

Drinking Water Management of Jaipur City

Issues & Challenges

Presented by
SATISH JAIN

Executive Engineer,
City Division I (North), Jaipur

HISTORY

- Jaipur Water Supply is more than 100 years old, initially fed by local Open wells, augmented in the year 1918 based on ground sources (16 large dia open wells on Amanshah Nallah bed) and tap water supply at common points introduced.
- 7.0 MLD of water production added from surface source Ramgarh Dam in 1952. Later augmented for 27 MLD in late sixties.
- The limited availability of surface water realized.

HISTORY

contd...

- Tube well drilling introduced in late sixties, augmentation from tube wells also started.
- Final augmentation from Ramgarh lake for 45 MLD in the year 1982.
- Allocation of water from Bisalpur Dam (11 TMC) work on ground started in the year 2006.
- Meantime, water production augmented from ground sources, 2009 City gets Bisalpur water.

Salient Features

| | |
|--|------------|
| Total Municipal Area | 467 sq KM |
| ■ Area Connected by Piped Water Supply | 215 sq KM |
| Population of City 2011 | 30.07 lacs |
| Present Population | 31.12 lacs |
| Population connected with water supply | 29.70 lacs |
| Present Water demand | 462 MLD |

Water Production & Supply

| | |
|---|---------|
| From Bisalpur System | 275 MLD |
| From tube wells (1900 Nos. operated on rotation) | 97 MLD |
| From single point tube wells (117 nos) | 2 MLD |
| TOTAL SUPPLY | 374 MLD |
| DEFICIT | 90 MLD |

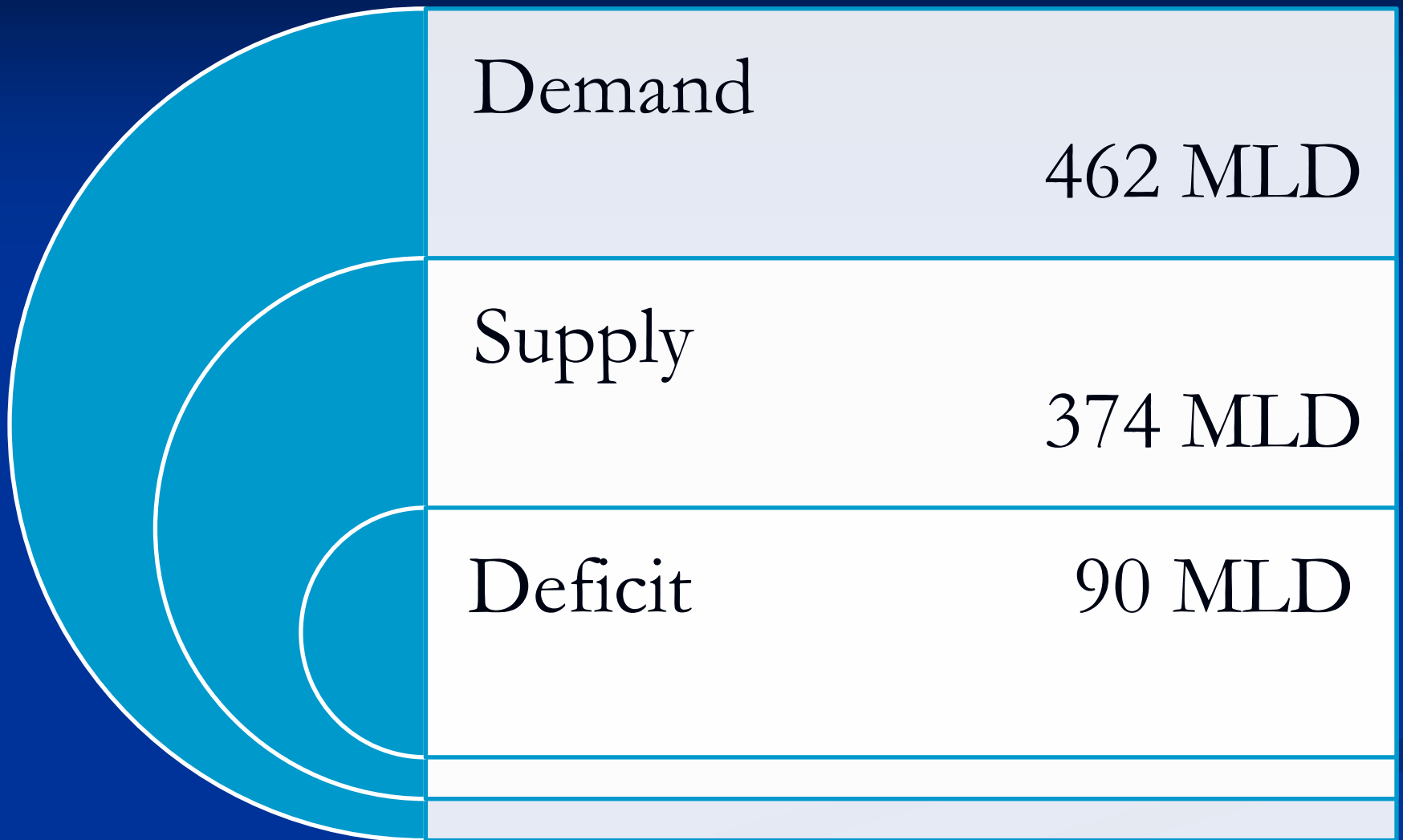
Details of Water Distribution System

| | |
|-----------------------------------|-----------|
| Length of Pipeline Network | 23500 K M |
| Installed Pumping sets | 12100 K W |
| Service Reservoirs | 95 |
| Clear Water Reservoirs | 78 |
| Pumping Stations | 85 |
| No of water supply Zones | 162 |
| Per Capita water supply (average) | 125 LPCD |

Water connections

| | |
|------------------------|--------|
| Total Connections | 390893 |
| Working connections | 352393 |
| Metered Connections | 384058 |
| Flat rate connections | 6835 |
| Domestic Connections | 329093 |
| Non Domestic | 51246 |
| Industrial Connections | 3719 |
| Public Stand Post | 1170 |

Present Scenario



Design demand from Bisalpur System

| Year | Design Demand (MLD) | Capacity for Jaipur City (MLD) |
|------|---------------------|--------------------------------|
| 2008 | 298.65 | 00.00 |
| 2009 | 335.3 | 360.00 |
| 2010 | 373.68 | 360.00 |
| 2011 | 418.02 | 360.00 |
| 2016 | 601.35 | 540.00* |

* 200 MLD additional WTP is in Progress

Water supply system

- Six water transfer pumping stations are operated for transfer of Bisalpur water at designated head works. Water transfer system is operated and monitored on SCADA.
- Water from tube wells is collected in local head works and transferred to deficit areas.
- Water supply to consumers is from local head works through Clear Water Reservoirs, Pumping Stations, Service Reservoirs and Distribution system.
- Old city area, Walled City is fed from distant Pumping stations located at Amanishah, Ramniwas Garden and Laxman Doongri Head works due to absence of local storage reservoirs.
- The water supply is intermittent and average duration is from 120-90 minutes per day.
- Dedicated Laboratory for daily monitoring of water quality.

Bisalpur System

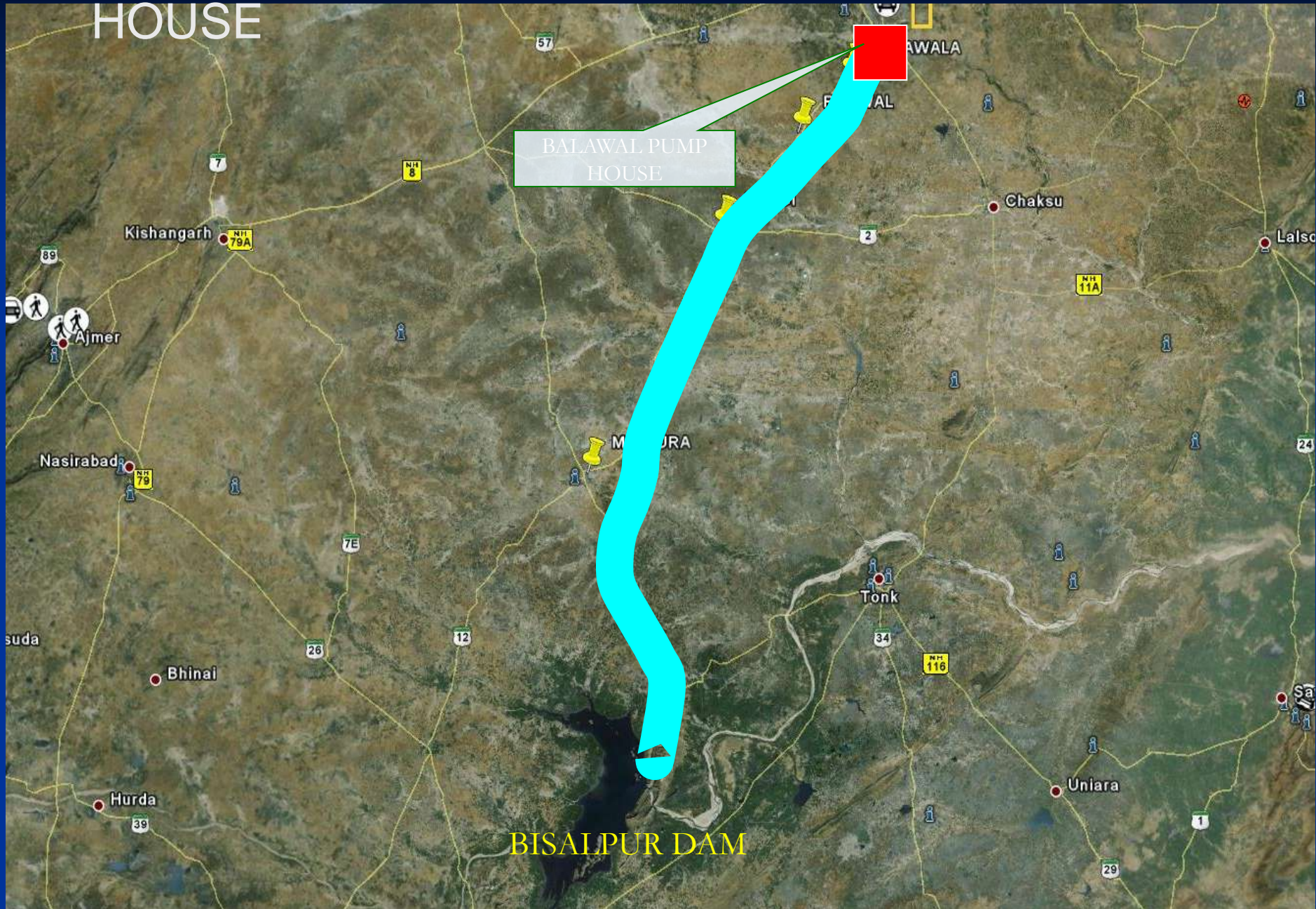
- The Bisalpur System consists of two parts
 - Transmission System
 - Transfer System.
 - Transmission System consists of
 - Raw water from Bisalpur Dam is pumped to filter plant 400 mld at Surajpura
 - Filtration and Chlorination at filter plant
 - Treated water is transferred to rural areas and Jaipur City upto Balawala pumping station

Transmission system contd.....

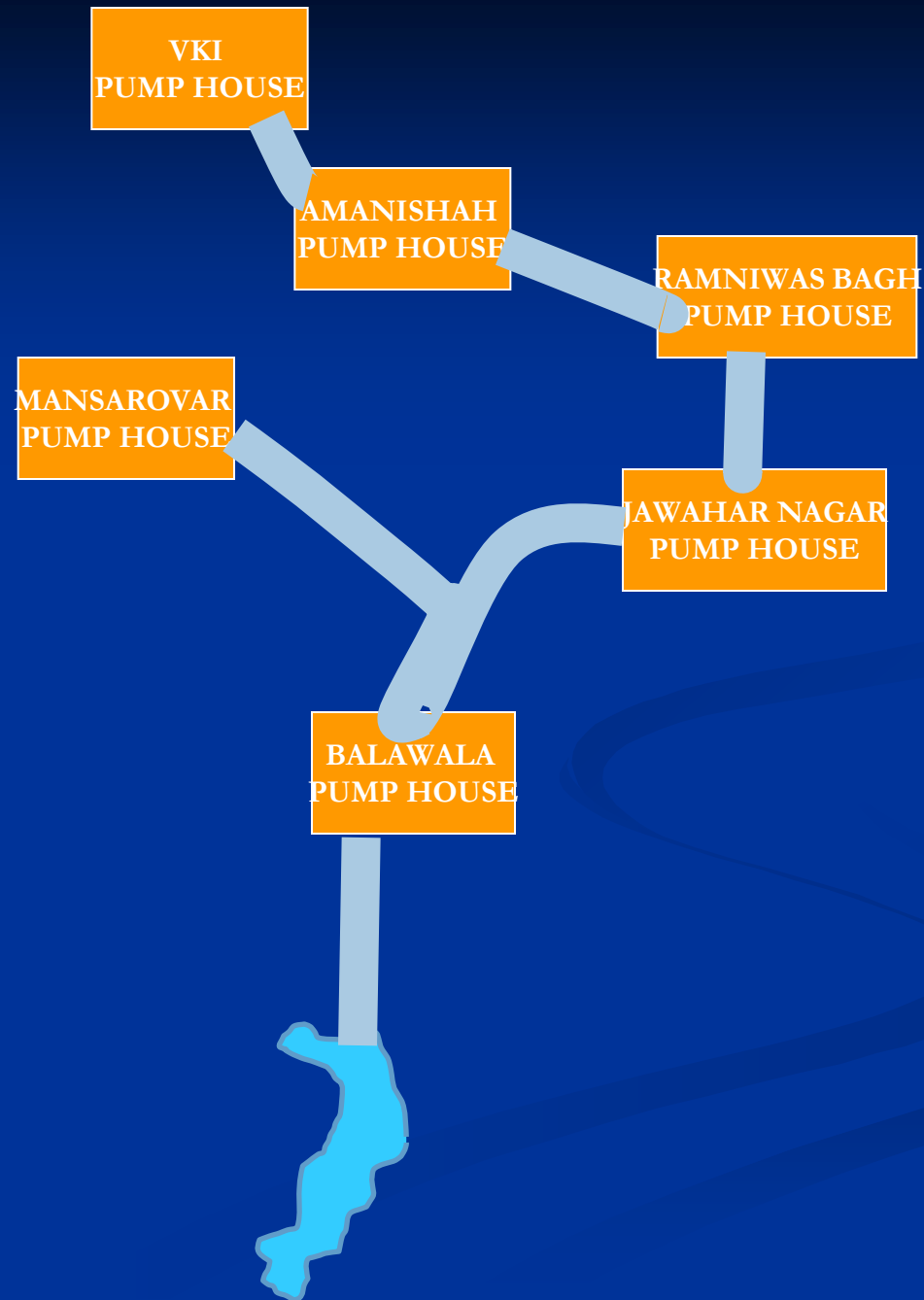
■ *Pipelines*

- Central Feeder from Balawala to Jawahar Circle, Ramniwas Bagh, Amanishah, Shastri Nagar, Vidhyadhar Nagar, VKI area. Jawahar Circle to Mahesh Nagar, Triveni Nagar, Barkat Nagar. Rambagh to Jypti Nagar, Civil Lines, Shanti Nagar.
- Western feeder from Balawala to Mansarovar, Shyam Nagar, Vidhyut Nagar, Khatipura, Jhotwara

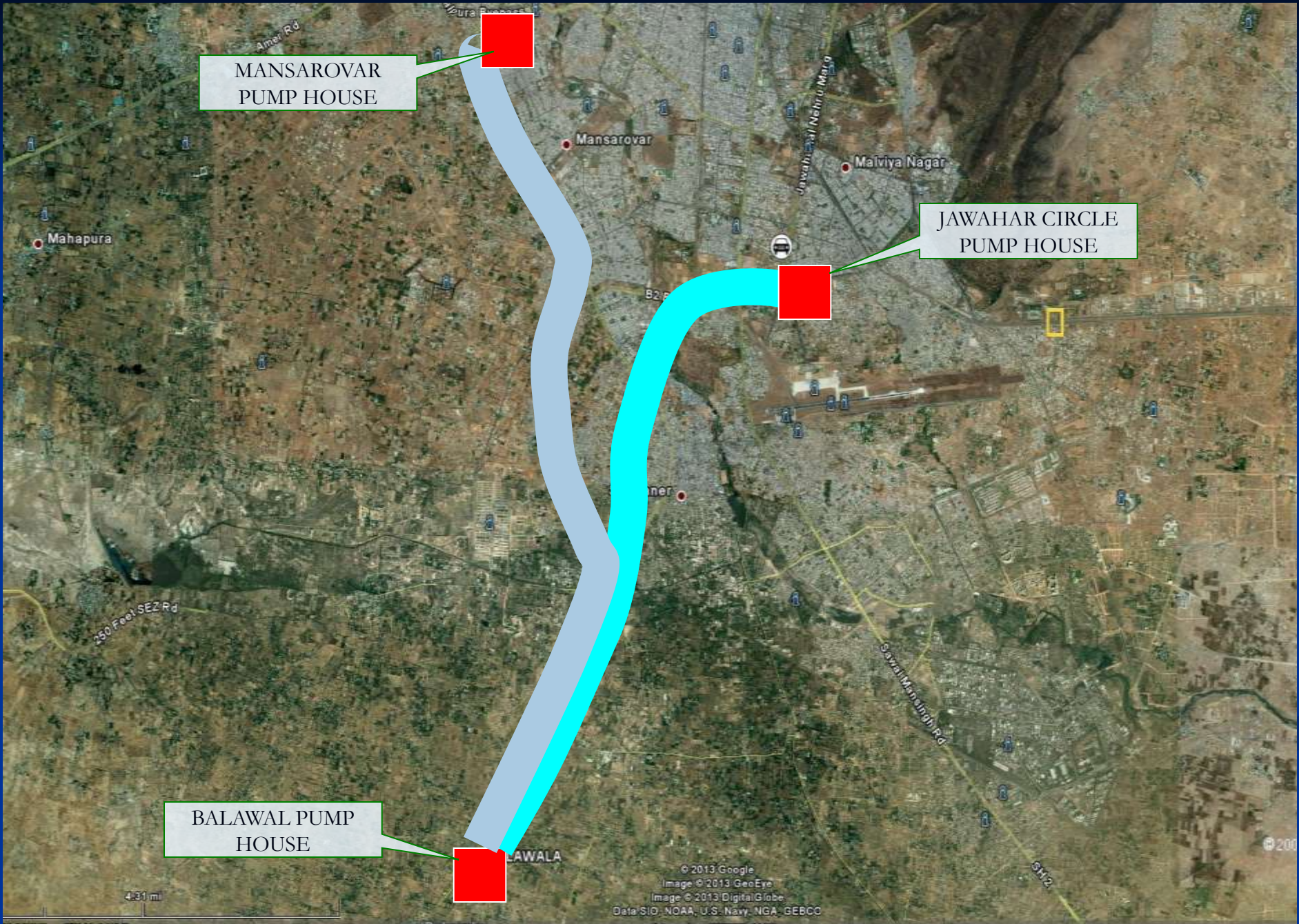
BISALPUR DAM TO BALAWALA PUMP HOUSE



INDEX MAP OF BISALPUR DAM TO JAIPUR WATER SUPPLY



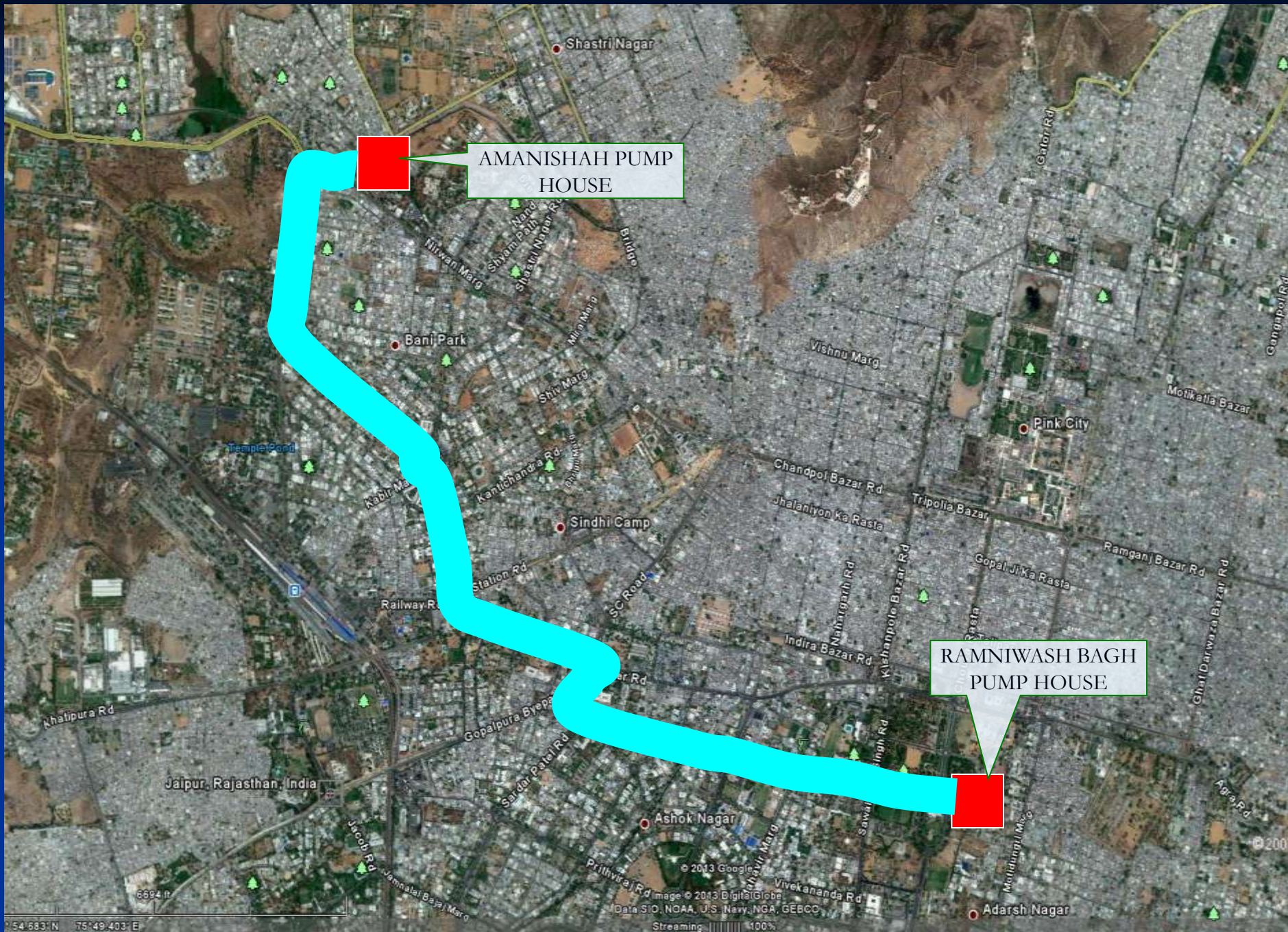
BALAWALA PUMP HOSE TO JAWAHAR CIRCLE& MANSAROWAR PUMP HOUSE



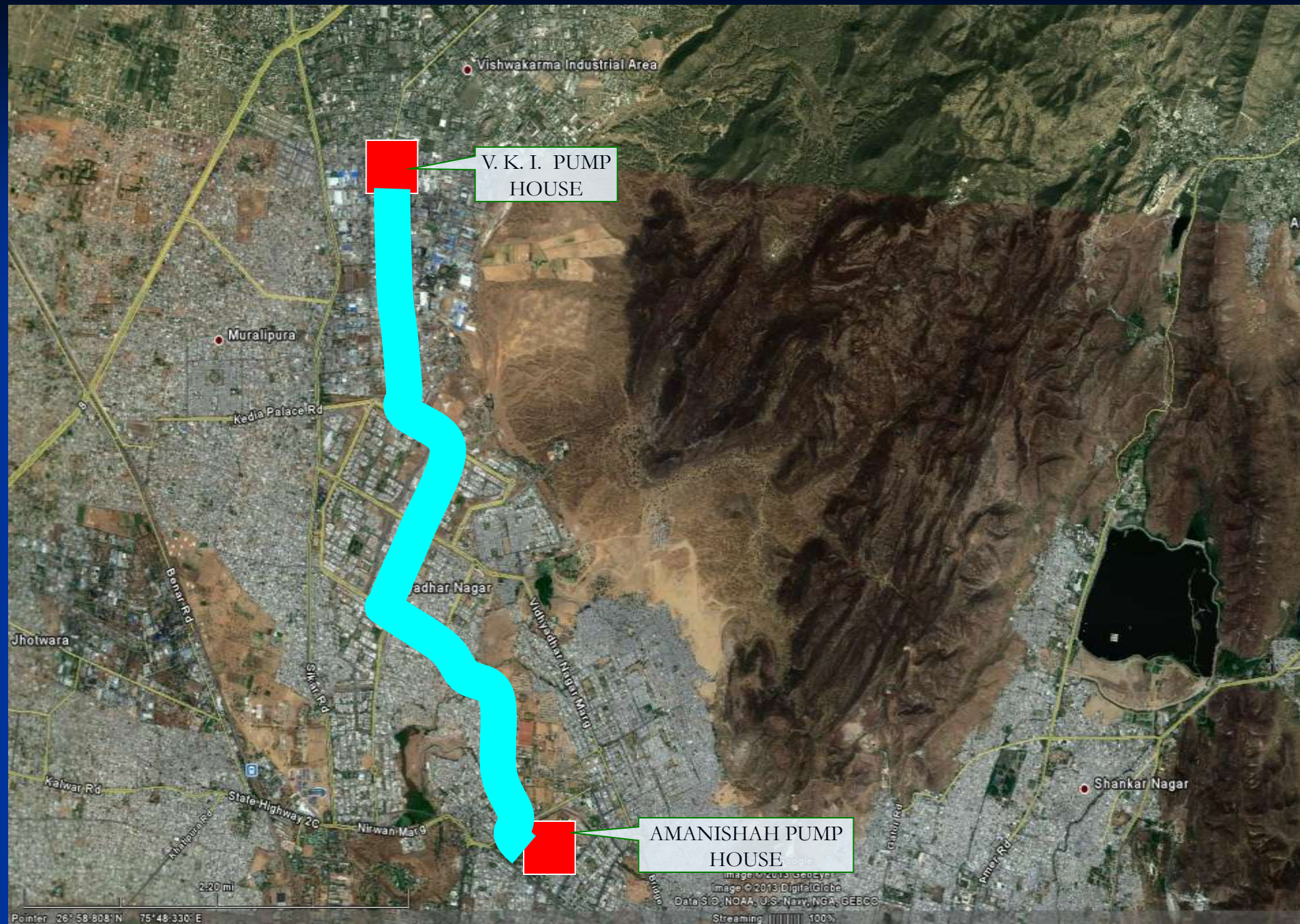
JAWAHAR CIRCLE PUMP HOUSE TO RAMNIWASH BAGH PUMP HOUSE



RAMNIWASH BAGH PUMP HOUSE AMANISHAH PUMP HOUSE



AMANISHAH PUMP HOUSE TO V.K.I PUMP HOUSE



Tanker transportation of water

- Tanker transportation of water is being done in connected as well as unconnected areas of city throughout the year.
- Improvement in distribution system completed in many localities like; Top Khanna Hazauri, Mandi Khatikan, Kanwar Nagar, Kamela Ki gali, Jagatpura etc.
- Till Year 2010, Nos of tanker trips during summers was about 2800. The present no of trips is about 1000. Out this about 300 are running in outer unconnected areas and balance in the connected areas.
- March 2012; Tanker tracking system introduced, all tankers fitted with GPS and payment as per trips recorded in GPS.
- Distribution system improvement works in progress and in coming summers tanker trips may further reduce.

Details of Contingency schemes sanctioned

- Contingency Scheme Summer 2009 Ph I estimated cost Rs 340 lacs
 - 40 tube wells drilled and commissioned
 - 10 hand pumps drilled and commissioned
- Contingency Scheme Summer 2009 Ph II estimated cost Rs 880.50 lacs
 - 85 tube wells sanctioned 85 drilled 78 commissioned
 - 50 single point tubewells 49 drilled & commissioned
 - 30 hand pumps 26 drilled and commissioned
- During the current financial year there is no contingency scheme. All the works are to be executed under plan

Pollution Mitigation works

| Name of Scheme | Year | Estimated Cost (Lacs) | Sanctioned length | Physical Progress |
|---|---------|-----------------------|-------------------|-------------------|
| Walled City I | 2004-05 | 116.05 | 27.40 | 27.40 |
| Kamela Area | 2005-06 | 222.24 | 11.50 | 11.50 |
| Walled City II | 2005-06 | 498.25 | 24.80 | 24.80 |
| Pollution Mitigation walled city | 2007-08 | 3596.09 | 45.10 | 45.10 |
| Replacement of pipelines in outer areas | 2008-09 | 2313.16 | 68.57 | 58.21 |
| | Total | 6746.14 | 177.37 | 167.21 |

Water Quality Assurance and Monitoring

- Regular chlorination of water is done by bleaching powder at pumping stations.
- Pumping stations under Bisalpur Project are provided with gas chlorination.
- 100 online chlorination plants has been installed on direct supply tube wells.
- 12 Electro-chlorinators are installed at pump houses.
- Daily water samples collected for residual chlorine and bacteriological examination.

Present Scenario of Ground Water

- As per studies there is an over drawl of more than 600% of ground water in Jaipur City.
- No more recharge basin available for city to meet the high water demand of rapid urbanization.
- Areas such as Jhotwara, Murlipura, Jagatpura, Malviya Nagar, part of Mansarovar, Bapu Nagar, C Scheme, Jawahar Nagar etc are almost dry.
- Increased rate of tube well failure due to drop in water table.
- Reduced yield of new tube wells being constructed in recent years.
- In addition to tube wells drilled by department for drinking water there are large number of tube wells drilled by private owners, using water indiscriminately.
- Depleting water table adversely affecting quality of water.

Remedial Measures Ground Water

- Drilling of tube wells prohibited without prior permission. Committee headed by District Collector empowered to issue permissions for drilling of tube wells after examination of need.
- Construction of Rain water harvesting structures is mandatory for houses with more than 300 Sqm.
- 100 Roof top artificial recharge structure constructed in govt. buildings and public parks etc. by JDA
- Artificial recharge structures constructed at road side depressions where water is accumulated for small duration during rainy season.
- Department constructed 100 artificial recharge structures on abandoned tube wells in the year 2011-12.
- Efforts are on to persuade Industrialist with big plots and sheds with huge open areas to construct rain water harvesting structures and artificial recharge structures for recharging the aquifer.

Problems in Distribution Management-1

- Illegal connections and Long distance connections.
- Equitable distribution of water in distribution zones
- Low pressure, short supply and tail end problems
- Incidences of water pollution due to choking/overflowing sewers & seepage from manhole chambers.
- Increase in demand of new water connections from consumers due to reduced yield of ground water in private tube wells.

Problems in Distribution Management-2

- Increasing numbers of multi story buildings in developed areas demanding bulk water.
- Water supply to planned areas developed by private colonizers in outer areas of city.
- Water supply to unconnected areas within zones.
- Curb on demands for Tanker transported water.
- Poor utility and asset mapping affecting monitoring.
- High non revenue water and water wastage at consumer end due to insignificant water tariff.

Planning for Distribution Management-1

- **Illegal connections:** Consumers counseled for regularization of illegal connections.
- **Distribution system Improvements:** Distribution network strengthened by providing additional pipelines, Orifice flow equalizers installed at connections with high pressure and Leaking valves replaced to curb 24 hrs water in lower zones.
- **Reduction of water losses:** Water Audit started from year 2011 with complete accounting of water quantity right from all sources to consumer end. (NRW reduced from 42 to 32% and savings provided for useful water)
- **Pollution control Measures:** The pollution prone areas combed and affected pipelines with service connections replaced. Three level water quality monitoring system introduced including mobile units for daily monitoring. (Resulted in almost 50% reduction in incidences of polluted water supply)

Planning for Distribution Management-2

- **Demand management:** New water connection guidelines introduced to curb use of water in non drinking purposes like; construction, washing, industry & process etc.
- **Demand for Multistoried buildings and New areas:** Policy for release of connections in multistoried buildings implemented with provisions for bulk metering, RWH and recycling.
- **Water Supply to areas developed by Private colonizers:** Detailed proposal and policy for providing water supply to outer areas is under preparation. Provisions for sharing of infrastructure cost and rationalized tariff to recover O&M cost are likely to be set.
- **Utility and Asset Mapping:** Consultant appointed for preparation of GIS based complete mapping of water utility and other assets. Pipeline networks already updated and clause inbuilt in all work contracts for simultaneous updating of maps.
- **High NRW:** Reduction of NRW in 4 pilot areas with JICA.

Assessment of water supplied

- Metering is an important tool for water management. Anything which is not measured is not managed.
- There are total 384058 metered connections in Jaipur Water Supply Scheme.
- In general about 60 % consumer meters are functional. Replacement of water meters is not been done due to shortage of staff, low meter repair rate.
- A broad policy for replacement of consumer water meters is under process of approval and it is proposed to out source the work. Providing and installation of FCRI tested water meters for 7 years including O&M and replacement guarantee may be introduced soon.

Energy Efficiency

60 % of O&M Cost is towards Energy Charges

MEASURES FOR IMPROVING ENERGY EFFICIENCY:

- 400 old inefficient submersible pumping sets of tube wells replaced.
- Policy for procurement of Star rated energy efficient implemented.
- Drive for replacement of In efficient centrifugal Pump sets started to save energy.
- Operation of tube wells with time switches.

Major Ongoing and proposed works

- Work of laying 600 mm pipeline in Ghat Bazar to improve pressures in Choukri Ghat, Ramchanderji, Top Khanna Hazauri, Modi Khanna, Vishwarji. Pipe line in Top Khanna Desh has been commissioned, tail end pressures has been increased by 3m.
- The interconnections and providing of missing pipeline links is under progress in many areas for pressure improvement.
- Development of new distribution zone for Kho Nagorian under construction.
- WSS for Sewerage farm area sanctioned, under tendering.
- 200 ML Filtration Capacity addition at Surajpura WTP
- Survey and feasibility started to bring additional surface water in Bisalpur dam from river Chambal.
- Proposal for additional Surface water from Isarda Dam.

24 X 7 water supply in pilot areas

- A MOU was signed among Ranhill Co Malaysia MJP and Govt. of Rajasthan
- Pilot project for 24 hrs water supply started in 4 zones of Jaipur City to study NRW and consumption behaviour.
 - Mansarovar Sec 1
 - Mansarovar Sec 3
 - Mansarovar Sec 9
 - Malviya Nagar Sec 9

These zones were provided with separate pipe lines from Service Reservoir along with bulk meters for DMA metering. Non functional consumer meters also replaced. Daily meter reading of consumer meters and bulk meters.

- The sector wise number of consumers are Mansarovar Sec 1 – 139, Sec3 -295, Sec 9 – 135 and Malviya Nagar Sec 9 – 140 .
- During execution of work IEC activities done to educate consumers for water conservation and checking of all possible leakages in side consumer property. It was observed that there were major leakages from the under ground water storage tanks, fittings and poor plumbing equipments.
- The results of pilot study are encouraging, in general the water demand has remained slightly higher than intermittent supply.
- Leakage levels have come down both in the distribution system and at the consumer end.
- It is proposed to extend coverage in the adjoining areas and replicate in other distribution centers; Kanwar Nagar, Jawahar Nagar & VDN Nagar etc.

Policy and Governance related Issues

- **Inadequate staff for regular O&M:** Out sourcing of services and SPR basis contracts floated with defect liability clauses.
- **Low Water tariff leading to higher consumptions:** No hike in water tariff for last more than 18 Years but as per the State govt policy drinking water is a basic requirement. Proposal for water tariff reforms is now under process to rationalize tariff for lifeline consumptions and charge higher rates on volumetric consumptions to curb excessive use and wastage.
- **Poor Cost recovery of O&M Expenditure:** The water for Jaipur city is pumped from Bisalpur dam, at a distance of 110 KMs with almost 95 Mtrs. of Hydraulic head. More than 50% of O&M expenditure goes on power charges alone. The proposed tariff reform is likely to address the cost recovery of O&M charges.

Consumer related Issues

- **Improvement of O&M efficiency:** Action plan to improve operational efficiency of schemes is drawn to attain minimum 65% efficiency and performance. Supply Pressure and duration time improved by 10-15%
- **Poor Water Revenue collection:** Revenue collection drive started, Collection efficiency improved by 20%. Local Kiosk for bill collection started from this month. On line water bill payment also introduced for easy payment.
- **Consumer Complaints:** Resolve time prescribed for different categories of complaints. Toll free Call centre facility introduced for water supply related complaints. Online monitoring of complaints resolved started. Very Good results achieved .

Sewerage System Management of Jaipur City

DETAILS OF INSTALLED CAPACITY-1

| S. No | Capacity, Location and Process | Operational Status |
|-------|--|--|
| 1 | 27 MLD at Brahmpuri – Extended Aeration Process. | STP is in operation at full capacity. 8 MLD tertiary Treatment & treated water in use for lake filling. Sludge is digested in anaerobic digesters. |
| 2 | 2 units of 62.50 MLD at Delawas - Activated Sludge Process | Both STPs in operation at full capacity. Gas produced from Unit-I used for power generation (5000-6000KWH). Gases produced (6500Nm ³ /day) from Unit-II is to be sold to generate a revenue (Rs. 150 lacs/ year on PPP model). The treated water discharged in Nalla used by Farmers for agriculture. |
| 3 | 50 MLD STP (North Zone)- Activated Sludge Process | STPs is in operation at 1/6 th capacity part PGTR. The methane gases produced is to be sold for Rs 130 lacs/ year (4000-5000Nm ³ /day) . Treated water discharged in nearby area used by farmers (free of cost). |

DETAILS OF INSTALLED CAPACITY-2

| S. No | Capacity, Location and Process | Operational Status |
|-------|---|--|
| 4 | 30 MLD South Zone(Ralawata Jagatpura area)- ASP Process | Under construction(JDA) |
| 5 | 30 MLD North area (Gajadhar pura kalwar road road)- ASP process | Under construction(JDA) |
| 6 | 1 MLD at Jawahar circle – MBBR Process | In operation from 2-3 years. Treated wastewater is being used for gardening. |
| 7 | 1 MLD at Ramniwas Bagh – MBBR Process | In operation for 1 year. Treated wastewater is being used for gardening. |
| 8 | 1 MLD at Swarn jaynti garden Vidhyadhar nagar – process- MBBR | Under construction (JDA) likely to put in operation by April-June-2013. |

Policy and Governance related Issues

- The O&M responsibility of Sewerage System is with Jaipur Nagar Nigam (Total Capacity/length: 265 MLD/400 Kms).
- Reviewing planning strategies and procedures, pricing policies, quality standards, monitoring and regulation of treated waste water for reuse in the cities of the state.
- Summarizing international best practices for the reuse of waste water, including the planning and tariff structure.
- Identification of capacity-building needs, preparation of institutional strengthening and training program.
- Design of pilot application to test the recommended guidelines for appropriate wastewater treatment & reuse and disposal of sludge including energy recovery (where ever applicable), preparation of cost estimates and a detailed implementation plan.

Thanks