from WTP to UGR



- Sonia Vihar command Area is shown in purple color.
- The transmission mains carrying water to the respective UGR's are shown by Red lines.

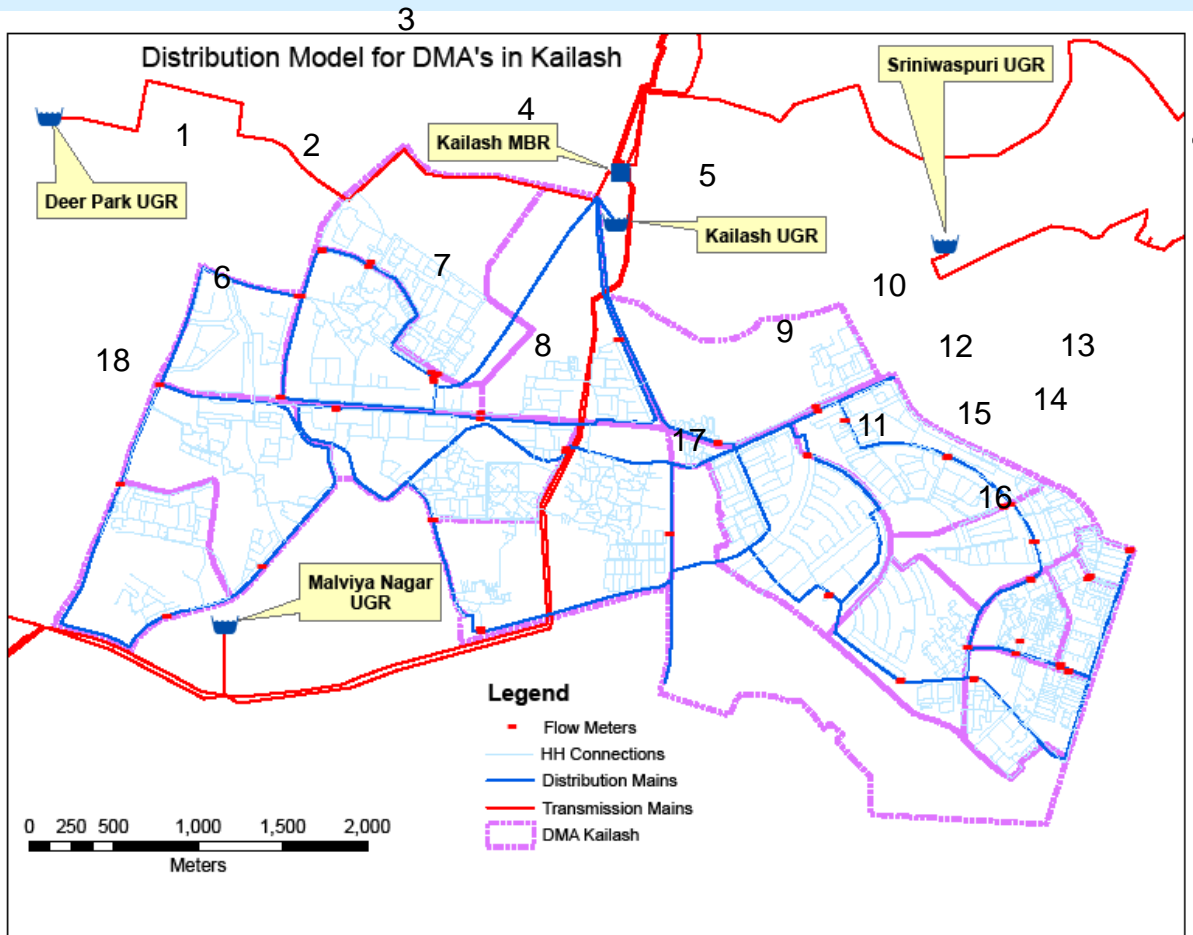
Three-tier System 2:

1 UGR Command Area with 10 to 20 DMA



Allocation with DMAs in Non-revenue Water Study,
and with Control Valves Flow meters and Pressure Meters in SCADA Study

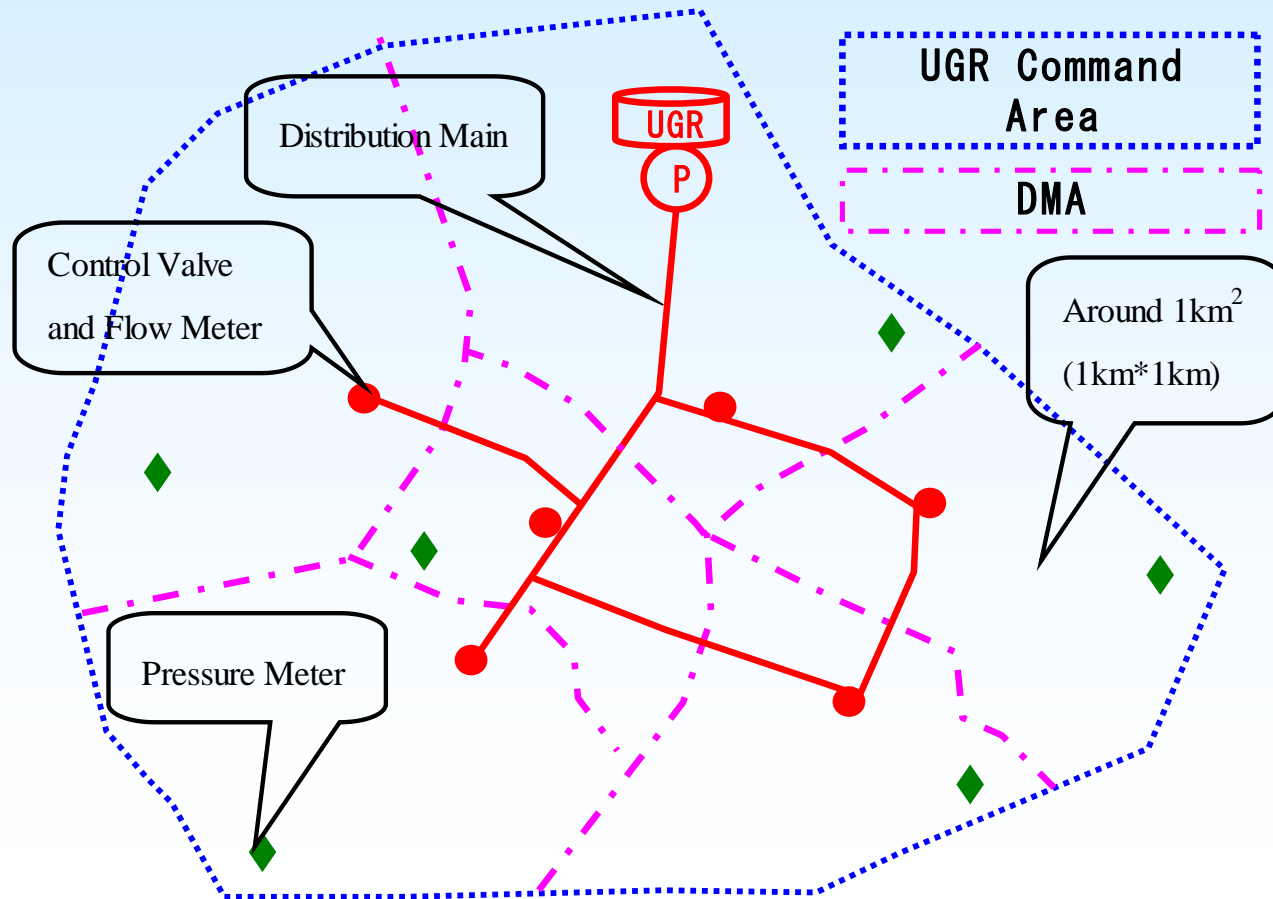
Second Tier- from UGR to DMA



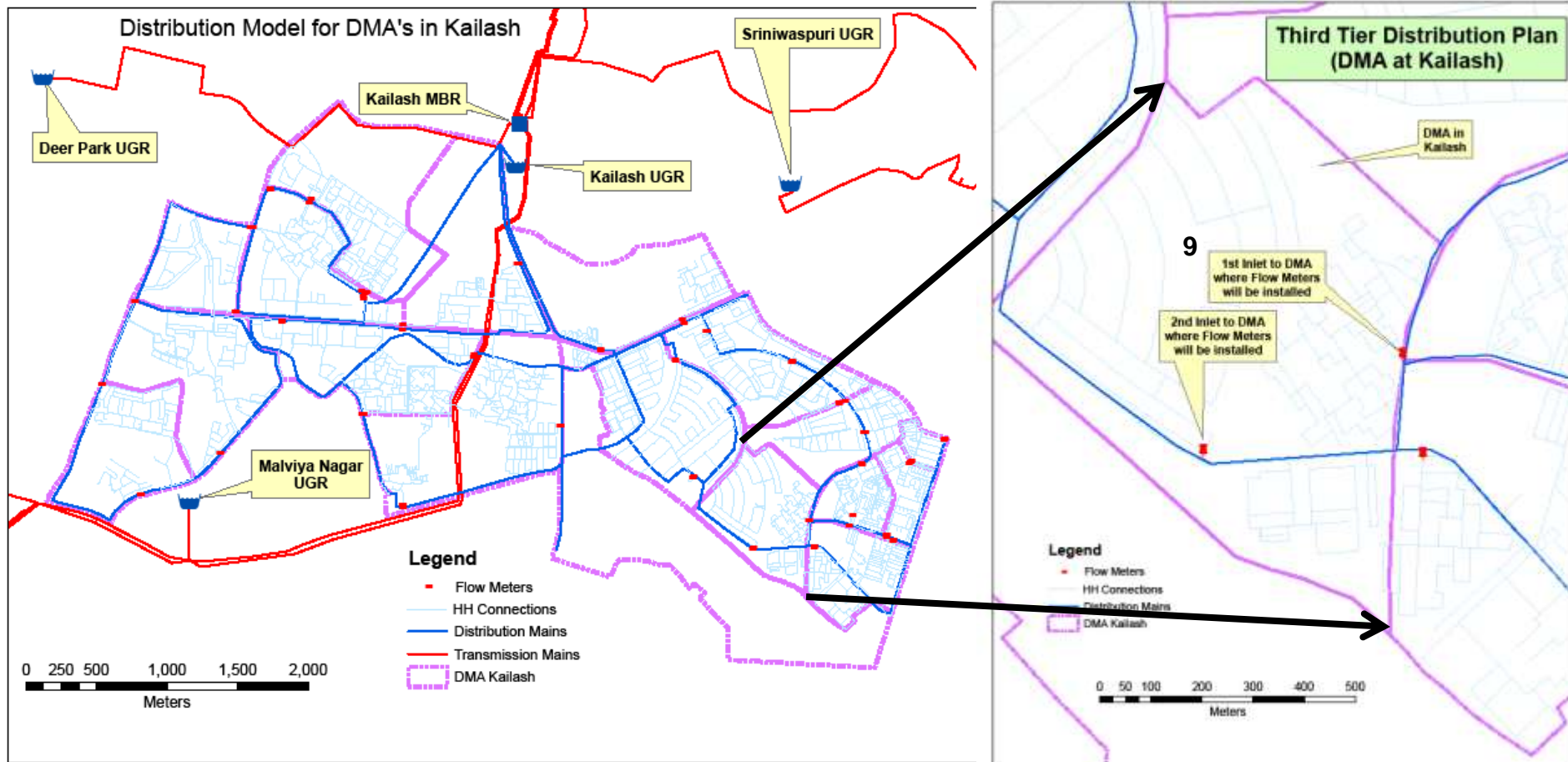
• The map shows the Command area of Kailash UGR

Three-tier System 3:

Each DMA Flow Control (SCADA system) Unit and NRW reduction measures Unit



Third Tier- within District Metered Area



- There are 18 DMA's in Kailash UGR Command area
- All the DMA are isolated from one another
- Two inlets are provided for each DMA's where the Flow meters are proposed to be installed.

Three-Tier System Distribution

- **WTPs:** 13 (Existing) + 1 to 2 (Proposed)
- **UGRs:** 125 (2 lacs population, 0.4 lacs connection)
- **DMAs:** 1000 to 2000 (10000 to 20000 population, 2000 to 4000 connection)
- Monitor and Control Flows at WTPs, UGRs and DMAs according to DMA Demand
- DMA Demand = Sum of consumers meter readings in each household within DMA

Estimation of Planning Framework

- Development of Base Statistical Data
 - 2001 Census Data
 - Land Use as per Delhi 2021 Master Plan
- Development of Planning Framework
 - Population Projections for 2021
 - Per Capita Demand Assessment
 - Non-domestic (Industrial and Commercial) Demand
 - Demand Assessment by Water Supply Zone

Water Resource Scenarios

Source	Quantity (MGD)
Existing WTPs	715
Ranney / TubeWells	100
Recycling Plants	30
Sub Total (Current)	845
New WTPs : Dwarka & Okhla (CLC savings)	80
Sub Total	925
Renuka Dam	275 ?
Total	925 or 1,200 ?

Water Demand for Facilities

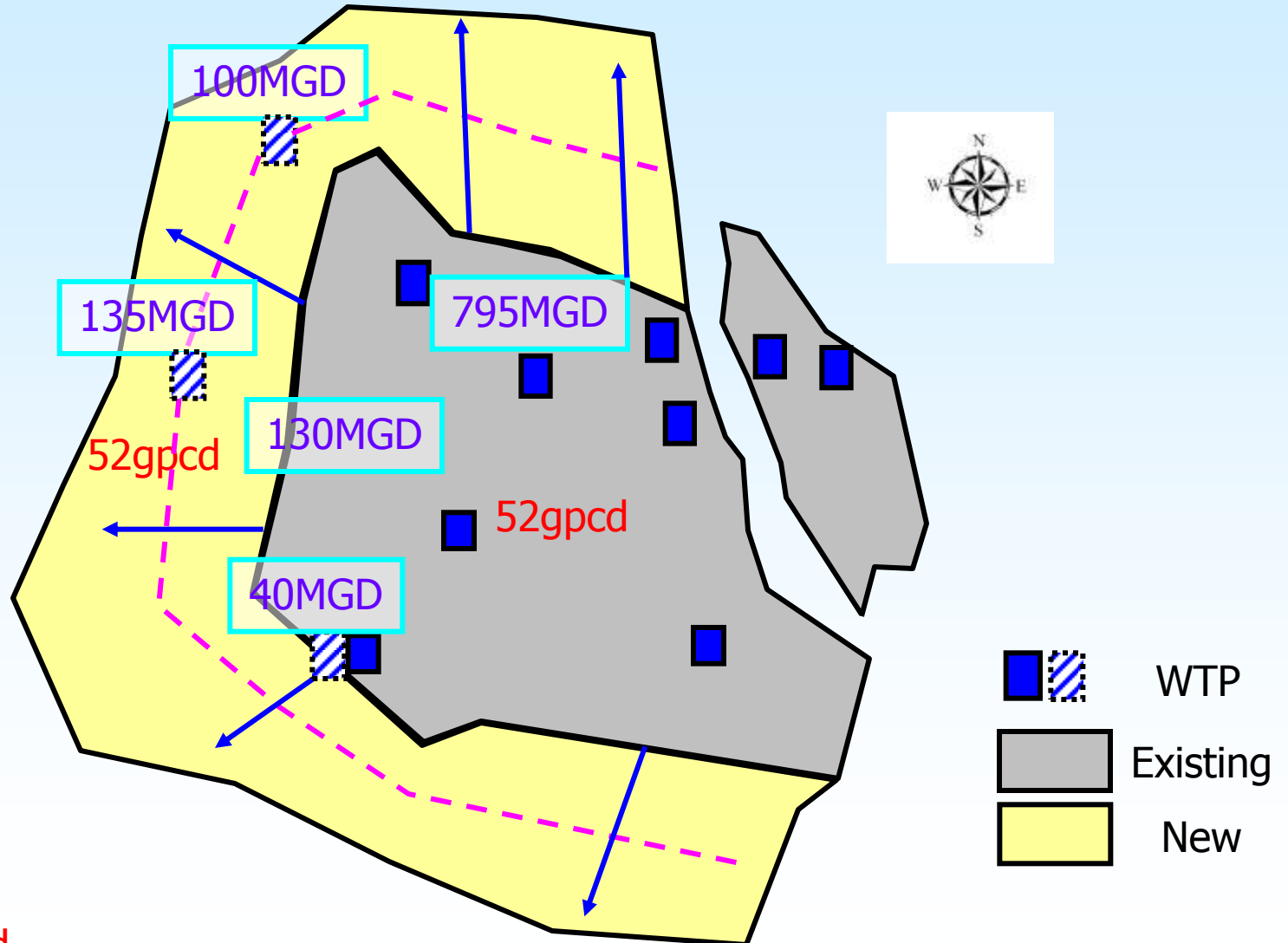
Population		23 Million		24.78 Million	
Total Demand		1,200 MGD		1,489 MGD	
Per Capita Demand	Domestic	153 LPCD		176 LPCD	
	Non Domestic	83 LPCD		96 LPCD	
	Total	236 LPCD / 52 GPCD		273 LPCD / 60 GPCD	
Adjustment for Un-Authorized Area		Without	With	Without	With
Demand For Delhi		1200 MGD	1231 MGD	1489 MGD	1525 MGD
Planning for		Resources	Transmission Facilities		Distribution Facilities

Water Allocation Scenarios

Item		Urban	Rural	Required Facilities	
				Existing	New
Scenario A = 925MGD	A	50	21	a few additional facilities	Necessary: small
	B-1	60	35	necessary	Necessary: Medium
Scenario B =1,200MGD	B-2	52	52	a few additional facilities	Necessary: Large
	C	60	60	necessary	Necessary: Large
Scenario C on Demand Basis =1,380MGD					

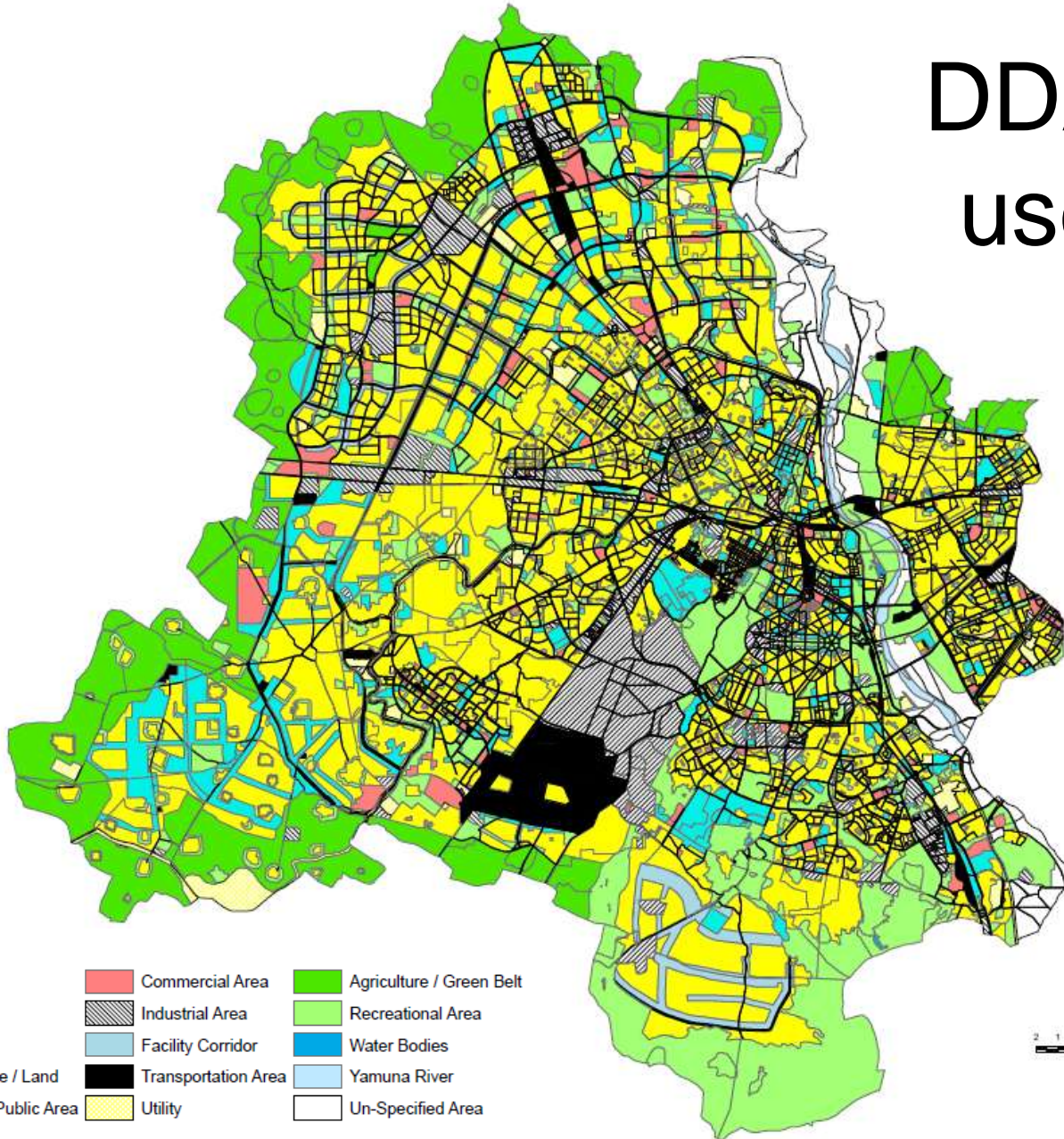
Supply Scenario B-2 (1200MGD)

(Existing area: 52, New area:52)



NDMC: 75gpcd

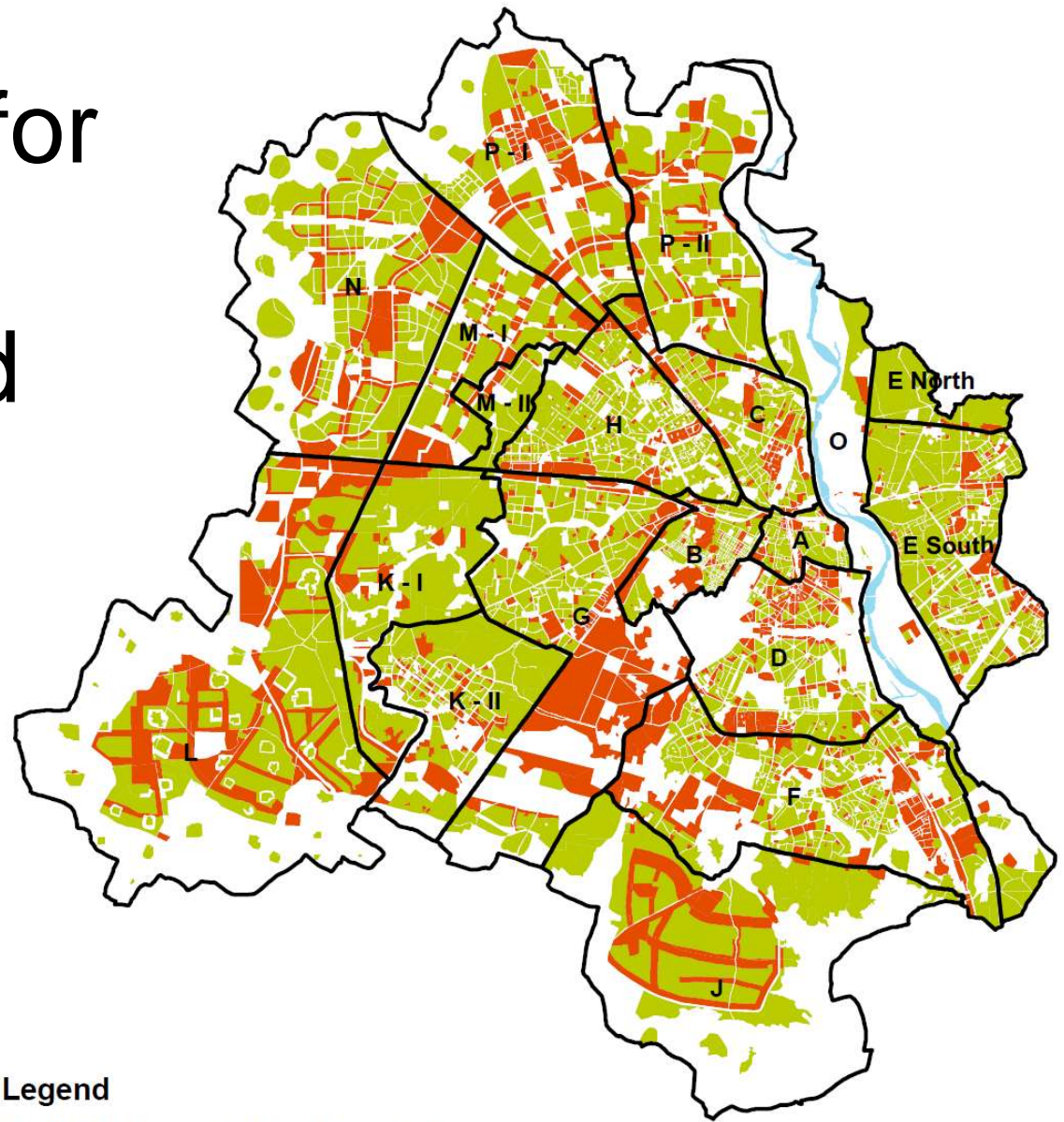
DDA Land use Map



LEGEND


Residential Area	Commercial Area	Agriculture / Green Belt
Urbanisable Area	Industrial Area	Recreational Area
Conserved Area	Facility Corridor	Water Bodies
Government Office / Land	Transportation Area	Yamuna River
Public And Semi Public Area	Utility	Un-Specified Area

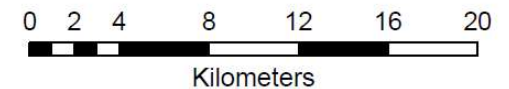
Planning for Water Demand



Legend

A - P DDA Zone Code (Note- There is no I)

-  Domestic Water Demand Area
-  Non Domestic Water Demand Area
-  No Water Demand Area
-  DDA Zonal Boundaries



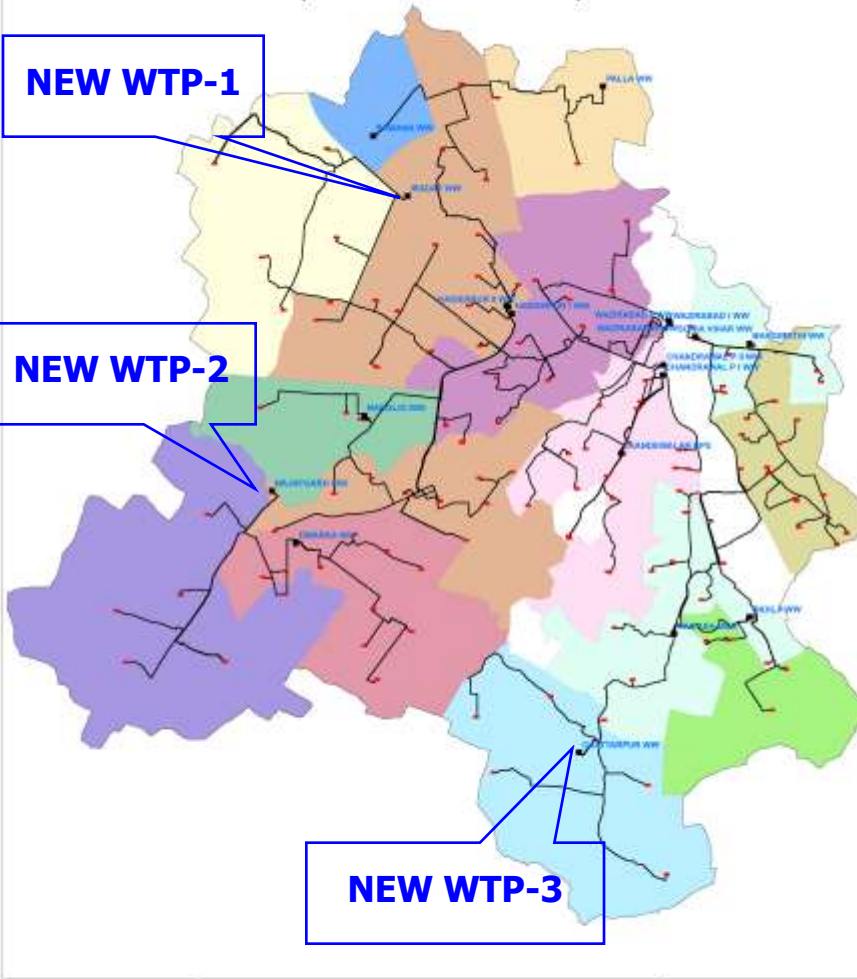
Transmission System (1200-B)

COMMAND AREA OF EACH WTP WITH TRANSMISSION NETWORK
(ALTERNATIVE 1200-B)

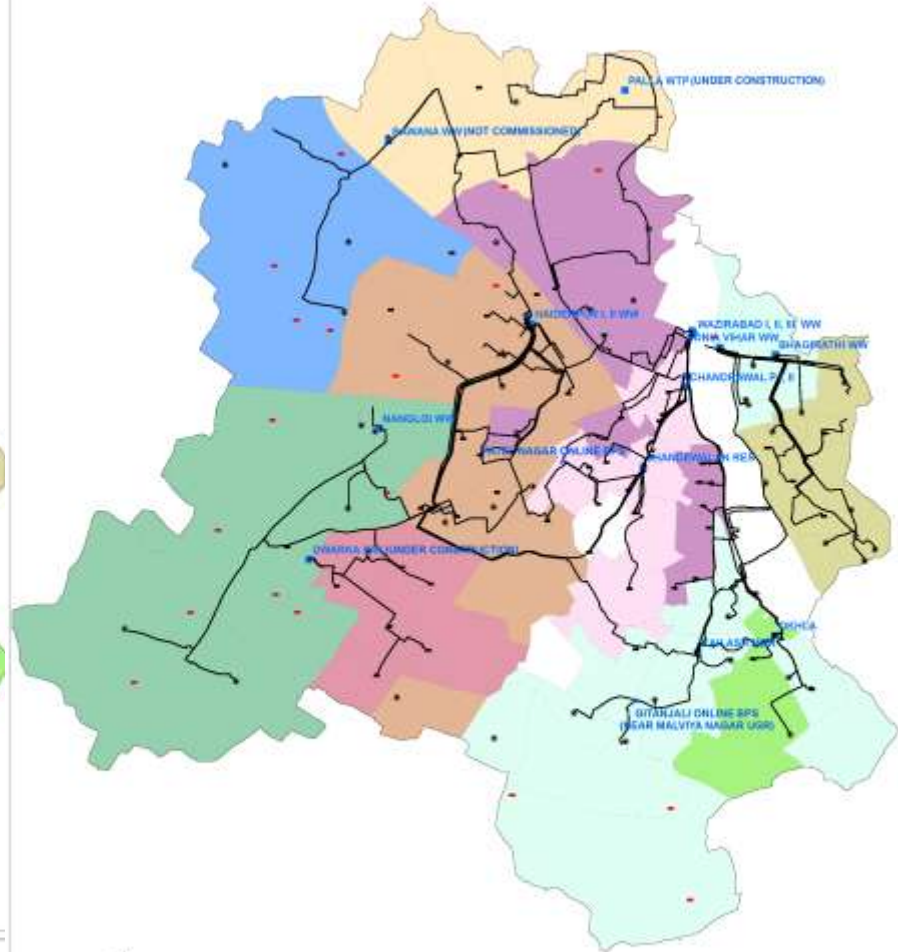
NEW WTP-1

NEW WTP-2

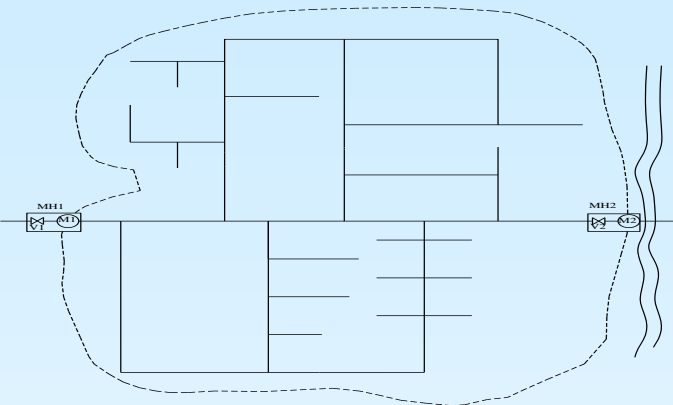
NEW WTP-3



UGR COMMAND ZONES AND TRANSMISSION MAIN
(EXISTING)



JICA Study : DMA based Loss Reduction



- 2 DMAs completed
 - Rs. 60 – 70 lakhs per DMA
 - Loss reduction by 20 – 24 %
 - 9 months : DJB staffs
- NRW Reduction Measures : DMA Model Contract
 - **Spot and legalise Illegal Connections**
 - **Pipe / Joints Repairs**
 - **Replacements of Meters**
 - **Rectification of Consumer connection**

Av. DMA Size	Total DMAs in Delhi
1500	1157
2000	868

Pictures of House Connection Replacement Work



Water Supply SCADA System

- **WTP SCADA**

Full Automation

- **Distribution SCADA**

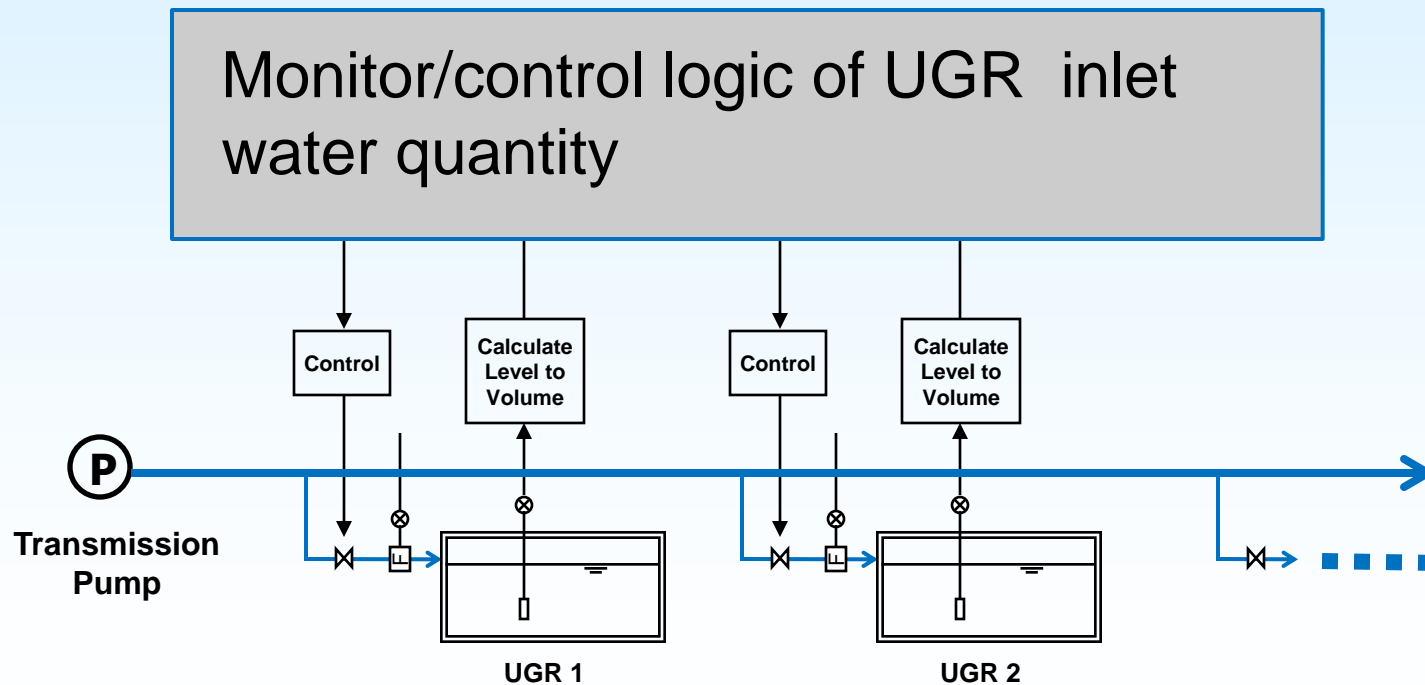
Equal distribution
NRW reduction

WTP SCADA

- **Sonia Vihar 140 MGD WTP on full SCADA**
- **Proposed SCADA for 110 MGD Bhagirathi WTP**
 - Replacement of valves etc. for full automation
 - Replacement of pumps, motors, transformers for energy savings
 - Current pump head: 45 m**
 - Proposed pump head: 36 m**
- **All other WTPS to be included for SCADA in a phased manner.**

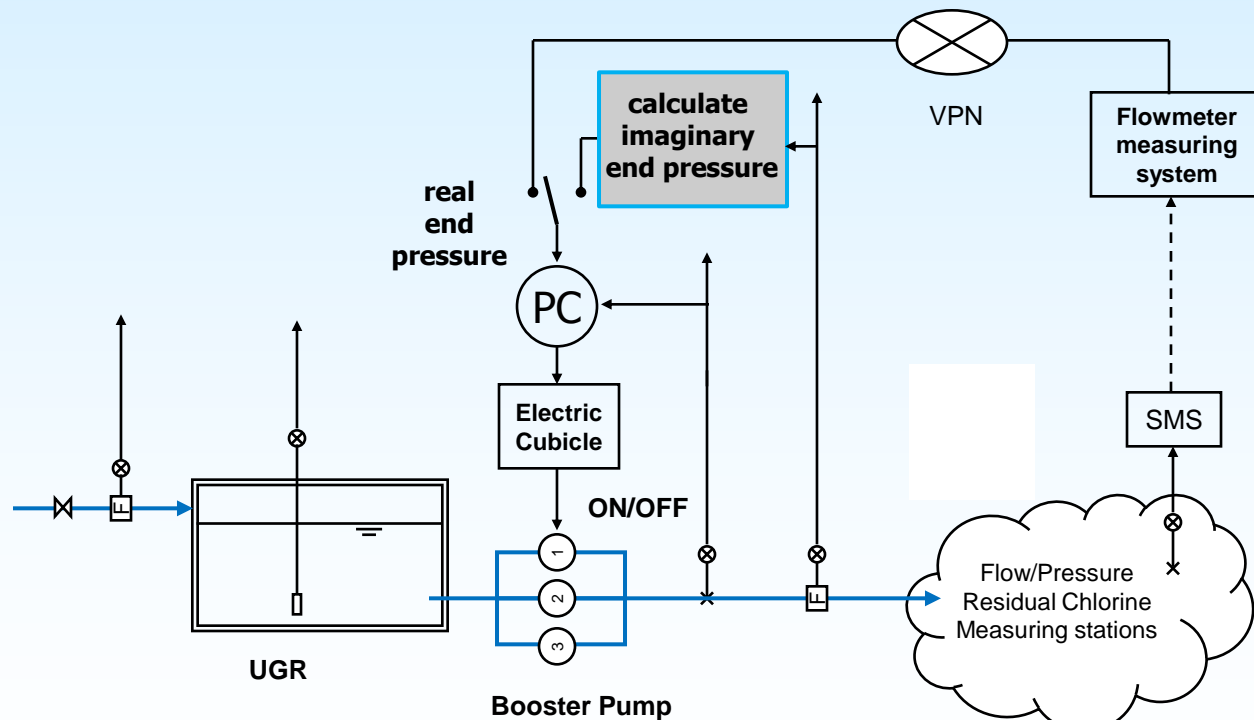
Distribution SCADA

1. Monitor/control of UGR inlet water quantity



Distribution SCADA

2. Monitor/control of UGR outlet water quantity



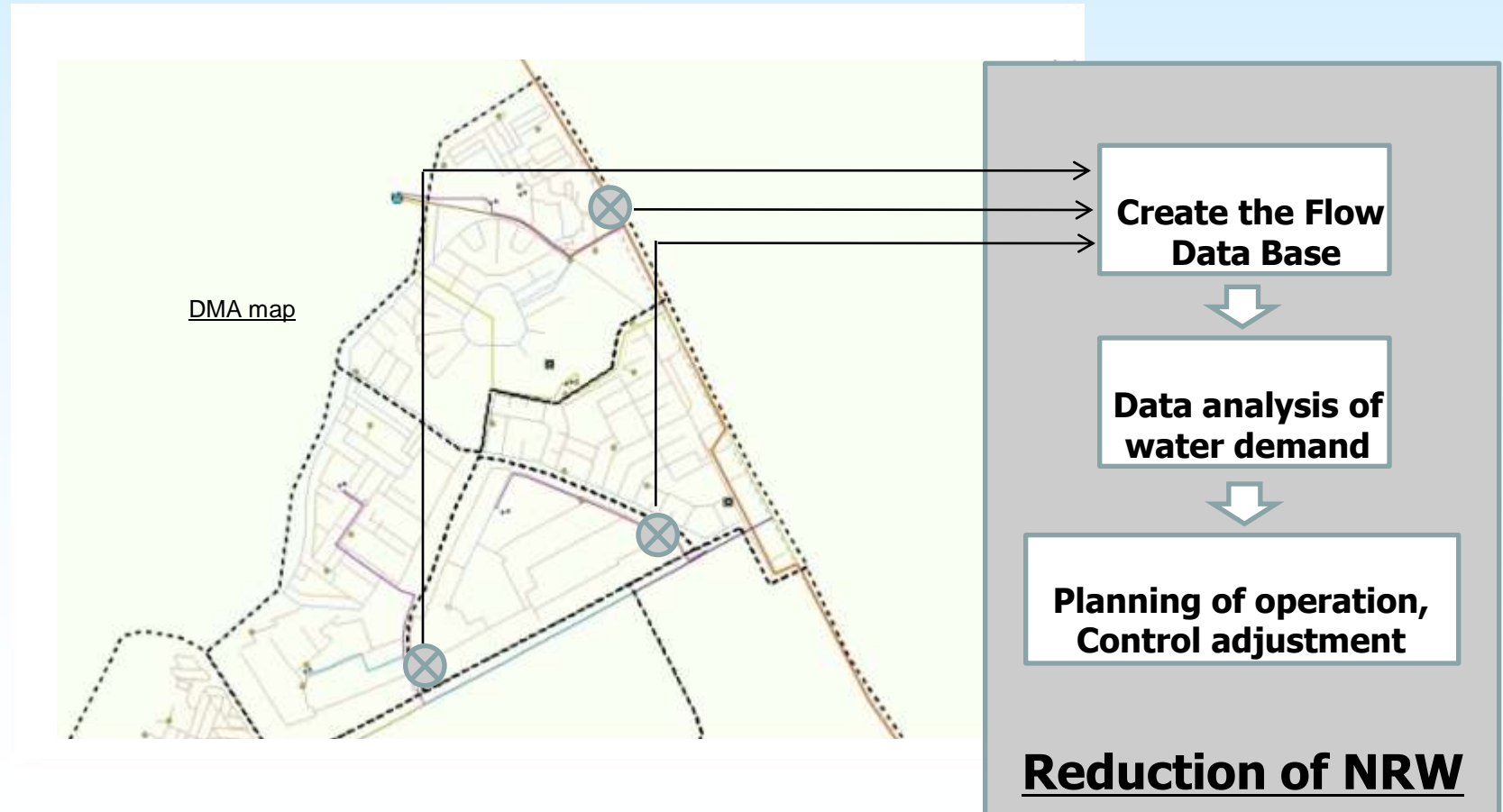
Avoidance of

- high-pressure power
- low end pressure

Distribution SCADA

3. Data collection and analysis of DMA flowmeter

- ✓ Monitor flow and pressure at each DMA and feed back to UGR.
- ✓ Compare inflow at DMA vs. every household meter readings



Hydraulic Model for Water network

- Under JICA study Network analysis and Hydraulic Model for the entire network is being created
- WaterGEMS software being used
- The input data from existing GIS system
- All future extension of water network to be based on hydraulic model

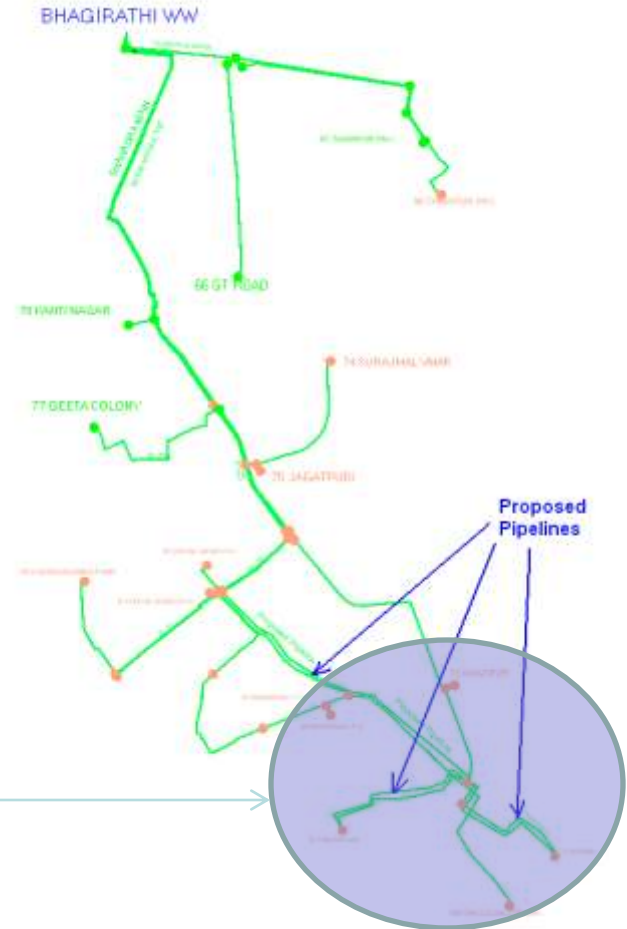
Advantages of the Network Modeling

- Troubleshooting an existing distribution system
- Locating critical pipe segments, analyzing their impact
- Calibrating distribution system models
- Performing energy audits on a water distribution system and improve operation
- And many more.....

Quick look (Existing)

Positive Pressure at
these Locations

BHAGIRATHI MODEL Proposed



Few reports from the Model

Element Symbology 0 x Background Layers 0 x DELHI_FIRSTLEVEL1.wtg Untitled2.wtg DELHI_FIRSTLEVEL1.wtg

FlexTable: Pipe Table (Current Time: 0.000 hours) [DELHI_FIRSTLEVEL1.wtg]

	Label	Length (Scaled) (m)	Start Node	Stop Node	Diameter (mm)	Material	Haas-Wilkens C	Flow (mgd)	Velocity (m/s)	Headloss Gradient (m/m)
30:	TAHERPU TAHERPUR MAIN	2,319.89	J-3	J-4	800.0	Ductile Iron	90.0	2.94	0.26	0.000
32:	TAHERPU TAHERPUR MAIN	358.70	J-4	J-5	800.0	Ductile Iron	90.0	2.94	0.26	0.000
34:	TAHERPU TAHERPUR MAIN	437.11	J-5	J-6	800.0	Ductile Iron	90.0	2.94	0.26	0.000
36:	TAHERPU TAHERPUR MAIN	38.16	J-6	87 TAHERPUR PH II	800.0	Ductile Iron	90.0	2.94	0.26	0.000
1093:	P-25 P-25	1,135.70	J-40	J-65	1,200.0	Ductile Iron	90.0	3.19	0.12	0.000
153:	JAL VEH JAL VIHAR MAIN	2,252.95	J-56	J-59	700.0	Ductile Iron	90.0	3.33	0.38	0.000
77:	Shahdar Shahdara Main	370.02	J-24	79 KANTI NAGAR	800.0	Ductile Iron	90.0	3.67	0.32	0.000
144:	JAL VEH JAL VIHAR MAIN	124.05	J-51	70 CHITRA VIHAR PH II	450.0	Ductile Iron	90.0	3.91	1.08	0.005
142:	JAL VEH JAL VIHAR MAIN	445.08	J-51	76 CHITRA VIHAR PH I	750.0	Ductile Iron	90.0	4.13	0.41	0.000

FlexTable: Junction Table (Current Time: 0.000 hours) [DELHI_FIRSTLEVEL1.wtg]

ID	Label	Elevation (m)	Zone	Demand Collection	Demand (mgd)	Hydraulic Grade (m)	Pressure (m H ₂ O)
50: 66 GT R...	66 GT ROAD	210.00	<None>	<<Collection: 1 item>>	2.67	221.15	11.1
150: 67 MAN...	67 MANDAVALI P I	210.00	<None>	<<Collection: 1 item>>	9.93	210.10	3.1
148: 68 MAN...	68 MANDAVALI P II	210.00	<None>	<<Collection: 1 item>>	8.95	214.15	4.1
155: 69 CHIL...	69 CHILLA DALLUPURA	210.00	<None>	<<Collection: 1 item>>	7.22	211.71	1.7
143: 70 CHE...	70 CHITRA VIHAR PH II	210.00	<None>	<<Collection: 1 item>>	3.91	215.67	5.7
125: 71 KON...	71 KONOLI	210.00	<None>	<<Collection: 1 item>>	5.75	213.36	3.4
121: 72 TRIL...	72 TRILOKIPURI	210.00	<None>	<<Collection: 1 item>>	7.65	213.26	3.3
111: 73 GHA...	73 GHAZIPUR	210.00	<None>	<<Collection: 1 item>>	8.28	214.92	4.9
98: 74 SURA...	74 SURAJMAL VIHAR	210.00	<None>	<<Collection: 1 item>>	9.69	212.29	2.3
58: 75 JAGA...	75 JAGATPURI	210.00	<None>	<<Collection: 1 item>>	5.74	218.09	8.1
141: 76 CHE...	76 CHITRA VIHAR PH I	210.00	<None>	<<Collection: 1 item>>	4.13	216.06	6.1
81: 77 GEET...	77 GEETA COLONY	210.00	<None>	<<Collection: 1 item>>	4.47	220.58	10.6
56: 78 VISH...	78 VISHWAKARMA PARK	210.00	<None>	<<Collection: 1 item>>	8.80	215.30	5.3
76: 79 KANT...	79 KANTI NAGAR	210.00	<None>	<<Collection: 1 item>>

FlexTable: Pump Table (Current Time: 0.000 hours) [DELHI_FIRSTLEVEL1.wtg]

ID	Label	Elevation (m)	Pump Definition	Status (Initial)	Hydraulic Grade (Suction) (m)	Hydraulic Grade (Discharge) (m)	Flow (Total) (mgd)	Pump Head (m)
814: GK MAIN	GK MAIN	208.00	JALVIHAR	On	209.21	234.42	30.63	25.21
811: JAL VEH	JAL VIHAR	208.00	JALVIHAR	On	209.39	234.17	33.27	24.78
817: SHAHA	SHAHADRA	208.00	SHAHADRRA	On	209.69	225.55	22.29	15.86
822: TAHERP...	TAHERPUR M...	209.00	TAHERPUR	On	209.90	223.78	17.84	13.88

45 of 45 elements displayed

Tables - Predefined

- Free Flow Node Table
- Flushing Report
- Pipe Table
- Junction Table
- Hydrant Table
- Tank Table
- Reservoir Table
- Pump Table
- Variable Speed Pump Battery Table
- PRV Table
- PSV Table

User Notifications

Message Id	Scenario

BHAGIRATHI WW

4 of 4 elements displayed

Transmission Facilities

- Transmission facilities are implemented based on the possible water resource scenario.
- If 1200, urban areas: few addition, outer area: new WTP and transmission facilities
- If 925, (diversion) transmission facilities from urban area to outer area

Water Quality Surveillance

Water quality conforms to BIS 10500-1999 and guidelines of CPHEEO

**14 laboratories for water
quality control.**

**Raw & clear Water analysis done
on hourly basis**

**Chemistry graduates deployed for
checking water samples**

**> Daily 300 water samples tested for
water quality in system**

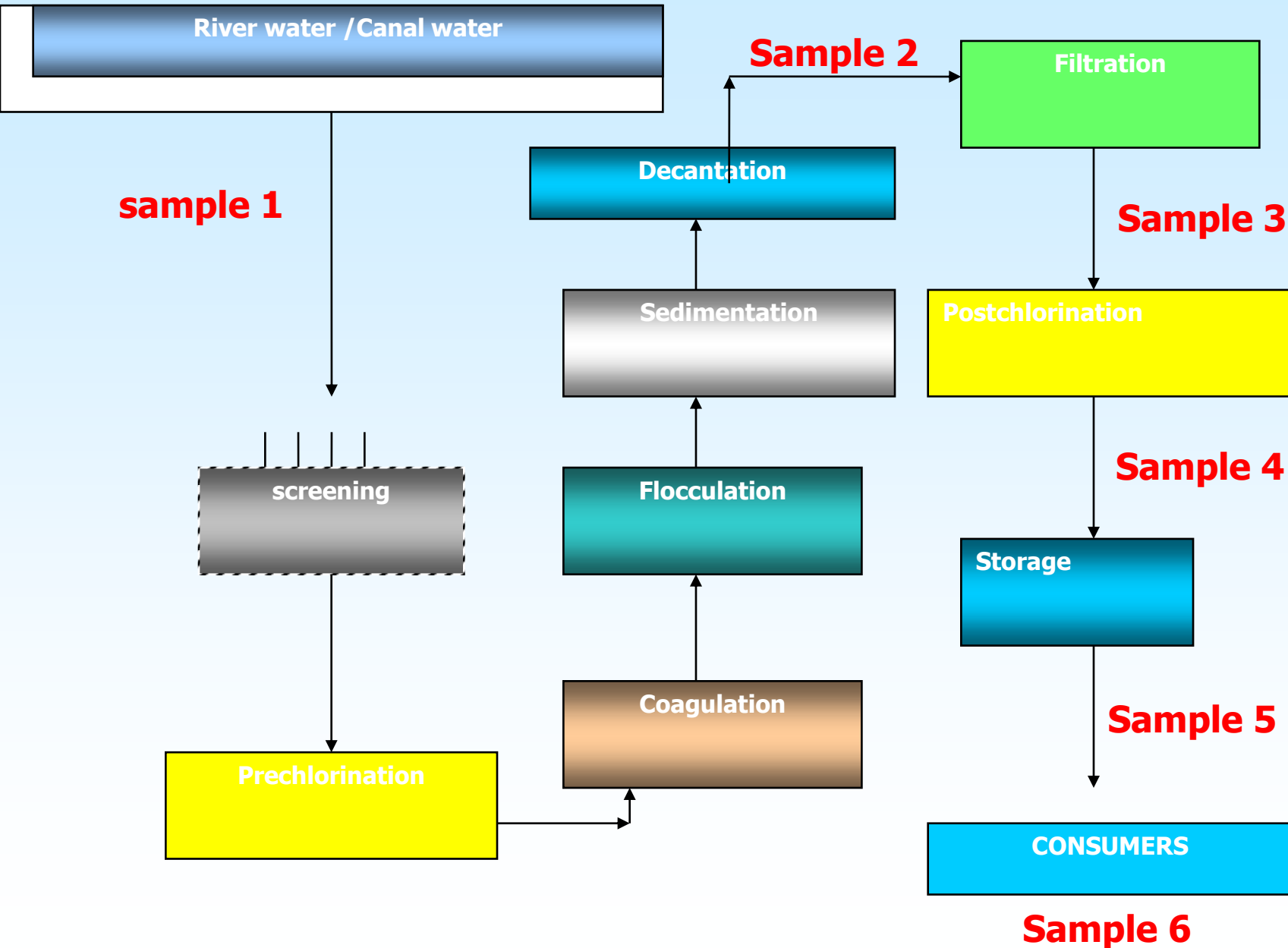
**Quality of each water tanker is checked
before leaving the filling station**

MONITORING OF RAW WATER SOURCES

SURFACE WATER

- River Yamuna
- Western Yamuna Canal
- Upper Ganga Canal

Quality monitoring at treatment plants and Distribution Networks.



The Physio-Chemical Parameters being conducted at Water Treatment Plant Laboratory, round the Clock

• **RAW-WATER**

1. Colour, Units
2. Odour
3. pH Value
4. Turbidity (NTU)
5. Alum Dose
6. Chlorine Demand
7. Total Alkalinity
8. Chlorides
9. Ammonia
10. Nitrites
11. Oxygen Absorption
12. Dissolved Oxygen

• **CLARIFIED WATER**

1. Turbidity (NTU)
2. pH Value
3. Total Alkalinity
4. Residual Chlorine

FINAL WATER

1. Turbidity (NTU)
2. pH Value
3. Total Alkalinity
4. Residual Chlorine
5. Aluminium

WATER QUALITY SURVEILLANCE LABORATORIES IN NCT OF DELHI

- Central Laboratory of Water Works Wazirabad -
North, Central Delhi and Rural North
- Zonal Laboratory Water Works Okhla.–
South Delhi
- Zonal Laboratory Water Works Haiderpur -
West Delhi & North-West.
- Zonal Laboratory Water Works Bhagirathi -
North-East & East Delhi
- Zonal Laboratory Greater Kailash-I (Rural Water Supply) – *Rural South Delhi*
- Zonal Laboratory Water Works Nangloi –
Najafgarh and Nangloi areas.

SURVEILLANCE PROGRAMME

DISTRIBUTION INTERNALLY

- **By Quality Control Staff**
 - Average about 300-400 samples per day,
After Bacteriological Examination, where Residual Chlorine is absent, immediate remedial action is taken by concerned zonal officers to ensure quality of the potable water

EXTERNAL QUALITY SURVEY

2. NATIONAL INSTITUTE OF COMMUNICABLE DISEASE (NICD) – DELHI :-*CHLORINE RESIDUE*
3. MUNICIPAL HEALTH OFFICER (MCD): --
CHLORINE RESIDUE
4. M/s SHRI RAM INSTITUTE FOR INDUSTRIAL RESEARCH – *TOTAL COLIFORM – FAECAL COLIFORM & CHLORINE RESIDUE*
5. CENTRAL POLLUTION CONTROL BOARD -
PHYSIO CHEMICAL /BACTERIOLOGICALANALYSIS
6. DELHI POLLUTION CONTROL COMMITTEE -
PHYSIO CHEMICAL / BACTERIOLOGICALANALYSIS

ACTION TAKEN FOR CONTROLLING POLLUTION IN DISTRIBUTION NETWORKS

- Attending water supply leakage on day to day basis
- Replacement of corroded and outlived pipes
- Avoiding overflowing of sewer mains holes by removing chockage on priority
- Ensuring that water connection do not cross drains, main-holes of sewers etc.
- Ensuring that individual sewer connection should not emit into storm water drain.
- Conducting awareness by organizing Camps with the help of Residents Welfare Association of colonies.

Replacement of old water lines

To ensure water quality, reduction in leakages & improve water pressure, following steps have been taken up

Trunk mains near Water Treatment Plants replaced by M.S. lined pipes

All PVC, AC and Old & incrustated distribution water pipes replaced by CI & DI pipes

Trunk mains of PSC pipes proposed to be rehabilitated to reduce leakages

DJB INITIATIVES
&
ACHIEVEMENTS

OPTIMUM UTILIZATION OF WTPs & SAVINGS in ENROUTE LOSSES

- 1. DJB treating 745 mgd water against installed capacity of 755 mgd (although 20 mgd Bawana WTP still remains unutilized)**
- 2. DJB receives surface water from far off places - incidence of enroute loss about 30-40%:**
 - (a) Enroute losses endeavoured to be reduced to 10-15% by constructing a dedicated 102 Kms long Carrier Lined Canal at a cost of about Rs. 500 crores.**
 - Canal likely to be commissioned in next 6 months**
 - (b) Regarding Ganga Water, DJB constructed in-situ conduits of 2800 mm & 3300 mm dia, 33 Km long connecting U.P. Canal Head to plants**
- 3. Recovery of around 37 MGD water from process waste water**

OTHER INITIATIVES

- 1. Use of Latest Technology:** New WTPs are being constructed with latest technology such as Membrane Filter, Use of Pulsators and automation with provision of 10 years O&M
- 2. SCADA:** Bhagirathi WTP (110 mgd) is proposed to be taken up for upgradation and automation including 10 yrs O&M by bidders.
 - Exercise will be replicated in other plants in next few years.
- 3. PPP Projects:** Under JICA support, DJB taking up 3 pilot schemes on PPP basis in the command areas of Nangloi Water Treatment Plant, Malviyanagar & Vasant Kunj UGRs with a view to reduce NRW from present 45% to 20%.
- 4. Water connections:** DJB considering to own and maintain service connections from ferrule to consumers' meters - presently, responsibility of the consumers
- 5. Water Audit:** 86 meters installed at plants and raw water intake and 305 meters being installed in the distribution system to ensure water audit.
- 6. Water Meters:** Procuring 4 lacs domestic meters (1.5 lacs of AMR type) on Installation & maintenance for 5 years basis

Contd.....

7. **GIS & GPS:** DJB using GIS since 2002 - entire water & sewerage network mapped into GIS system. The work of “Installation of GPS on 800 water tankers” is under process
8. **Central Monitoring System (CMS):** Real time Information of flow, pressure, water quality, levels of UGRs and energy etc. visible on web. Consultancy work given to NISG
9. **Revenue Management System(RMS):** Comprises of computerization of metering, billing and collection data and customer relationship management. Work awarded to TCS
10. **Public awareness through NGOs:** NGOs have been appointed in all revenue districts for public awareness about DJB policies, water conservation and Rain Water Harvesting etc.
11. **Incentive for Rain Water Harvesting:** RWAs are given monetary benefit up to maximum limit of Rs. One lac for installation of RWH structures.

DJB Shining!!

S.No.	Parameters	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	RE 2010-11
1	Water Production (MGD)	669	672	720	740	800	800	850
2	Billed Quantity (MGD)	339.99	279.59	253.63	254.95	275.87	264.24	293.94
3	Recovered tariff (Rs/ KL)	2.06	3.93	3.30	3.14	3.32	3.53	5.78
4	Collection Efficiency	1.52	0.90	1.07	0.99	0.76	0.97	0.90
5	No of registered water connection (lakh)	12.13	12.53	12.96	13.26	13.59	14.85	18.21
6	No of Metered connections (lakh)	8.78	9.10	9.56	9.81	10.07	11.63	15.14
7	Power consumption (Rs lakh/ MGD treated water)	33.93	42.08	49.38	43.62	44.98	39.76	36.94
8	Staff Strength/ MGD treated water	32.41	33.67	30.83	31.00	28.05	27.72	26.20
9	No. Of Water connection/ Employee	56	55	58	58	61	67	82
10	Staff Strength per 1000 water connection	18	18	17	17	17	15	12
11	Total Revenue Income (Cr)	402.86	591.34	571.59	674.44	797.51	1013.94	1251.86
12	Non-Plan Support (Rs. Cr)	250	125	100	200	350	380	0

THANK YOU!



Save Water

Because every drop matters



Metering & Cost Recovery

– Commissioning of SCADA

- Bhagirathi WTP & UGR already approved by Board

– Billing Policy & System

- Implementation of Revised Tariff & Development Charges
- No Meter : Deterrent Tariff Introduced
- Billing System : Integration, Handheld bill reading generators, SMS : RMS

– Compulsory Metering

- Advt Campaign + 1 lakh meters Installed
- 3 Revenue Courts : To be further strengthened
- Lok Adalat to be made functional
- Metering by DJB : RFP being framed

– Revenue – Engineering – Finance

- Zones Overlap, Authority Converge & Cost Correlate

Significant initiatives in pipeline

- **3 Water Sector PPPs** in progress
 - Malaviya Nagar UGR service area
 - Vasant Vihar and surrounding areas
 - Nangloi WTP command area
 - What DJB intends is to enter into an approx. 10 year fee-based contract for management of services
 - ✓ Assets would continue in DJB ownership
 - ✓ No staff retrenchment
 - ✓ Capex by DJB while opex by Operator
 - ✓ Fee subject to performance parameters as determined by SLA
- **Restructure DJB** so that for a defined area there is a senior manager incharge of all functions (production, revenue and distribution) and accountable for that area
 - DJB plans to initiate the unity of command at Chief Engineer level
- **Service connections:** Plans to replace and maintain service connections from ferrule to consumers' meters since these are big source of leakages.
 - Due to legal angle, DJB may have to finance this on its own.
 - MCD R/R charges a big drag

New Initiatives



Initiatives for customers

Facility of depositing water charges with SBI branches, post office and Jeevan counters.

Revamping of Zonal Offices

Exploring tie-up for ATM type kiosks.

Re-zoning according to hydraulic boundaries

New scheme for customer care launched from *15th June* to deal with contaminated supply complaints

Rain water harvesting/ storage and incentives to RWA to promote rain water harvesting

Recording complaints on SMS: 54646, e-mails & CCR at 1916

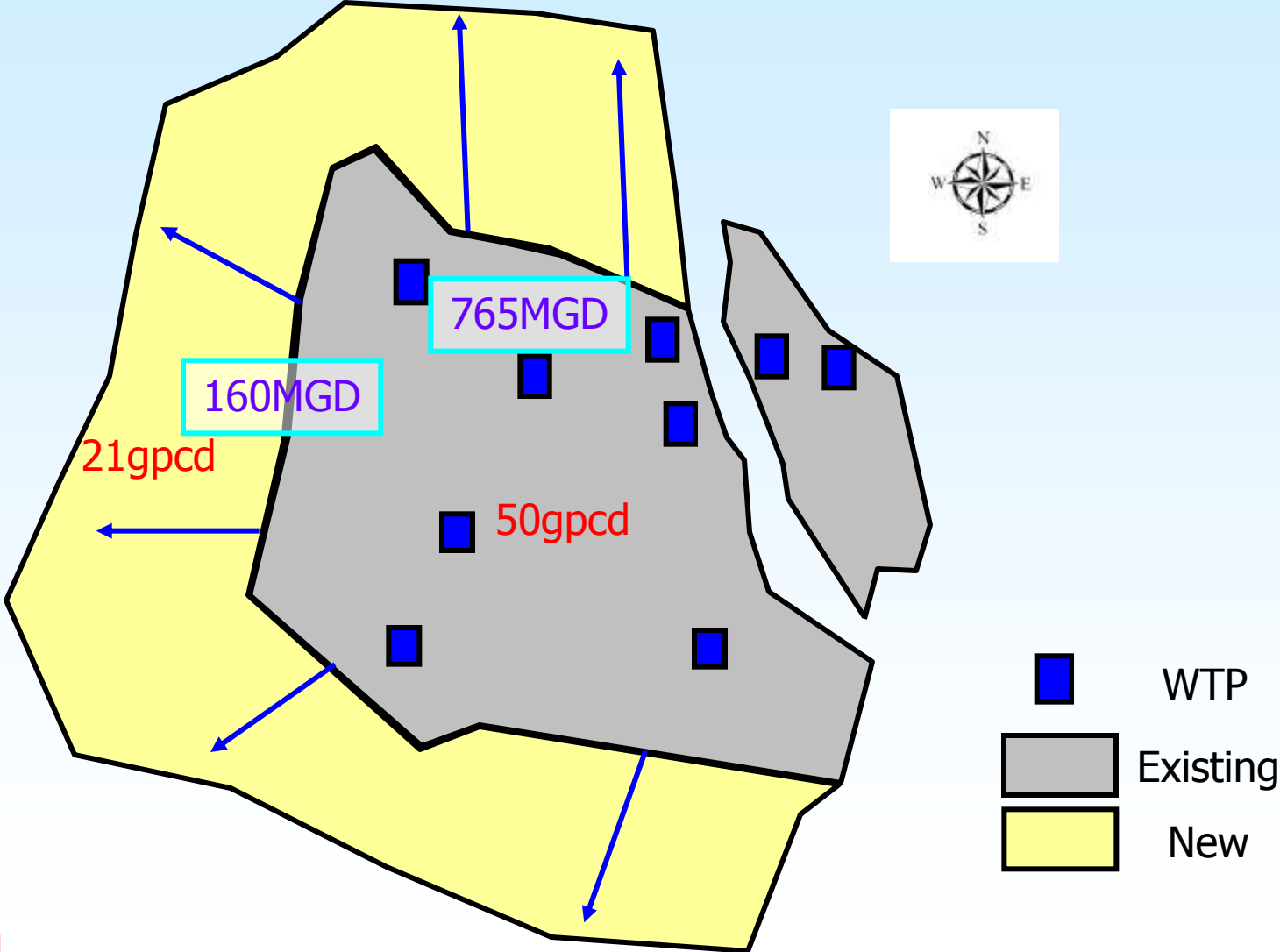


REHABILITATION OF TRUNK MAINS

1. Like other Metros, Delhi has no dedicated service corridors for laying services.
 - Made replacement of worn out mains difficult.
2. DJB rehabilitated one of the water mains through CIPP lining
3. DJB further examining to replace/ rehabilitate its old water mains through online trenchless method

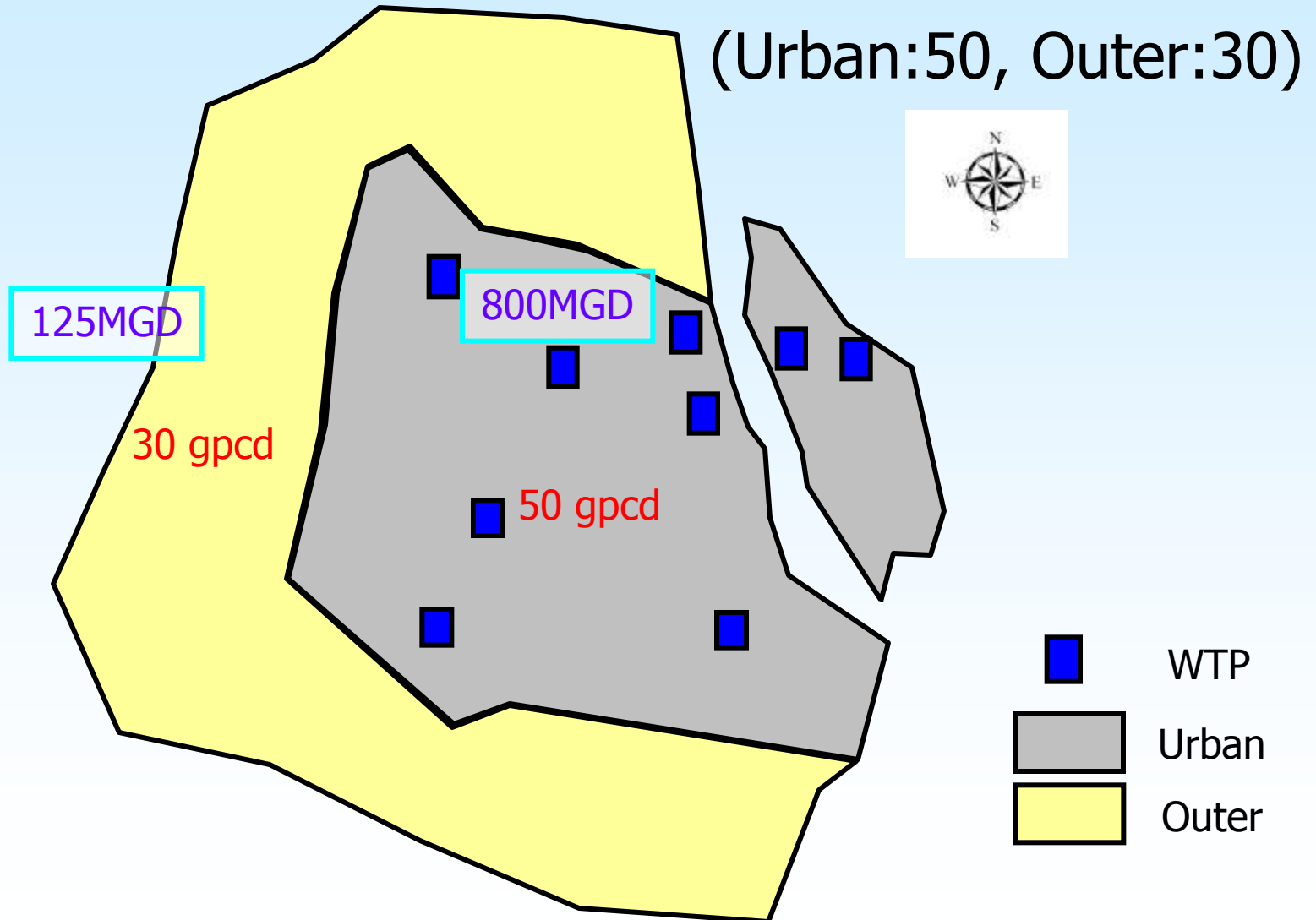
Supply Scenario A (925MGD)

(Existing area: 50, New area: 21)

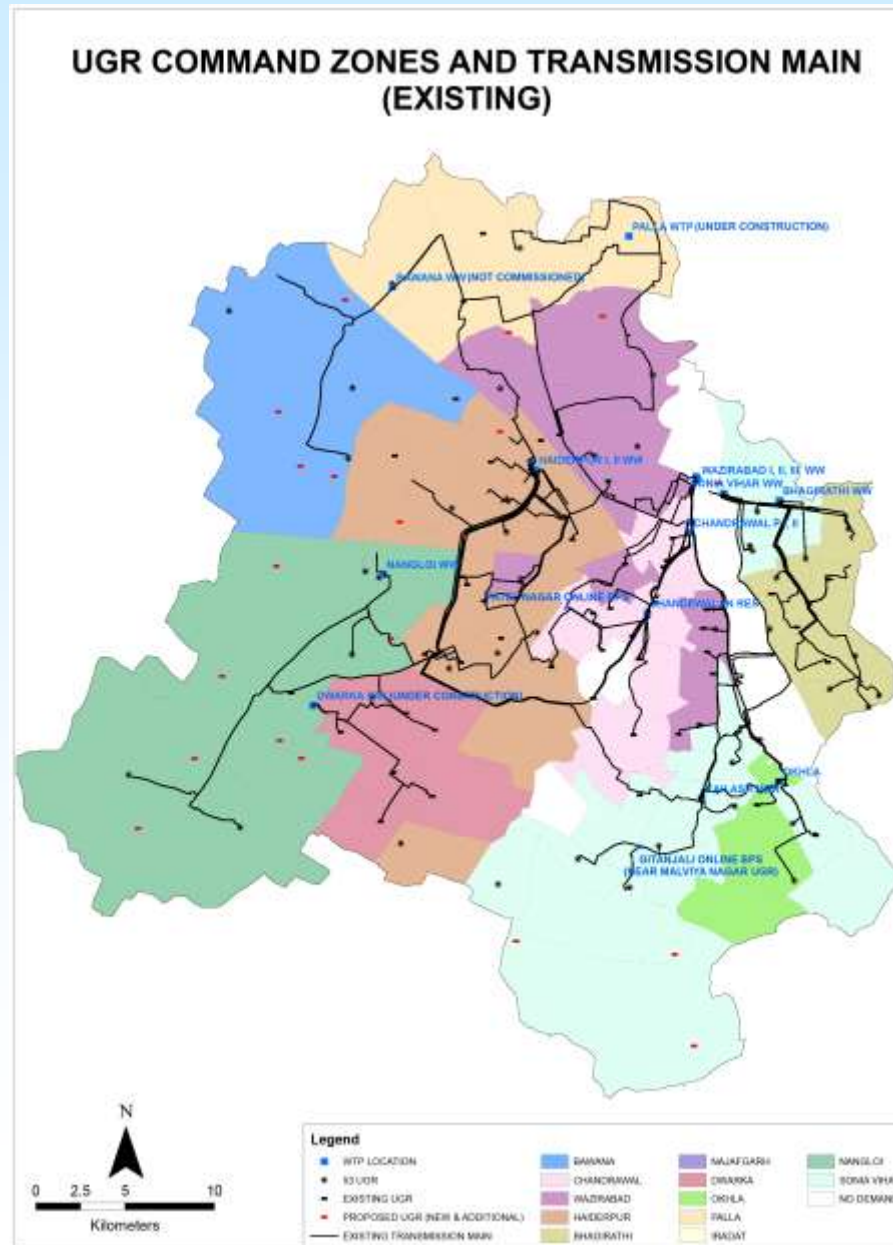


NDMC: 75gpcd

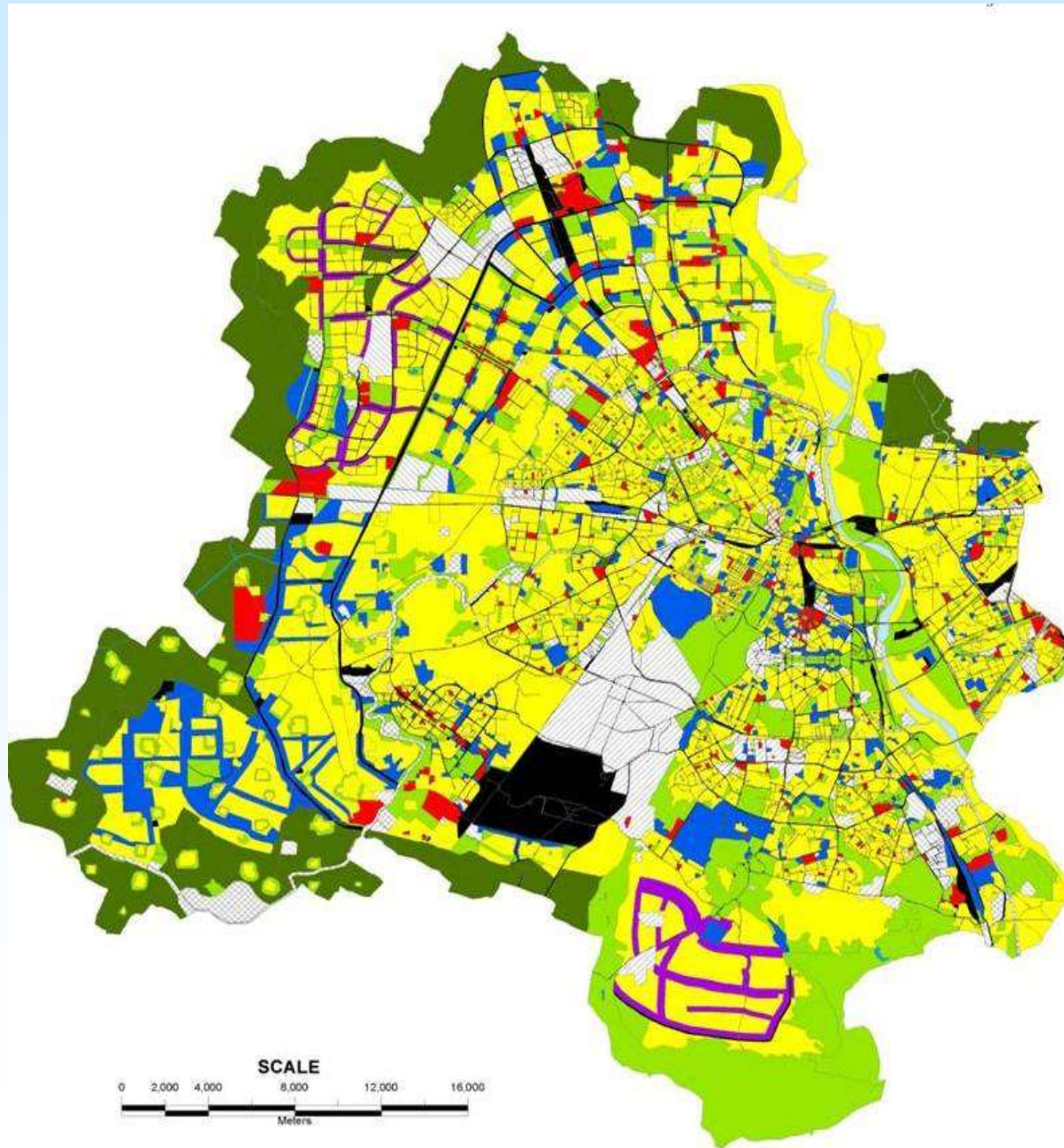
Existing Facilities Arrangement (925MGD)

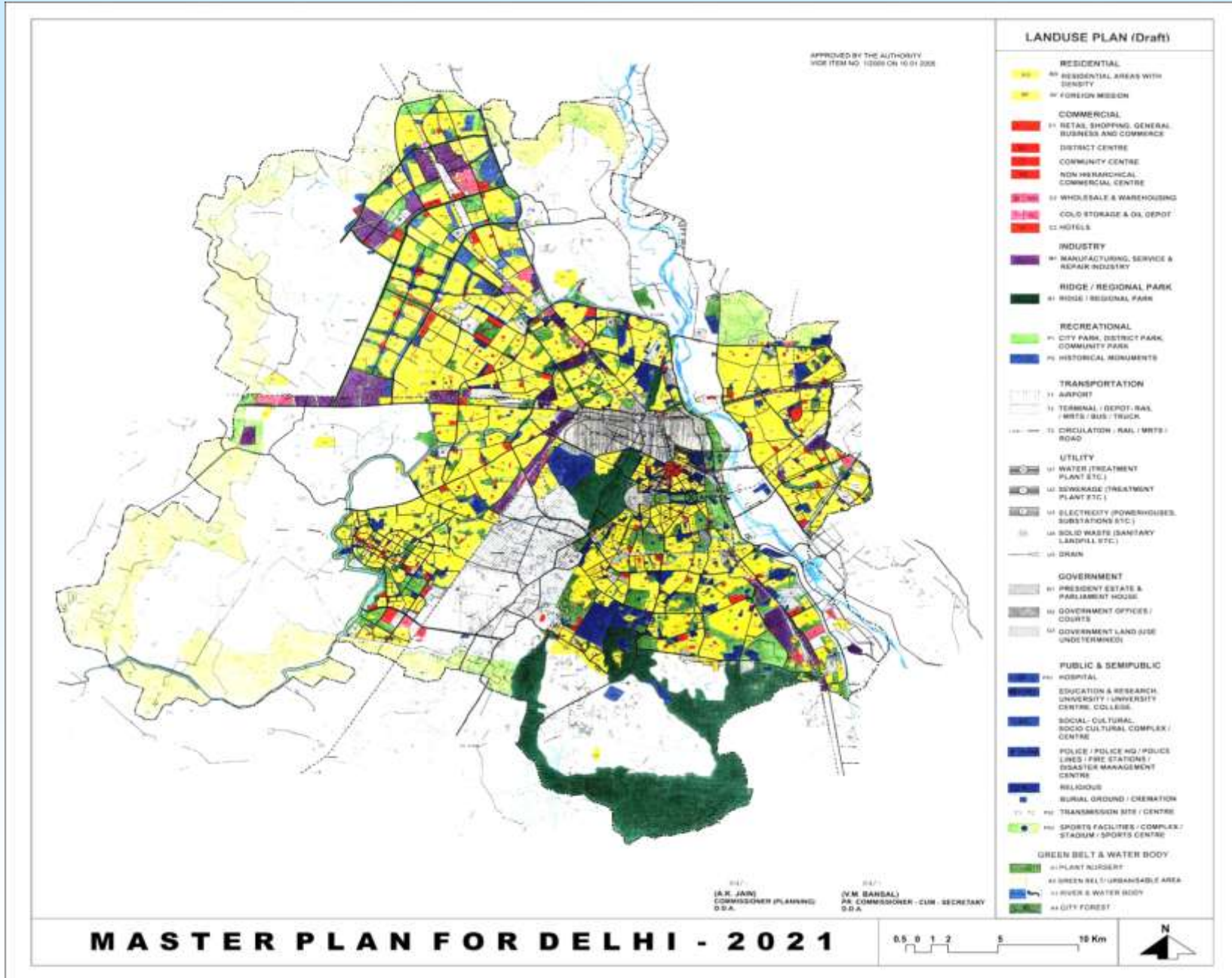


Existing Command Areas

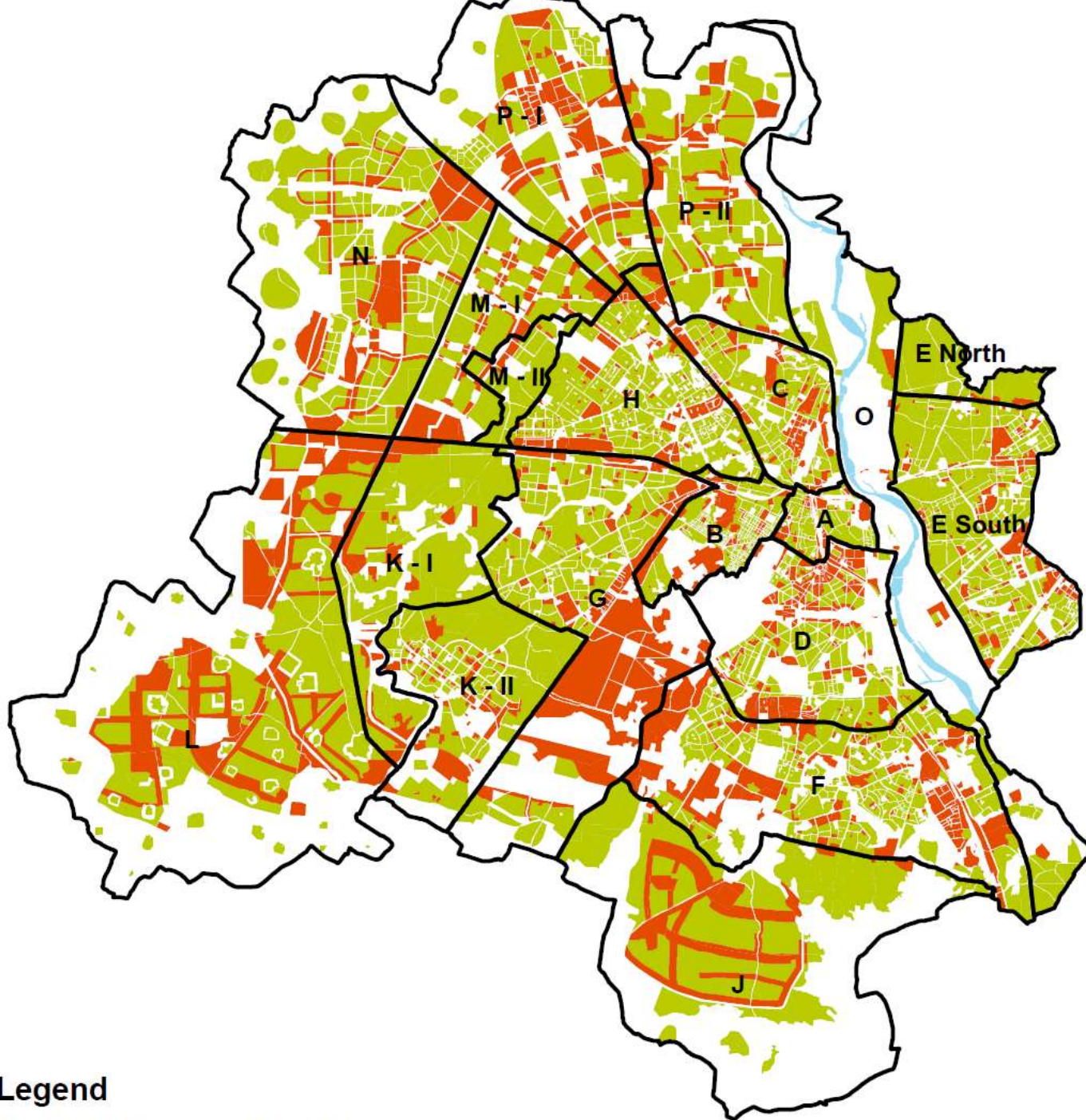


Framework: Land-use in Delhi





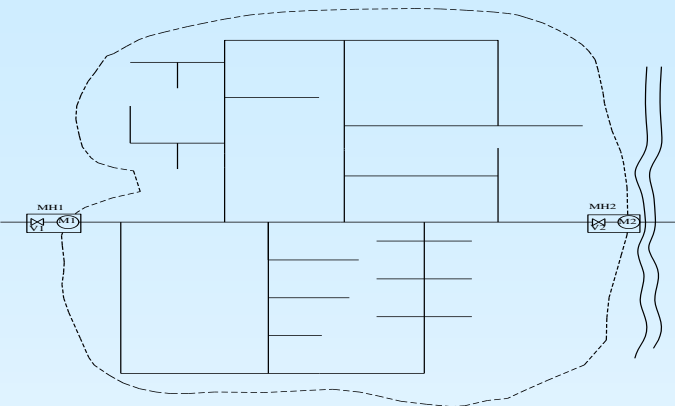
Planning Basis : Land Use MPD 2021



Legend

A - P DDA Zone Code (Note- There is no I)

JICA Study : DMA based Loss Reduction



- 2 DMAs completed
 - Rs. 60 – 70 lakhs per DMA
 - Loss reduction by 20 – 24 %
 - 9 months : DJB staffs
- NRW Reduction Measures : DMA Model Contract
 - Spot and legalise Illegal Connections
 - Pipe / Joints Repairs
 - Replacements of Meters
 - Replacement of Components

Avg. DMA Size	Total DMAs in Delhi
	1157
	868

CHALLENGES

- Political consensus for reform IMPORTANT
- Stabilize reform management team and change drivers DESIRABLE
- Effective communication – external and internal ESSENTIAL
- Reduction in UFW; move to metered consumption
- Managing expectations
- Obtain sustained political support for Roll Out



PERFORMANCE IMPROVEMENT PLAN

AIMS – Reliability, Sustainability, Affordability

- **RELIABILITY** - Intermittent to continuous supply; Infrastructure Rehabilitation
- **SUSTAINABILITY** - Recover O&M cost, full metering, leakage control and Recovery of Billing
- **AFFORDABILITY** - Reducing Energy and Establishment costs; Replacing Inefficient Equipment; Target low income communities – Expand the Reach and Access

Challenge of Managing DJB's infrastructure

Pattern of growth largely unplanned(around 1639 unauthorized colonies being regularized. 45% of Delhi is unsewered



Decadal population growth of 47% against National growth of about 24-26%



- Increased pressure on civic infrastructure
- Civic agencies with large financial deficits
- Political impediments to undertake reforms
- Inability to recover O&M cost



Demanding residents expecting highest quality services at lowest cost



सत्यमेव जयते

Powers split between the Centre & the State Governments

GOVERNMENT OF INDIA



WATER MASTER PLAN 2021 (JICA)

Framework: Water Demand (comparison)

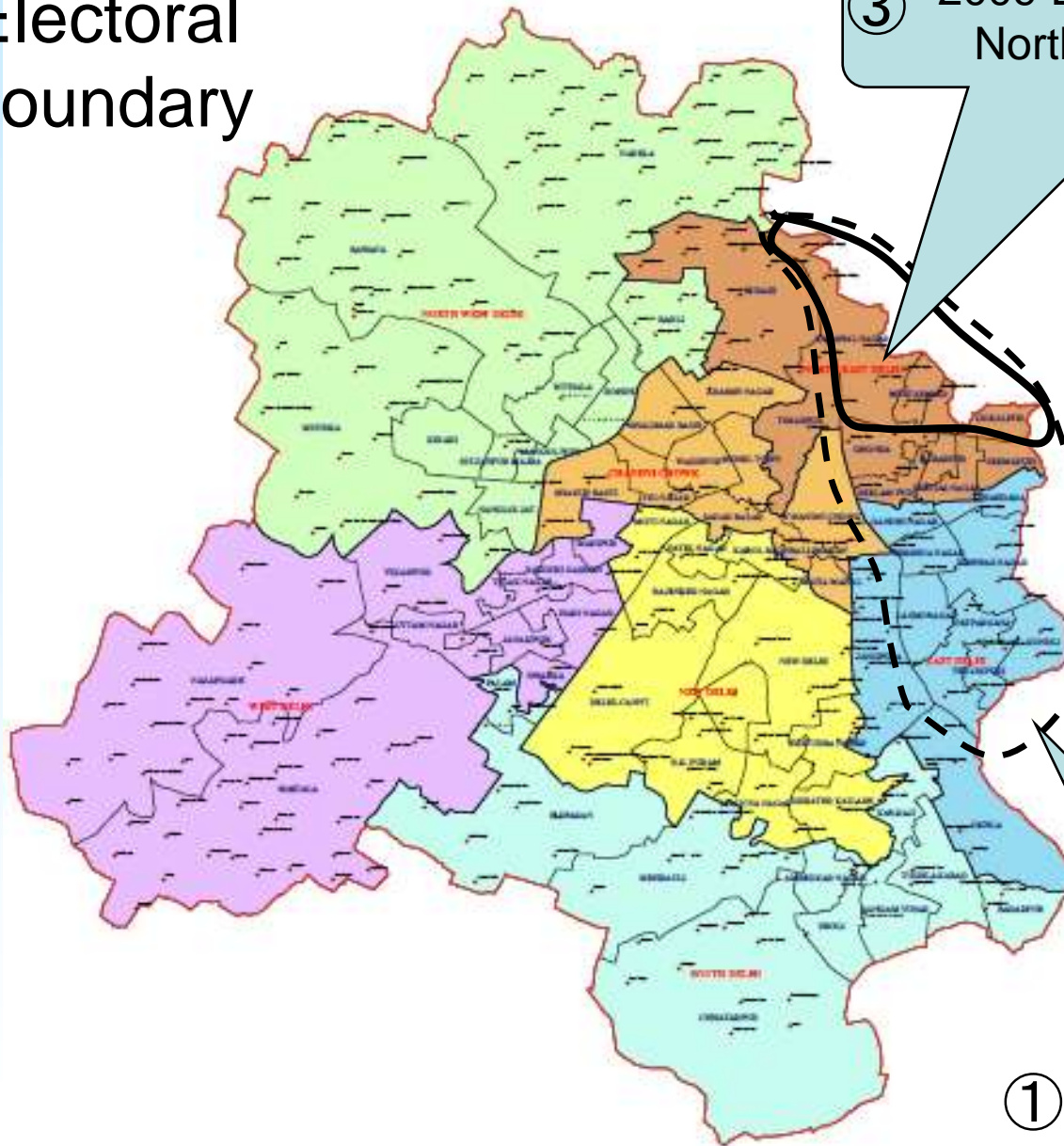
	JICA Study Team	TCE	DJB	DDA MPD
Demand (mgd)	1,380	1,170	1,380	1,840
Gross Per Capita (gpcd)	60	51	60	80
Net Per Capita (gpcd)	52	51	60	80
Leakage	15%: 8 gpcd	Included in Net	Included in Net	Included in net

Installed Capacity of Water Treatment Plants at the end of Five Year Plans

(MGD)

S N	Name of Plant	1st FYP	2nd FYP	3rd FYP	4th FYP	5th FYP	6th FYP	7th FYP	8th FYP	9th FYP	10th FYP
1	Chandrawal	60	90	90	90	90	90	90	90	90	90
2	Wazirabad	-	-	40	80	80	80	100	120	120	120
3	Haiderpur	-	-	-	-	50	100	100	200	200	200
4	Bhagirathi	-	-	-	-	-	37	100	100	100	100
5	Nangloi									40	40
6	Rainy Wells/ Tube wells	-	-	-	5	20	30	47	63	88	100
7	Okhla (Iron Removal)	-	-	-	-	-	-	-	7	12	-
	Total	60	90	130	175	240	337	437	580	650	650

Electoral Boundary



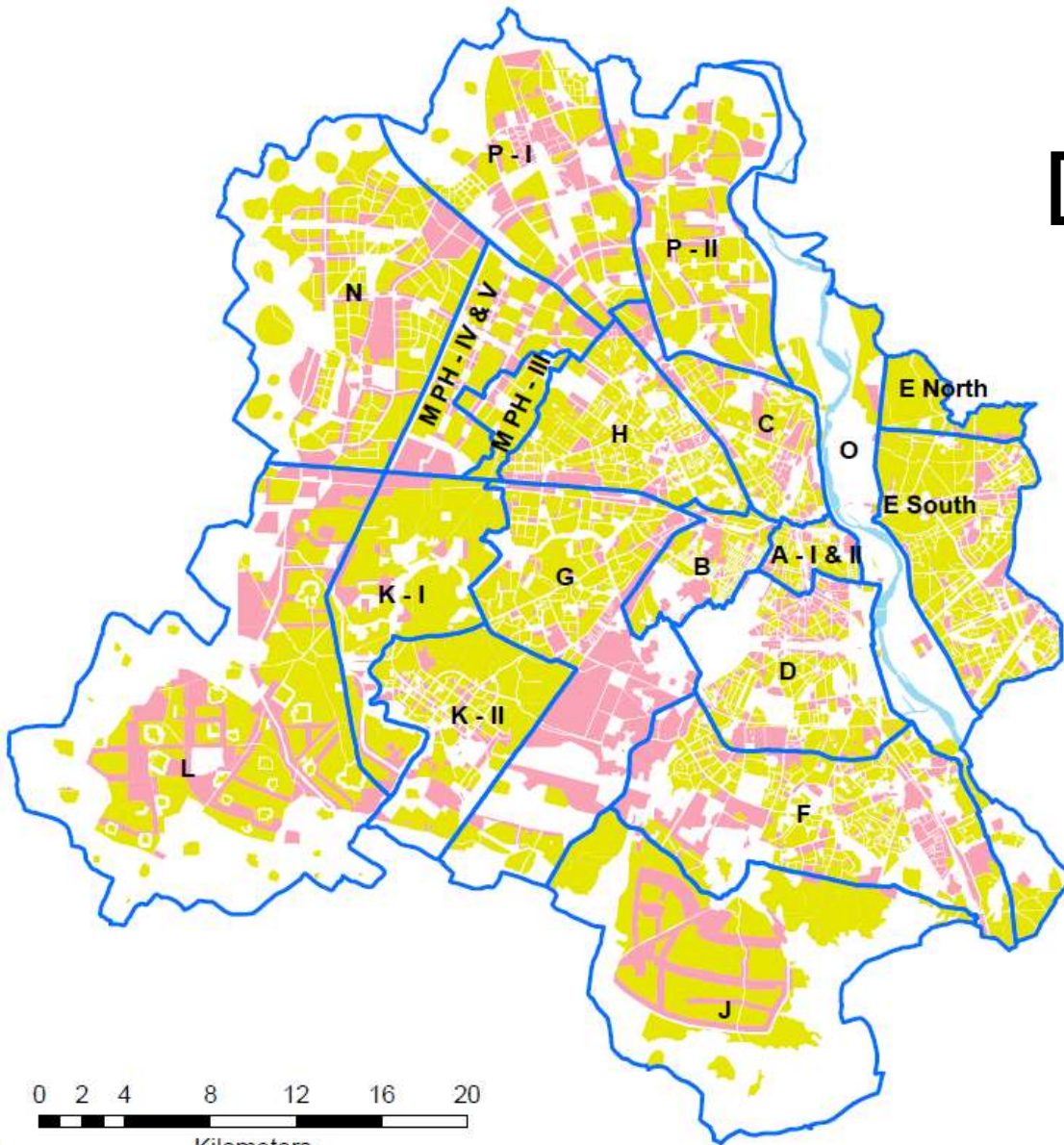
③ 2009 Electoral Population at Northern Area = 811,000

④ $4,000,000 - 2,800,000 - 811,000 = 389,000$ distributed at whole Zone E


② 2009 Total Electoral Population at Zone E = 4,000,000

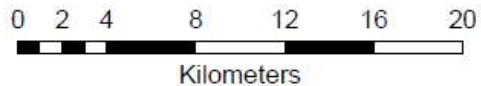
① DDA Population Projection in 2021 at Zone E = 2,800,000

Water Demand Area



Legend

-  Domestic Water Demand Area
-  Non Domestic Water Demand Area
-  No Water Demand Area
-  DDA Zone Boundary



WTP Command Area Basis Implementation

- Flow Monitoring and Control covering every Facilities including SCADA and NRW Reduction
- Build and Operate Basis for Equitable Water Allocation and NRW Reduction

Distribution SCADA

4. Organizational Restructuring for Distribution Operation

Creation of Water (Flow) Monitoring and Operation Center

1. Every pump and UGR should be under one command line.
2. Flow, UGR level and pressure in the tail-end pipe in each DMA are sent through “distribution SCADA”
3. One command line analyses the above.
4. One command line controls no. of operational pumps, opening of flow control valves.
5. Should cover from Clear Water Pumps to Small Pumps

Pictures of House Connection Replacement Work



Pictures of House Connection Replacement Work



Few reports from the Model

UGR Parameters

Label	Demand (mgd)	Hydraulic Grade (m)	Pressure (m H2O)
66 GT ROAD	2.67	221.15	11.1
67 MANDAVALI P I	9.93	211.07	1.1
68 MANDAVALI P II	8.95	195.72	-14.3
69 CHILLA DALLUPURA	7.22	189.96	-20
70 CHITRA VIHAR PH II	3.91	213.69	3.7
71 KONDLI	5.75	204.86	-5.1
72 TRILOKPURI	7.65	204.53	-5.5
73 GHAZIPUR	8.28	210.75	0.7
74 SURAJMAL VIHAR	9.69	212.29	2.3
75 JAGATPURI	5.74	218.09	8.1
76 CHITRA VIHAR PH I	4.13	214.09	4.1

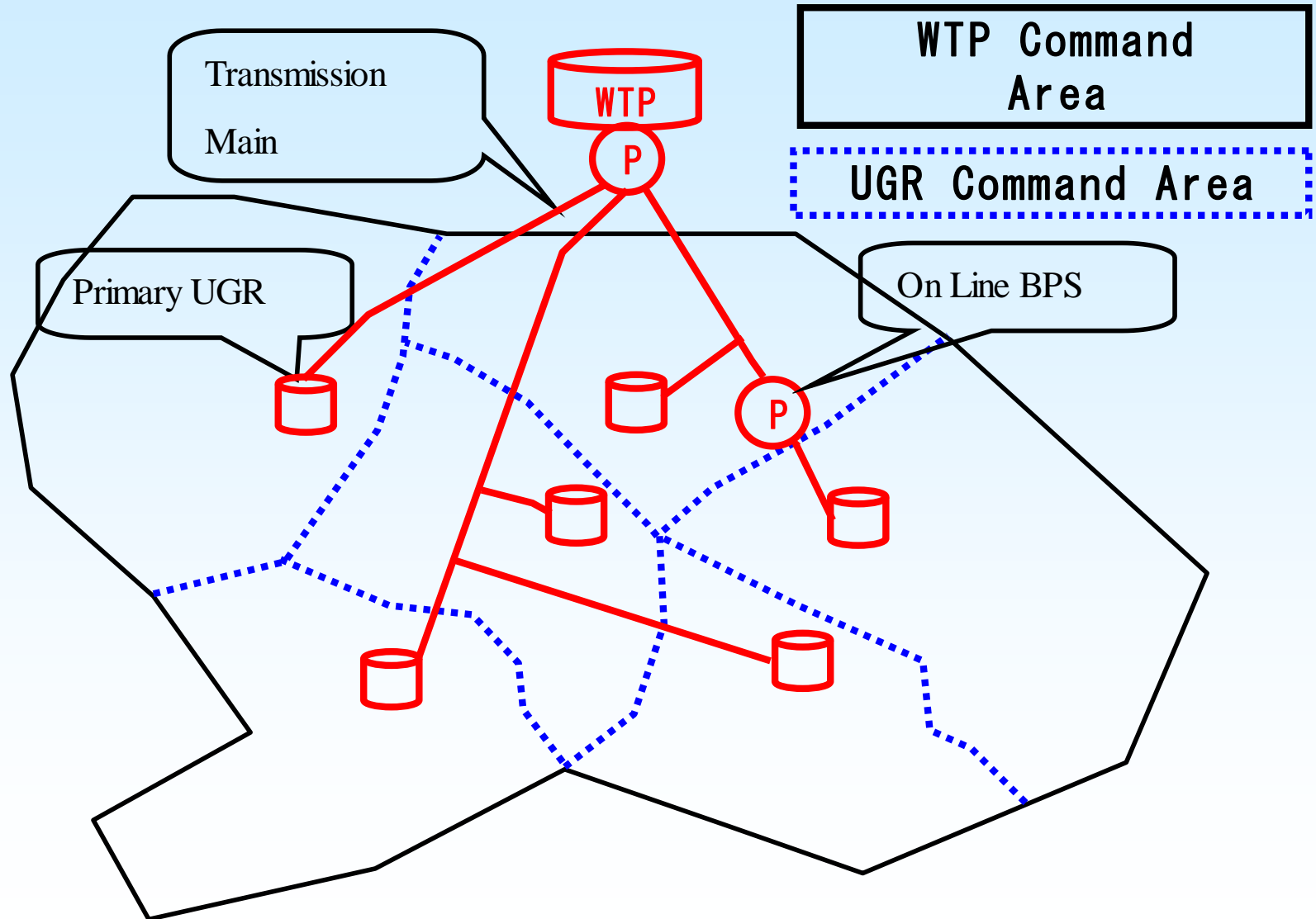
PUMP Parameters

ID	Label	Elevation (m)	Pump Definition	Start (Initial)	Hydraulic Grade (Suction) (m)	Hydraulic Grade (Discharge) (m)	Flow (Total) (mgd)	Pump Head (m)
811	JAL VIHAR	208	JALVIHAR	On	209.39	234.17	33.27	24.78
814	GK MAIN	208	JALVIHAR	On	209.21	234.42	32.63	25.21
817	SHAHADRA	208	SHAHADRA	On	209.69	225.55	22.29	15.86
822	TAHIRPUR MAIN	209	TAHIRPUR	On	209.9	223.78	17.84	13.88

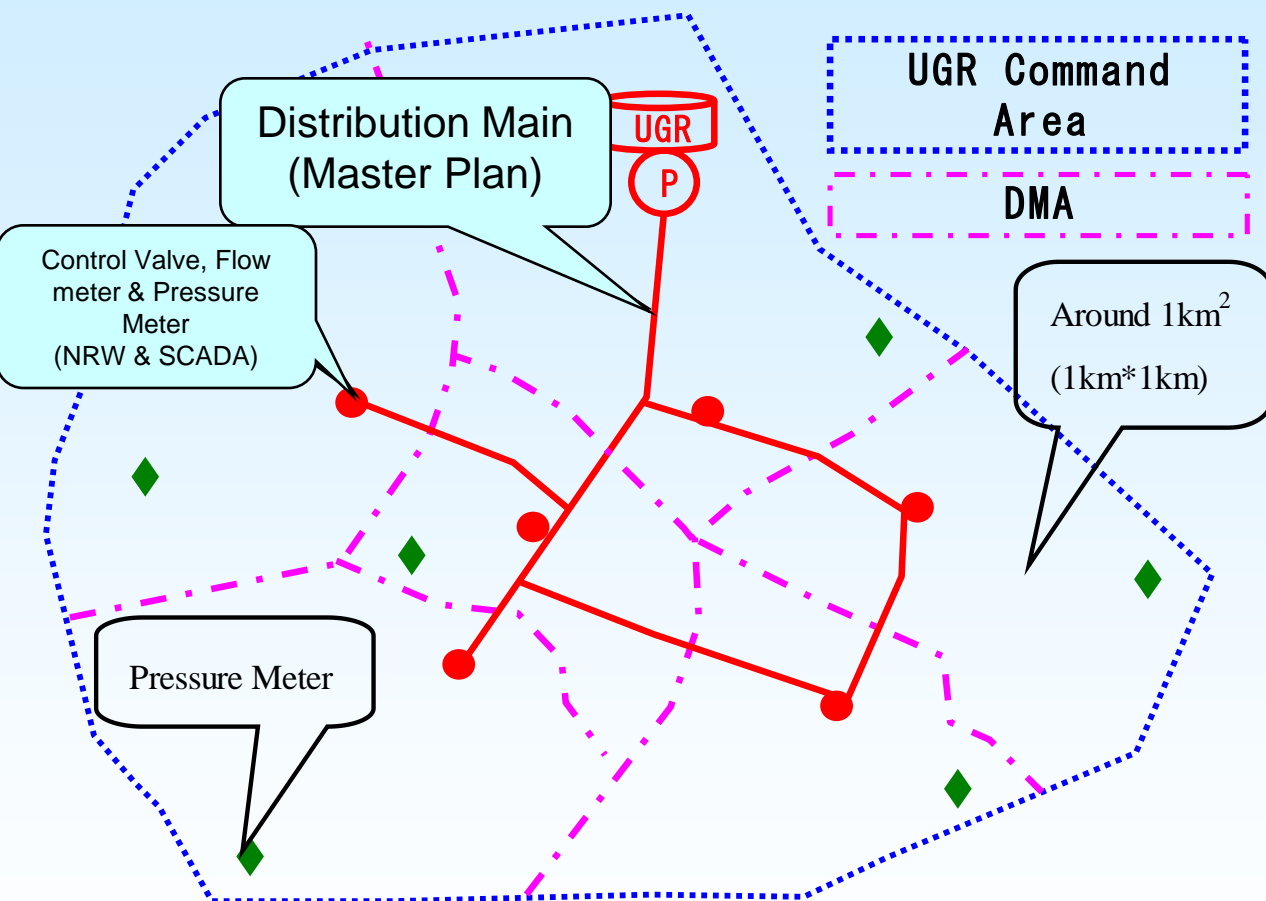
Pipeline Parameters

Label	Length (Scaled) (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-Williams C	Flow (mgd)	Velocity (m/s)	Headloss Gradient (m/m)
TAHIRPUR MAIN	73.89	J-20	J-3	900	Ductile Iron	90	-12.23	0.84	0.001
TAHIRPUR MAIN	68.31	J-21	J-3	900	Ductile Iron	90	-2.67	0.18	0
G K MAIN	2,975.32	J-65	J-17	1,200.00	Ductile Iron	90	0	0	0
TAHIRPUR MAIN	2,855.38	J-21	66 GT ROAD	900	Ductile Iron	90	2.67	0.18	0
TAHIRPUR MAIN	2,319.89	J-3	J-4	800	Ductile Iron	90	2.94	0.26	0
TAHIRPUR MAIN	358.7	J-4	J-5	800	Ductile Iron	90	2.94	0.26	0
TAHIRPUR MAIN	437.11	J-5	J-6	800	Ductile Iron	90	2.94	0.26	0
TAHIRPUR MAIN	38.16	J-6	87 TAHIRPUR PH II	800	Ductile Iron	90	2.94	0.26	0
P-25	1,135.70	J-40	J-65	1,200.00	Ductile Iron	90	3.19	0.12	0
Shahdara Main	350.02	J-24	79 KANTI NAGAR	800	Ductile Iron	90	3.67	0.32	0
JAL VIHAR MAIN	124.05	J-51	70 CHITRA VIHAR PH II	450	Ductile Iron	90	3.91	1.08	0.005

WTP Command Area and Transmission System



UGR Command Area and Distribution Main with DMA Area



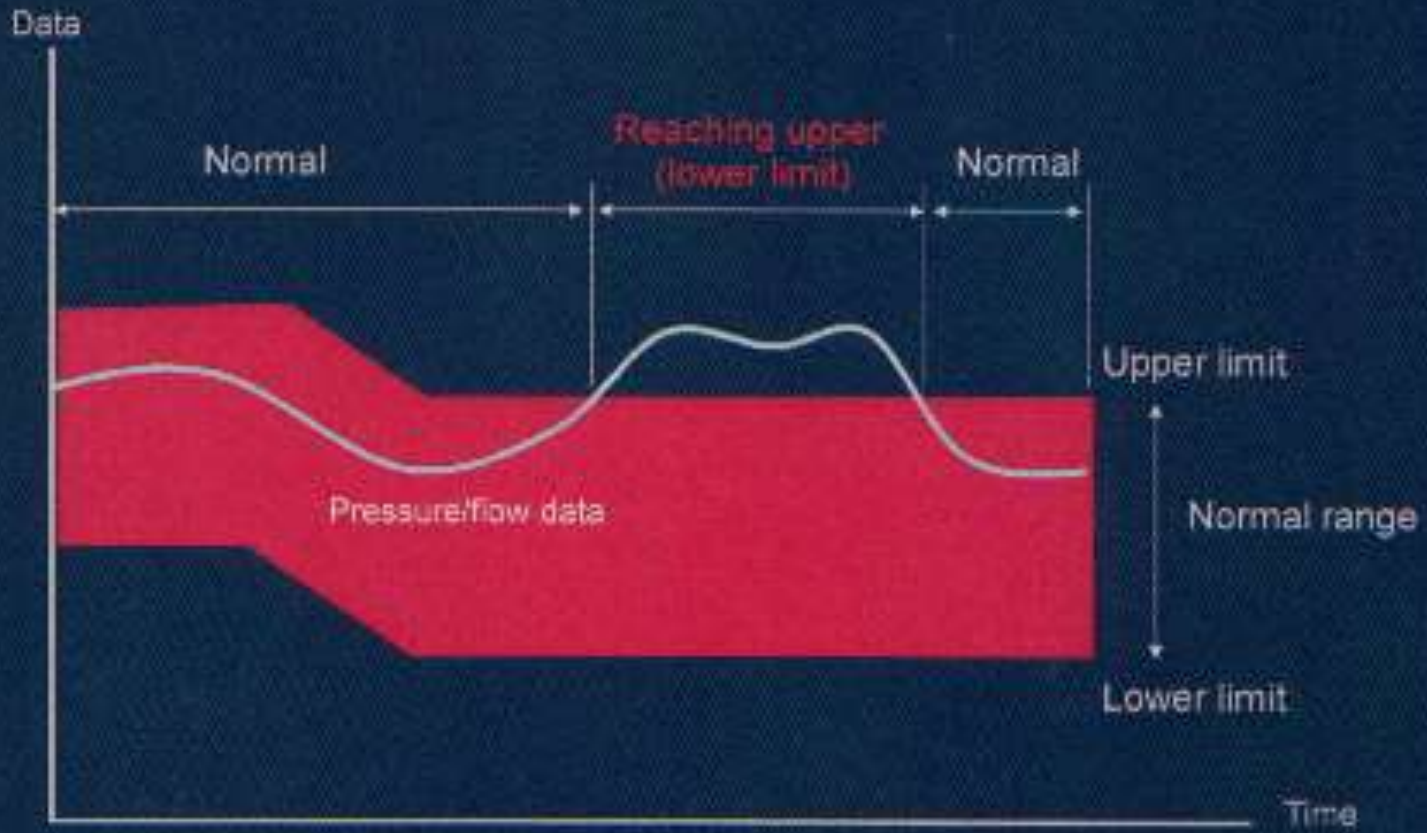
Planning of UGR command area referring to

- TCE Report
- Land use map (Zonal Plans MPD 2021)
- present UGR Command Areas
- Max. Size of UGR Command Areas (Diameter 10km circle)

Allocation with DMAs in Non-revenue Water Study, and with Control Valves Flow meters and Pressure Meters in SCADA Study

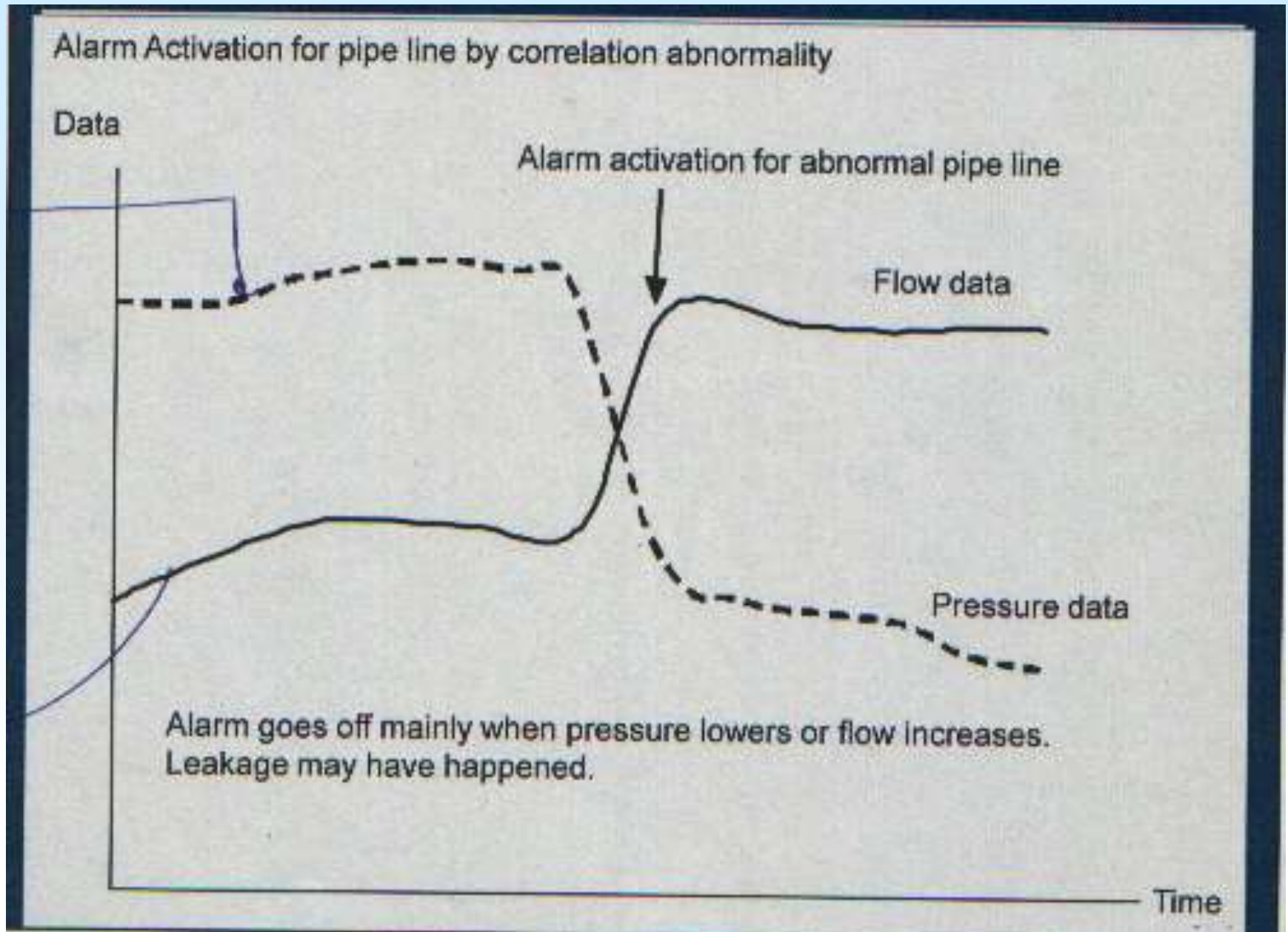
Operational abnormalities

Operational Abnormalities (reaching upper and lower operational limit)



※ An alarm goes off and the condition is shown on electronic blackboard.

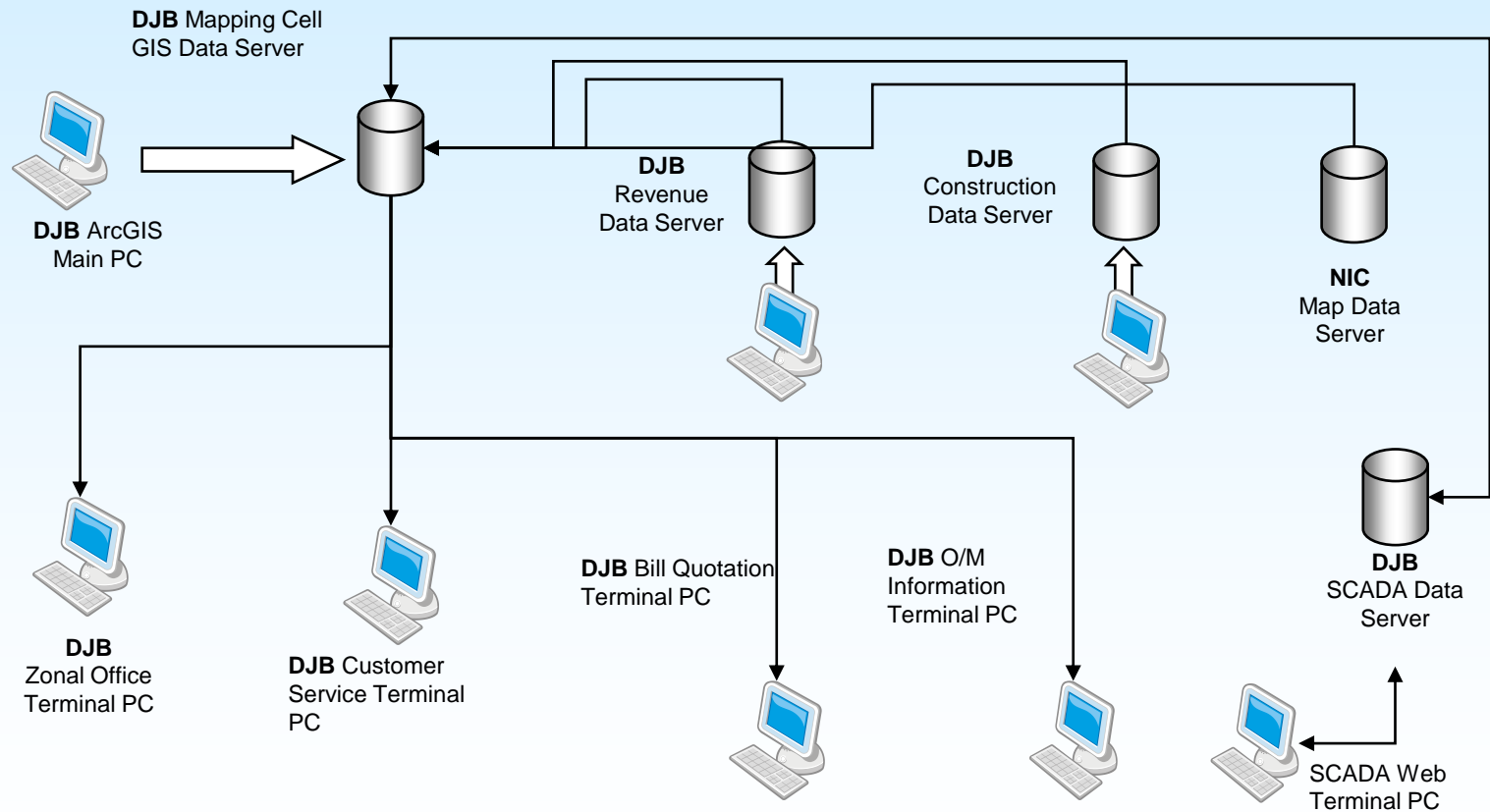
Operational abnormalities- pipe burst



DJB initiatives - CMS

- **DJB has already formulated a proposal under Information Systems Improvement Plans (ISIP) for Centralized Monitoring Station (CMS) to be setup at Chandrawal**
- **Existing 89 bulk flow meters at WTPs and 305 bulk flow meters in transmission network to be integrated.**
- **Further about 200 new bulk meters covering upto the peripheral distribution of UGRs to be installed.**
- **Pressure gauges to be installed at all locations of flow meters.**
- **Chlorine analyzers and turbidity meters are also proposed at strategic locations to monitor quality on real time basis.**
- **Energy consumption at WTPs and pumping stations**
- **Future provision for integrating SCADA systems of WTPs and Pumping Stations for efficient operations.**

Basic System Structure and Practical Usage on the Web page



Transmission Facilities by 2017

- Total Supply - 925 MGD up to year 2017
- Water Allocation to Urban Area and Outer Area up to year 2017
 - (800 MGD vs. 179 MGD out of 979 MGD by TCE)
 - 818 MGD vs. 107 MGD, 1200 MGD scenario
 - 733 MGD vs. 192 MGD, 1075 MGD scenario
 - 577 MGD vs. 348 MGD, 925 MGD scenario
- Transmission Facilities in Urban area is based on the above