ENERGY & RESOURCE EFFICIENCY IN URBAN WATER MANAGEMENT

INTACH

December, 2013

- Energy Consumed
  - In Lifting Water From Rivers/Canals
  - In Pumping Groundwater
  - In Water Treatment
  - In Water Supply
  - In Pumping Sewage
  - In Sewage Treatment

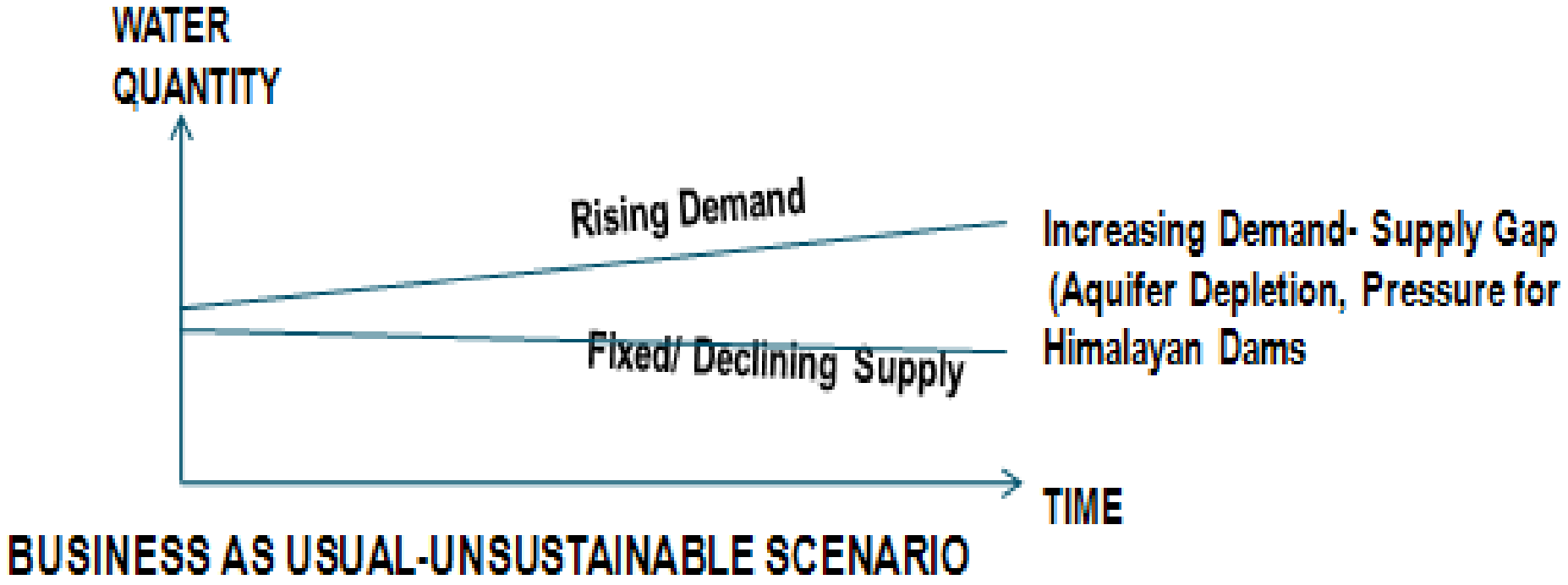
Cost Is Incurred In All The Above Components But Also Payment Has To Be Made For Conveyance Thru UP & Haryana Canal Systems

Capital Cost Of 240 MGD From Tehri Dam Rs. 15 Cr/MGD
Capital Cost Of 275 MGD From Renuka Dam Rs. 12 Cr/MGD

- QUESTION MARK OVER FURTHER DAMS IN THE HIMALAYAS

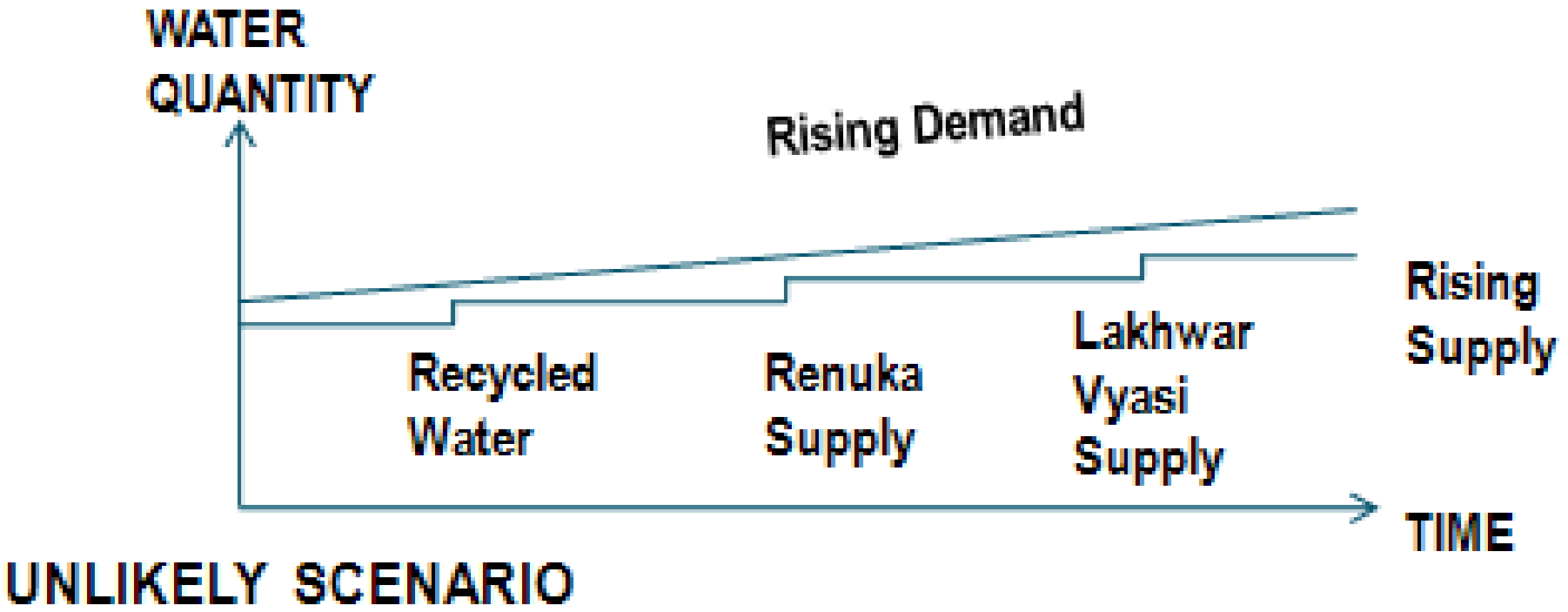
- HARYANA INTRANSIGENT OVER DELHI'S SHARE

SCENARIO I

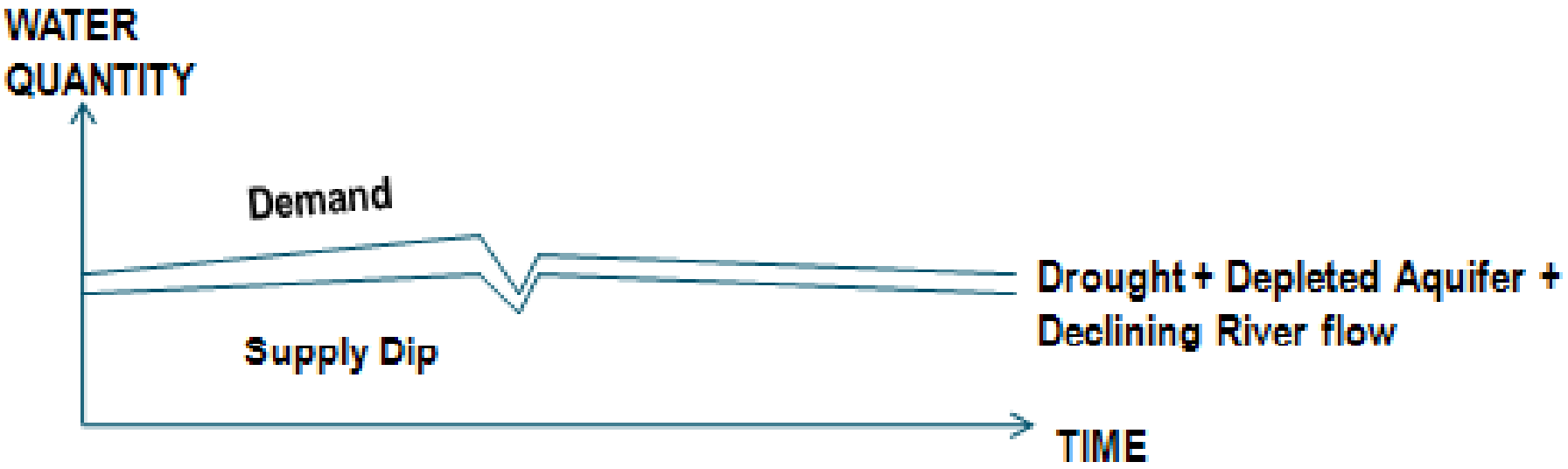


BUSINESS AS USUAL-UNSUSTAINABLE SCENARIO

SCENARIO II – Supply Side Emphasis



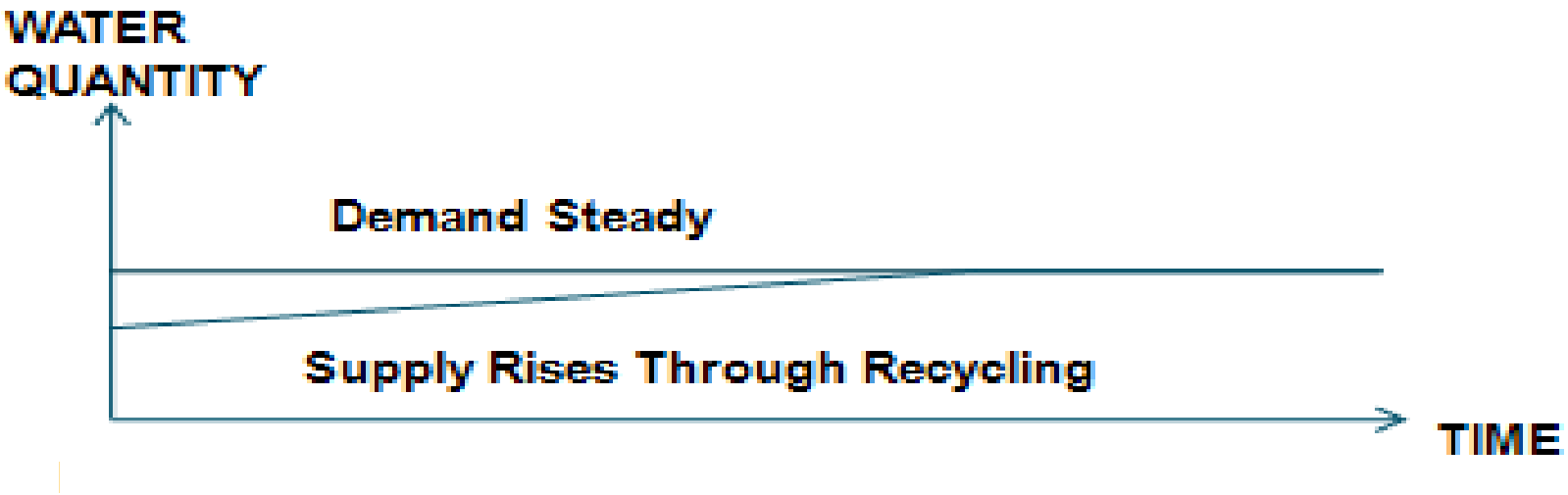
SCENARIO III – Worst Case



WORST SCENARIO (TO PREPARE FOR)

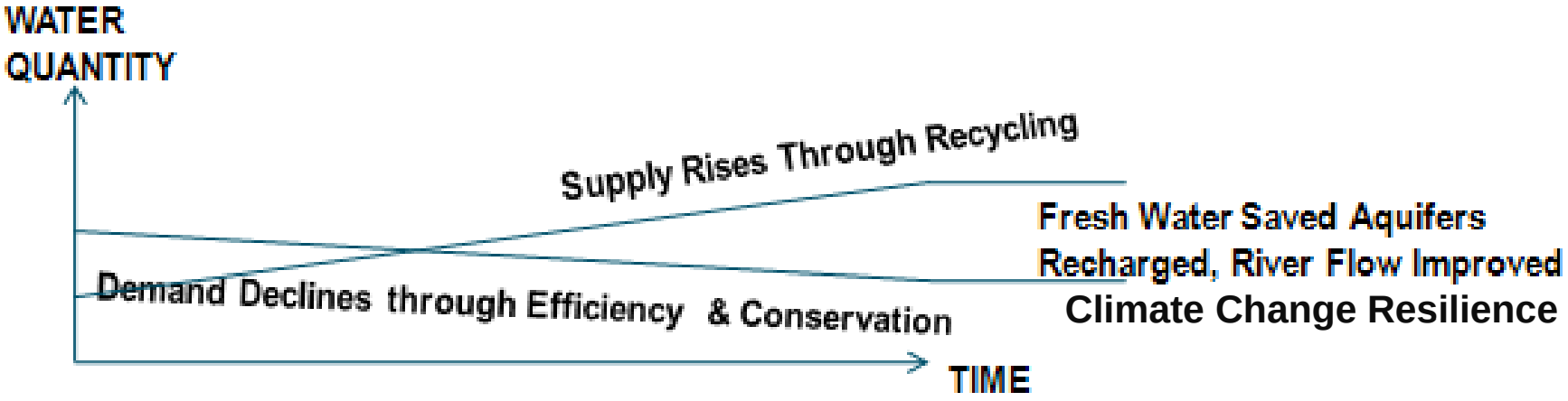
Deficient Precipitation
Declining River Flow
No Further Upstream Reservoirs
Inter-State Rivalry
Depleted Aquifers

SCENARIO IV

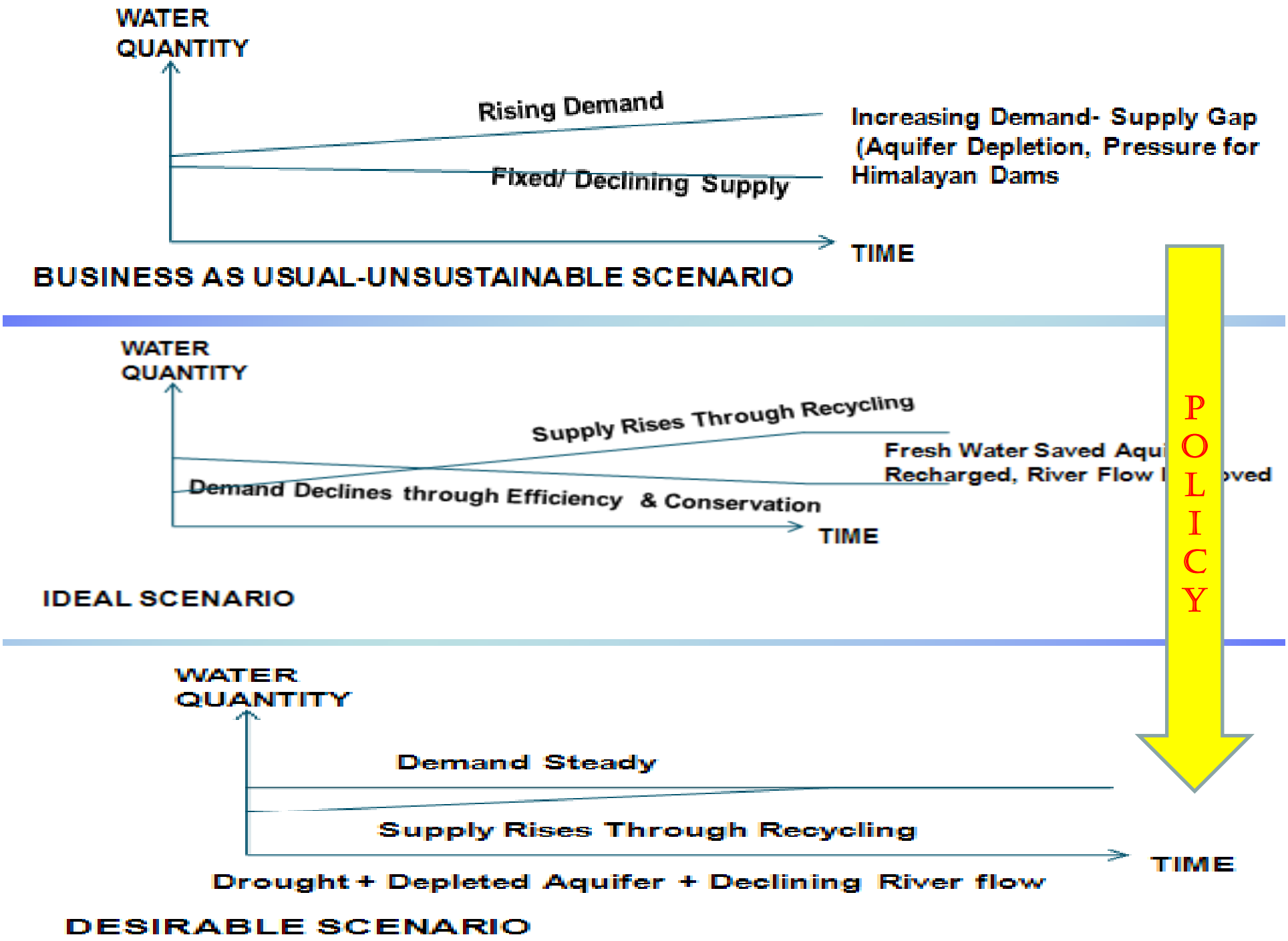


DESIRABLE SCENARIO

SCENARIO V

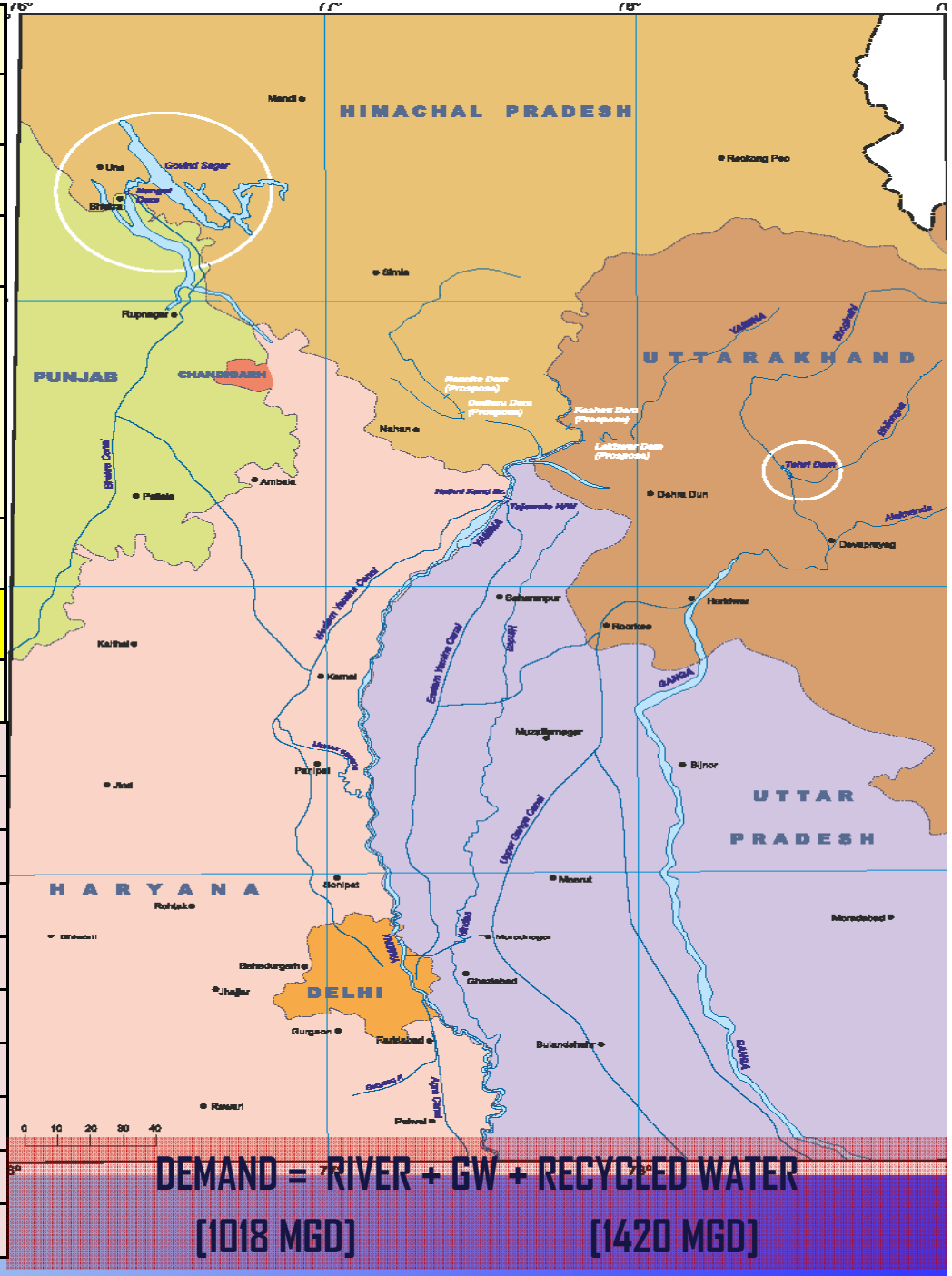


IDEAL SCENARIO


WATER QUANTITY
Rising Demand
Fixed/ Declining Supply
Increasing Demand- Supply Gap (Aquifer Depletion, Pressure for Himalayan Dams
TIME
BUSINESS AS USUAL-UNSUSTAINABLE SCENARIO
WATER QUANTITY
Supply Rises Through Recycling
Fresh Water Saved Aqui
Recharged, River Flow
oved
Demand Declines through Efficiency & Conservation
TIME
IDEAL SCENARIO
POLICY
WATER QUANTITY
Demand Steady
Supply Rises Through Recycling
TIME
Drought + Depleted Aquifer + Declining River flow
DESIRABLE SCENARIO

S.No.	Sources of Water	Qty [MGD]
1	Yamuna River	310
2	Ganga River	240
3	Bhakra Storage	140
4	Expected Increase due to saving of losses via parallel lined canal and recycling backwashed water in filters of various WTPs	130
5	Sub Total	820
6	Ranney Wells/Tube Wells (G.W)	100
7	Total	920

S No.	Present Water Resources	Quantum
1	Surface + Sust. GW Resources	920 MGD
2	Rain Water Runoff Potential	[150 MCM] 100 MGD
3	Recycled Waste Water Potential	400 MGD
	Total Availability	1420 MGD
	Future Fresh Water Resources	
5	Renuka Dam	275 MGD
6	Kishau Dam	372 MGD
7	Lakhwar Vyasi Dam	135 MGD
8	Sharda – Yamuna Link	4085 MGD



DEMAND = RIVER + RECYCLED WATER + GW + CAPTURED RAIN WATER

AGAINST FINAL DEMAND OF 1018 MGD [2051]

790 MGD [freshwater] + 300 MGD [recycled water] = 1090 MGD availability

880 MGD [freshwater] + 360 MGD [recycled water] = 1240 MGD availability

NOTE : The Demand Is Based On Norm of 172/160 LPCD – This Can Be Reduced Further To Say 150 LPCD – At That Level A Population Of 41 Million Can Be Supported

Delhi's Constraints Make It A Laboratory For Testing Innovative Ideas

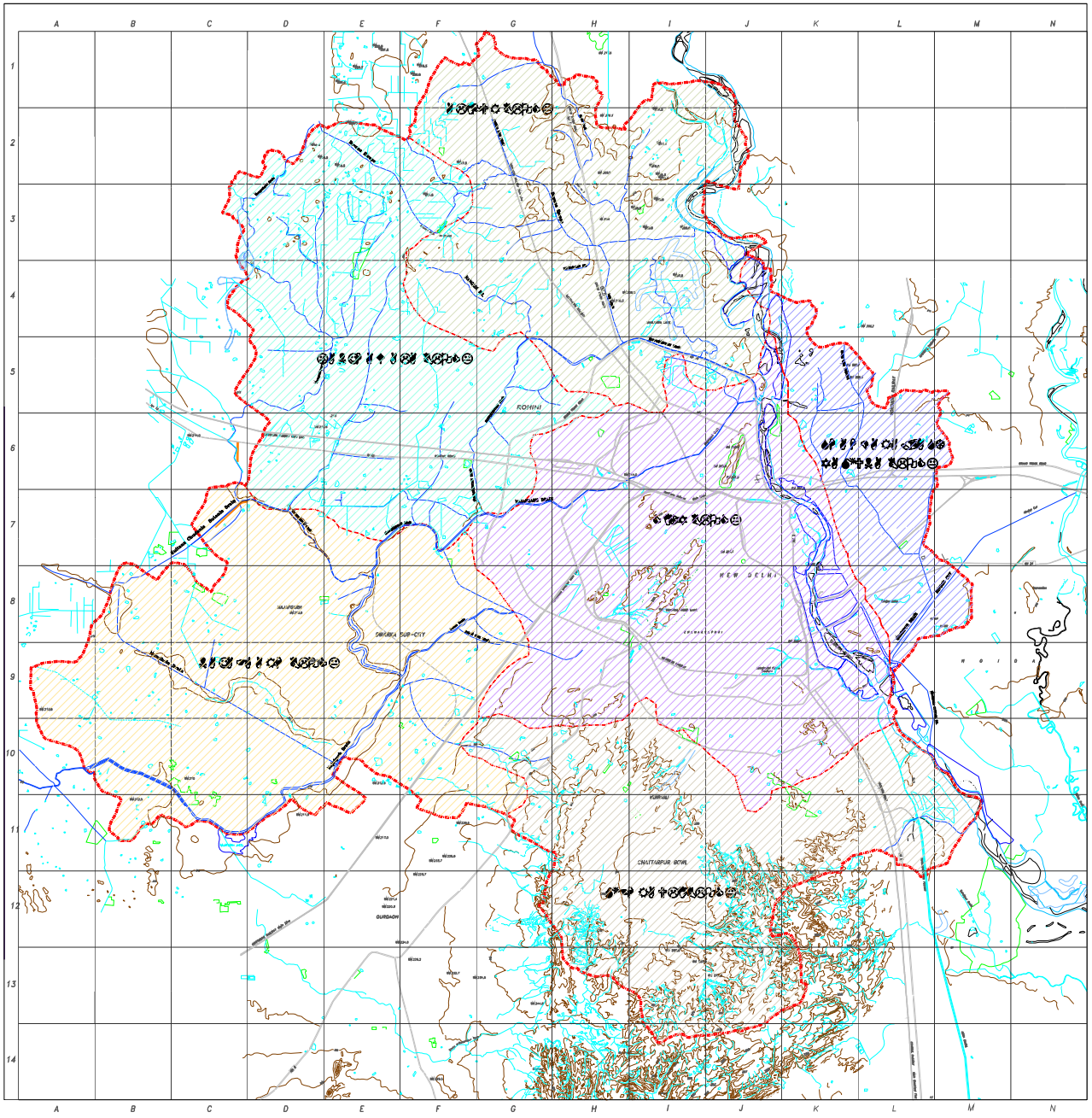
- Demand Management Vs. Supply Augmentation
- Less Water Consumption Means Less Sewage To Deal With
- Less Sewage Means Lower Energy Consumption And Land Footprint
- Illogical After Incurring High Cost Of Sewage Treatment Only To Throw It Away
- It Does Not Make Sense To Transport Sewage Away From The Point Of Origin, Treat It For Reuse, Then Pump It All The Way Back – Hence Importance Of Decentralized Treatment Systems
- Decentralized Supply & Sewage Treatment Results In Short Conveyance Systems With Correspondingly Decreased Line Losses

- **Urban Extensions To Have Zero Discharge Policy With Decentralized Treatment - Closed Water Resource Cycle Must Become The Norm**

- **Future Urban Growth To Be Resource Based**

- **Hydrological Sensitivity In Landuse Planning To Ensure Safeguarding Of Aquifer Recharge Zones**

- **Substitution with recycled water can reduce groundwater extraction in the industrial/commercial/institutional sector by 45 MCM annually approximately and in the irrigation sector by approximately 60 MCM annually**



- NCT BOUNDARY
- BLOCK BOUNDARY
- N.C.T.BOUNDARY
- BLOCK BOUNDARY
- MAJOR DRAINS
- RIDGE
- MINOR DRAIN
- LAKES/PONDS/WATER BODIES

SHEET TITLE:

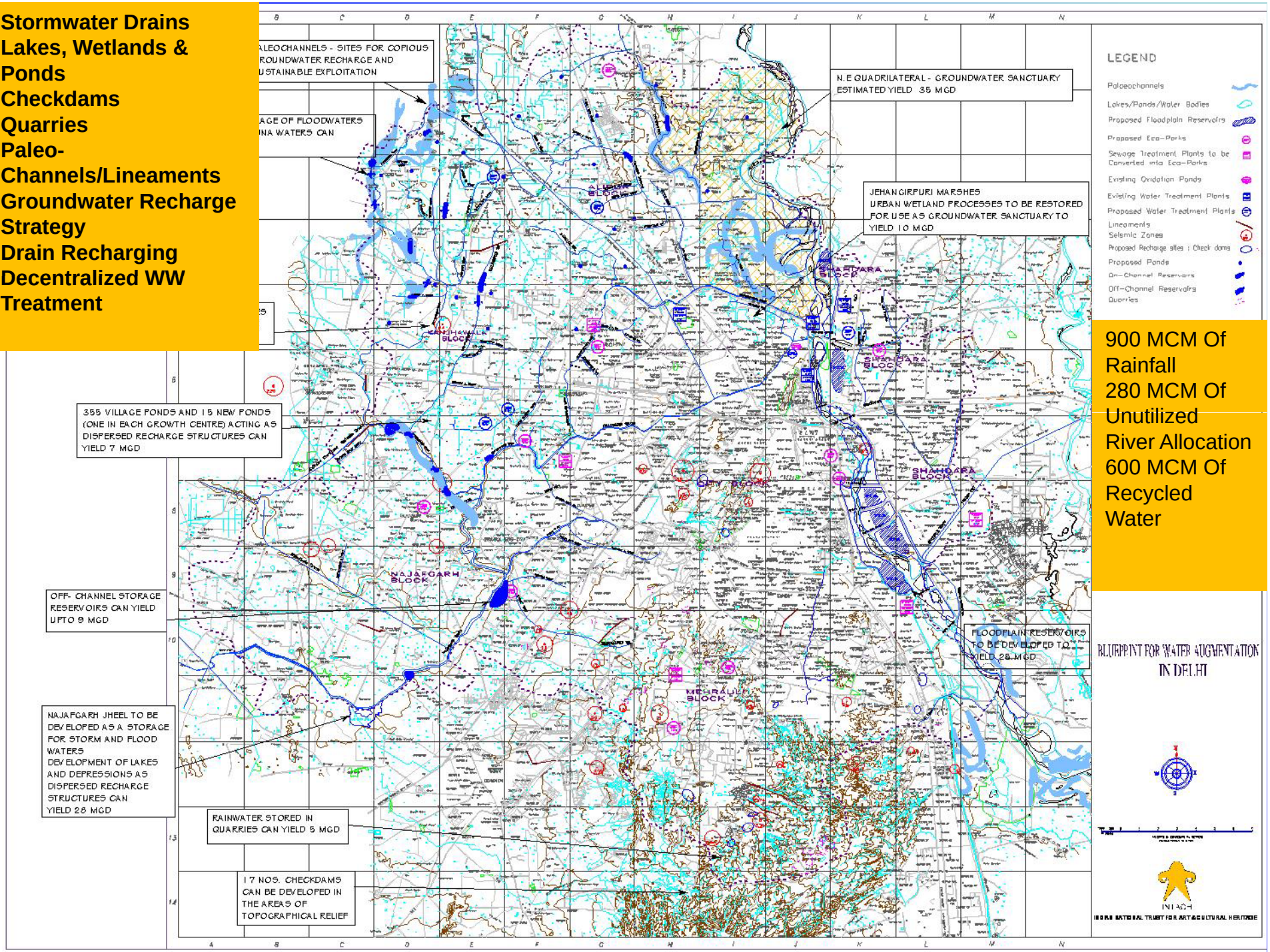
MAP NO : 11

DATE : DECEMBER 2007

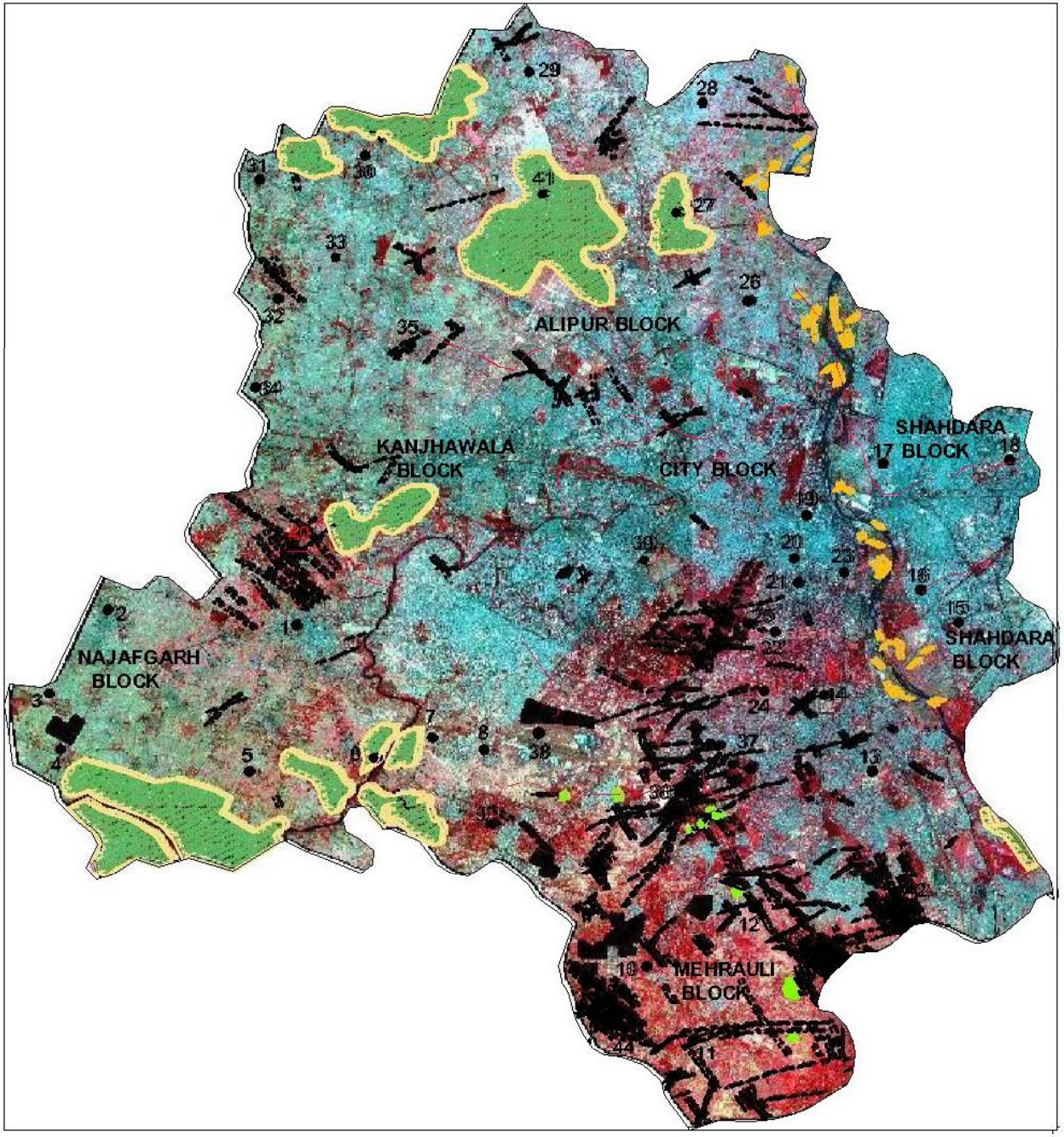
SCALE
0.5 0 1 2 3 4
In Meters

NATURAL HERITAGE DIVISION
INDIAN NATIONAL TRUST FOR ART & CULTURAL HERITAGE
71, LODHI ESTATE, NEW DELHI-110003
PH: 24641304, 24632267 FAX: 24611290

Stormwater Drains
Lakes, Wetlands & Ponds
Checkdams
Quarries
Paleo-Channels/Lineaments
Groundwater Recharge Strategy
Drain Recharging
Decentralized WW Treatment



900 MCM Of Rainfall
280 MCM Of Unutilized River Allocation
600 MCM Of Recycled Water



LOCATION OF GROUND WATER RECHARGE SITES

1	Roshanpura	23	Indira Gandhi Indoor Stadium
2	Mandhela Kalan	24	Aerodrome
3	Isapur	25	Rastrapati Bhawan
4	Dhansa	26	Burari
5	Daulatpur	27	Nathupura
6	Najafgarh Drain	28	Tajpur Kalan
7	Tehar Central Jail	29	Narela
8	Jahanabad	30	Daryapur Kalan
9	Kapashera	31	Qutabgarh
10	Dinapur	32	Jauni
11	Dera Mand	33	Salahpur
12	IGNOU	34	Rashidpur
13	Lotus Temple	35	Karala
14	Nehru Stadium	36	JNU
15	Mayur Vihar	37	Hauz Khas
16	Shatri Nagar	38	IGI Airport
17	Brahmapuri	39	Pusa Institute
18	Ramnagar	40	Didhon
19	Delhi RS	41	Holambi Khurd
20	New Delhi RS	42	Vocational Train
21	Connought Place	43	Asola Wild Life
22	India Gate	44	Mandi

LEGEND

- BLOCK BOUNDARY
- LINEAMENT
- BURIED PEDIMENT PLANE
- PALEOCHANNEL
- NON RECHARGE SITE WITH CONDUCTIVE EXTRACTION
- 1 RECHARGE SITE

SHEET TITLE:

PALEO-CHANNELS AND LINEAMENTS

GROUND WATER RECHARGE STRATEGY FOR DELHI
SPONSOR : DELHI JAL BOARD

MAP NO : 13

DATE : DECEMBER 2007

SCALE 5 0 5 KM

N

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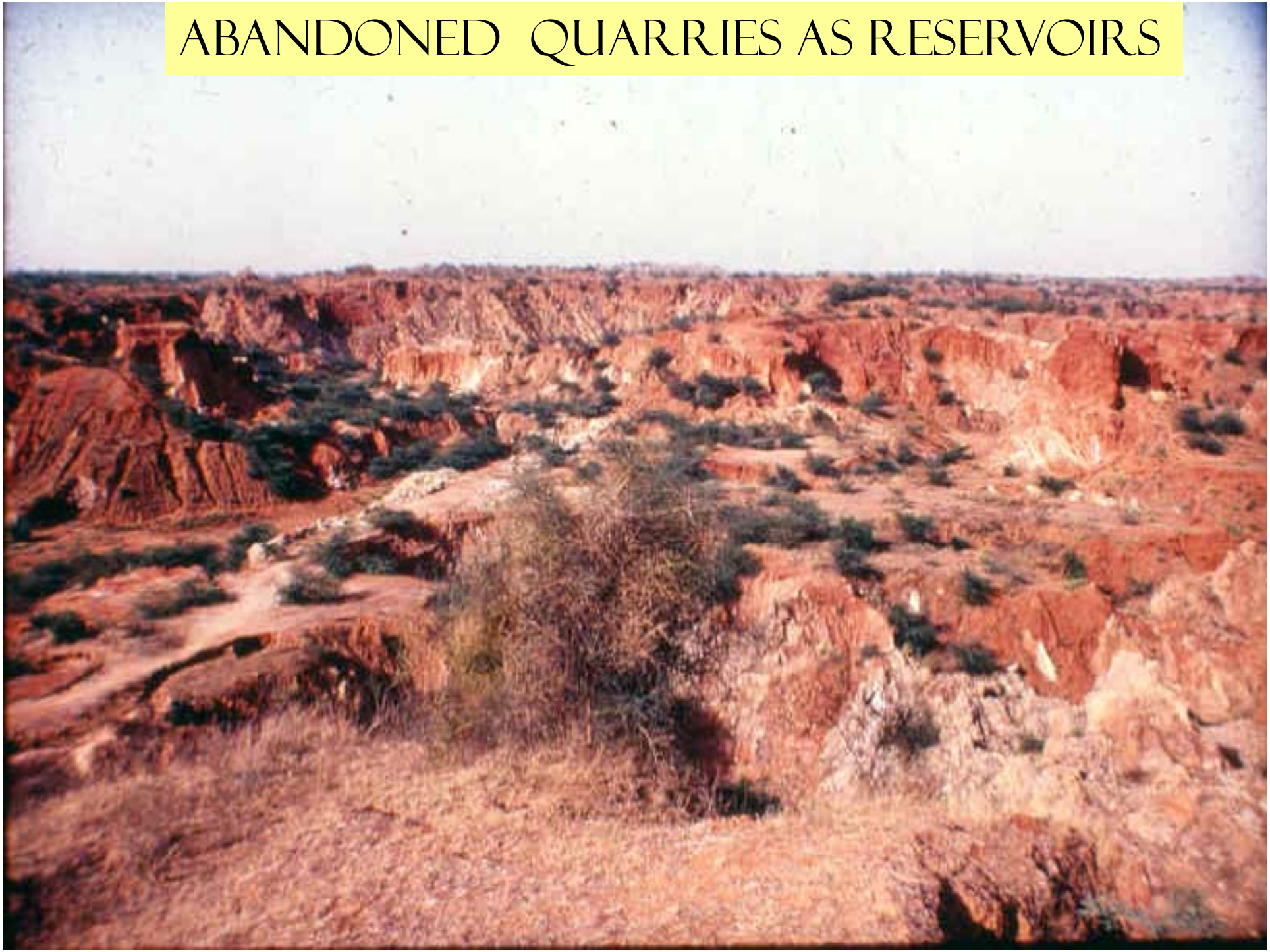
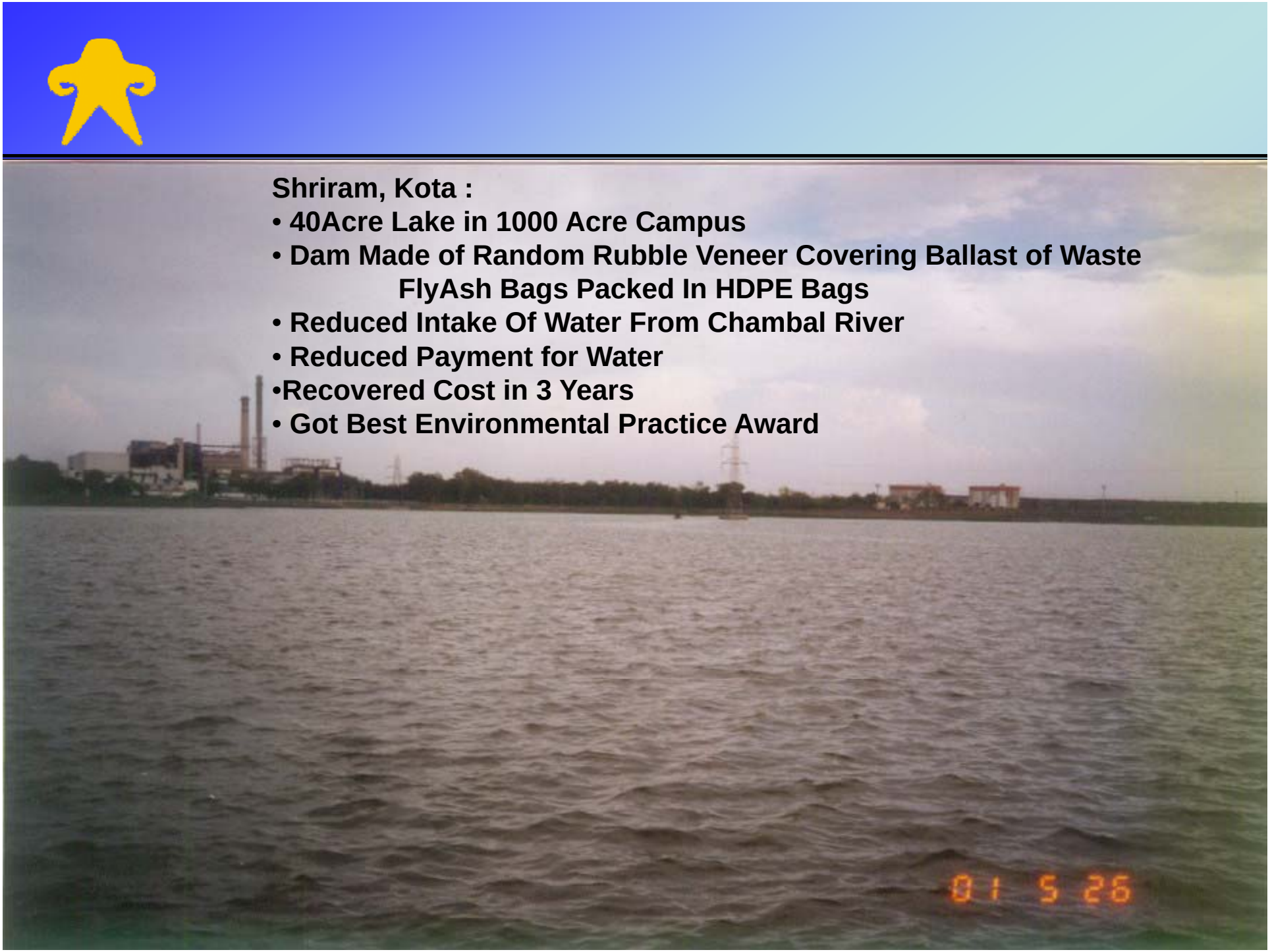
PH: 24641304, 24632267 FAX: 24611290

ABANDONED QUARRIES AS RESERVOIRS

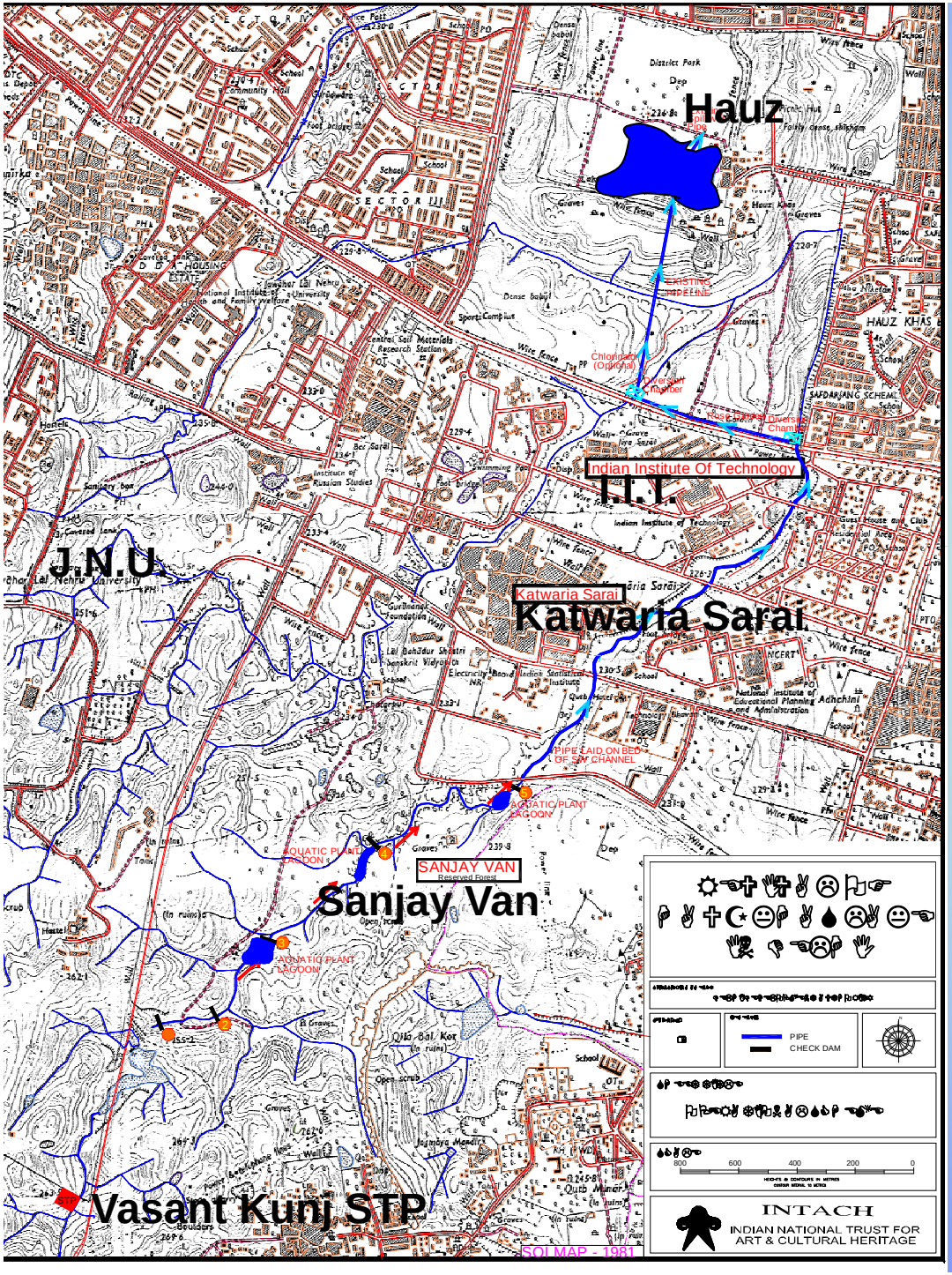




Shriram, Kota :

- **40Acre Lake in 1000 Acre Campus**
- **Dam Made of Random Rubble Veneer Covering Ballast of Waste FlyAsh Bags Packed In HDPE Bags**
- **Reduced Intake Of Water From Chambal River**
- **Reduced Payment for Water**
- **Recovered Cost in 3 Years**
- **Got Best Environmental Practice Award**

Hauz Khas Lake - Delhi



Hauz Khas

Operational Scheme


Aquatic Weed Treatment On Inflow


RECHARGE ESTIMATED AT 700 ML

Ground Water Quality

PRE-PROJECT

(March 2003)

- pH : 7.6
- Chloride : 70 mg/l
- BOD : 3 mg/l
- COD : 10 mg/l
- Nitrate : 20 mg/l
- EC : 650 mohms/cm
- TDS : 425
- Ammonia : 0.04mg/l
- Total Hardness : 350 mg/l
- Fluoride : 0.1 mg/l

MID-PROJECT

- (April 2005)
- pH : 7.1
- Chloride : 84 mg/l
- BOD : 1 mg/l
- COD : 4 mg/l
- Nitrate : 1.14 mg/l
- Phosphate: 1.44 mg/l

Post Project

[April, 2013)

pH : 7.7
Chloride : 92 mg/l
BOD : BDL
COD : BDL
Nitrate : 4.3 mg/l
EC : 830 mohms/cm
TDS : 556
Phosphate : BDL
Total Hardness : 404 mg/l
Total Hardness : 350 mg/l
Fluoride : 0.4 mg/l
Sulphate 48 mg/l
Total Coliform 125 MPN/100ml
Faecal Coliform : 0


Bhalaswa
Lake
Sant Nagar
Yamuna
RME
Mukandpur
Supp. Drain
Jaroda Majra
Burari
Jahangirpuri
Wazirabad
Dr Mukherjee Nagar
Coronation
Memorial
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Image © 2007 DigitalGlobe
©2006
Goo

2001

- Filling Bhalaswa Lake with Yamuna Flood Waters
- Backing Up In Supplementary Drain

Najafgarh Jheel


MDR 136
Jhatikra Village
Proposed New Regulator
Dharampur Village
Bundh On Left Bank -- Delhi Side
Haryana Side Of Jheel As Phase I
Power House
Khekri Village
Image © 2012 DigitalGlobe
© 2012 Mapabc.com
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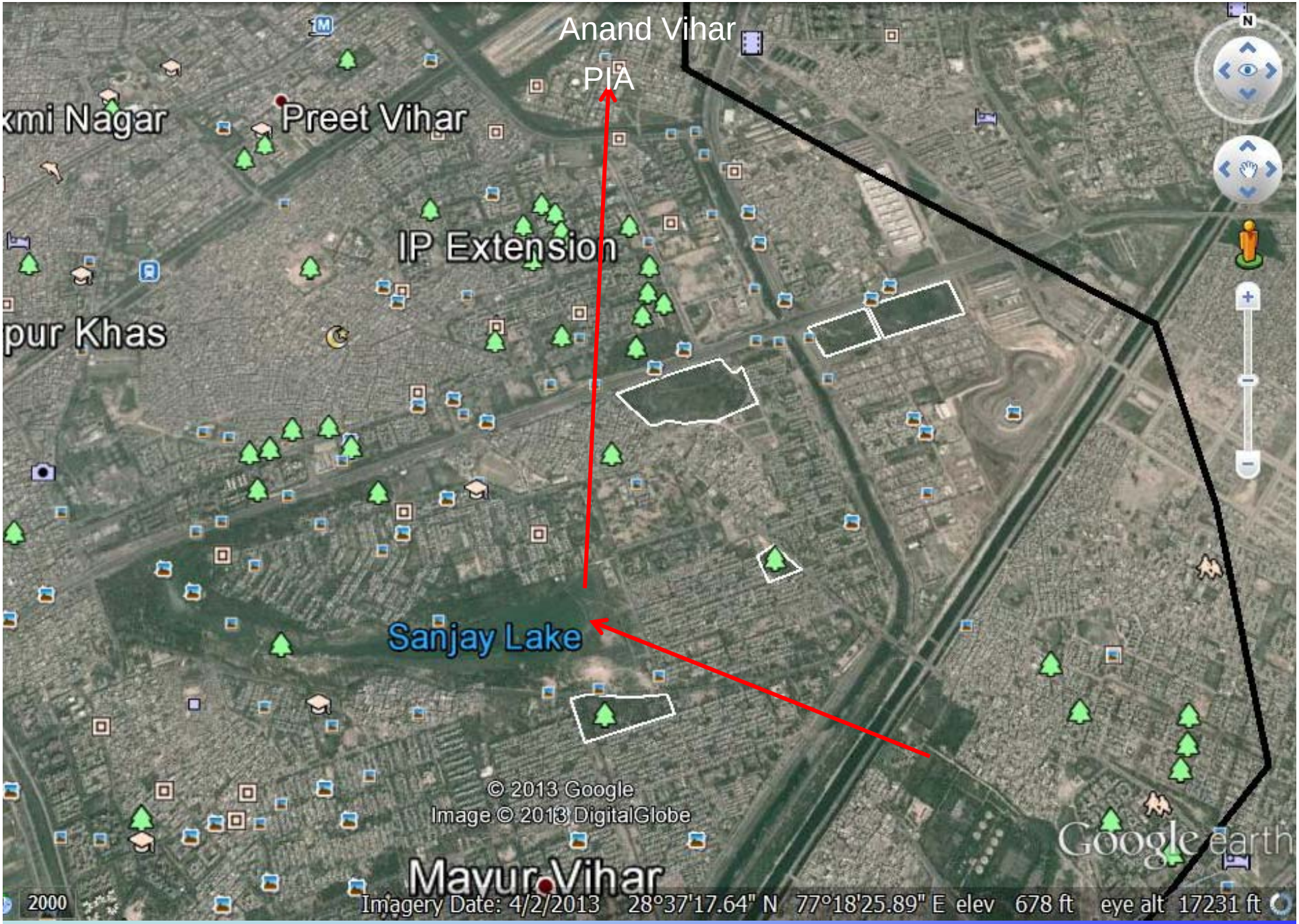
Image © 2012 GeoEye
Google earth
Imagery Date: 6/10/2010
2002
28°30'42.76" N 76°56'24.02" E elev 214 m
Eye alt 6.55 km

ON-CHANNEL WATER HARVESTING SCHEME WITH A POTENTIAL YIELD OF 6 MGD

Najafgarh Drain Pre - Desiltation

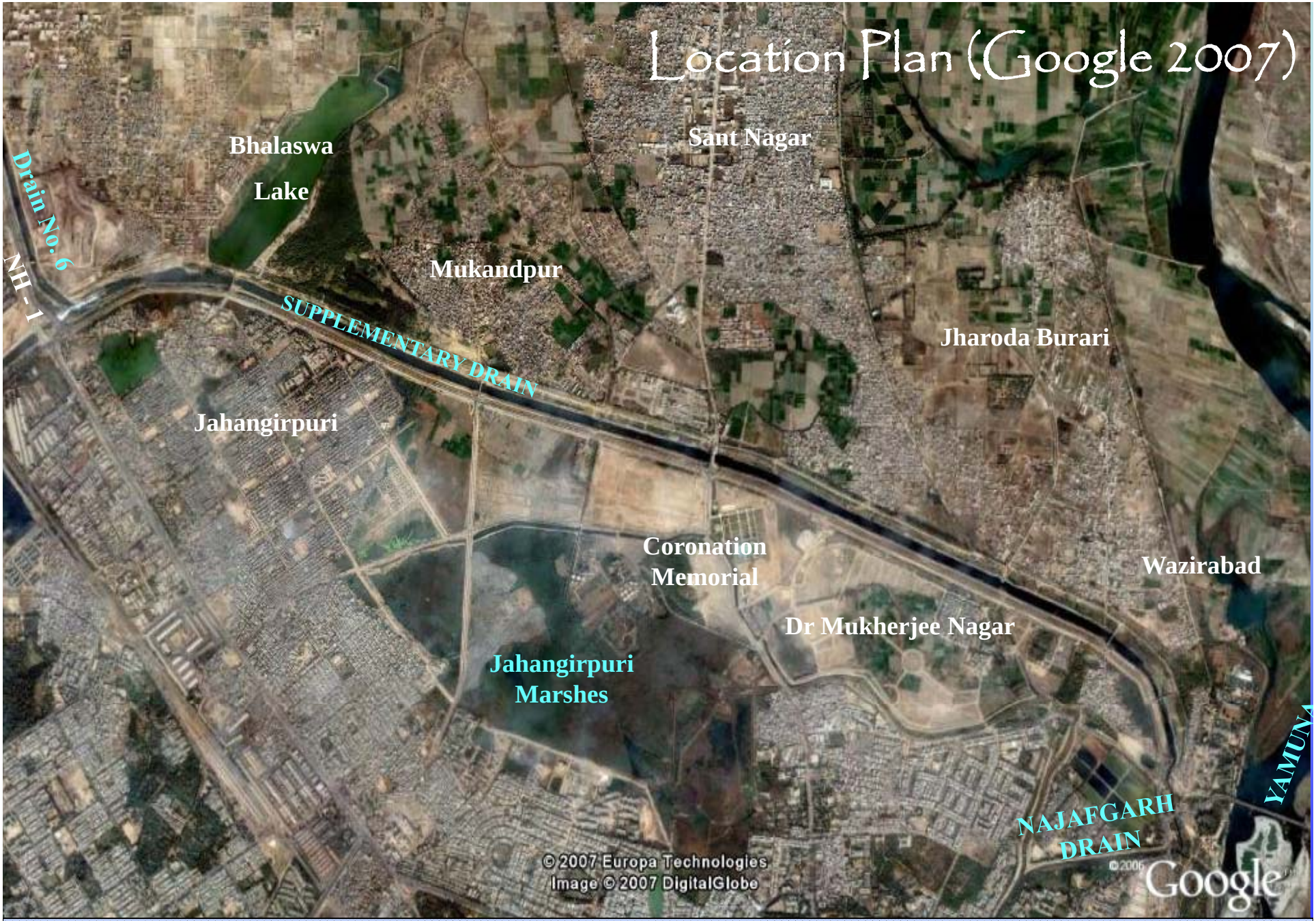
SPARSE VEGETATION NEAR DHANSA

Stormwaters Retained On-Channel For Percolation By Gated Regulator


Anand Vihar
PIA
xmi Nagar
Preet Vihar
IP Extension
pur Khas
Sanjay Lake
© 2013 Google
Image © 2013 DigitalGlobe
Mayur Vihar
Google earth
2000
Imagery Date: 4/2/2013 28°37'17.64" N 77°18'25.89" E elev 678 ft eye alt 17231 ft

SANJAY LAKE

PAANI MORCHA & INTACH



PAANI MORCHA & INTACH


WATER
HYACINTH CHANNEL
Bhalaswa
Lake
DRAIN NO. 6
BOD- 60 mg/L
REED BED
WATER
HYACINTH CHANNEL
Sant Nagar
Mukandpur
BOD- 20 mg/L
BACTERIAL
TREATMENT
Jaroda Majra
Burari
AERATION
BUBBLERS
Jahangirpuri
BOD - 10 mg/L
SUPPLEMENTARY DRAIN
BOD- <10 mg/L
BOD- 5 mg/L
Wazirabad
Dr Mukherjee Nagar
Coronation
Memorial
REED BED
FISH
PONDS
YAMUNA
BOD- <5 mg/L
© 2007 Europa Technologies
Image © 2007 DigitalGlobe
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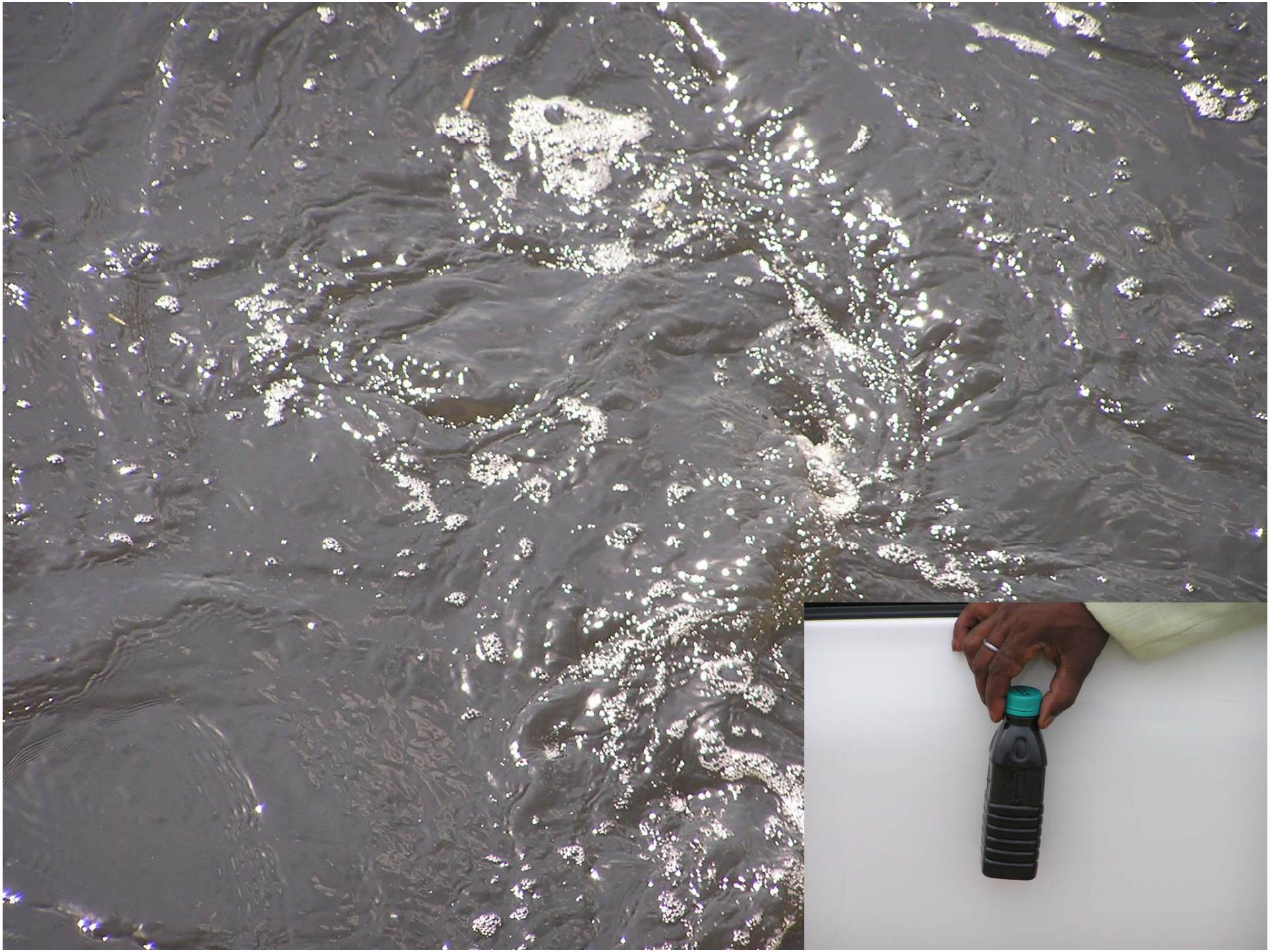
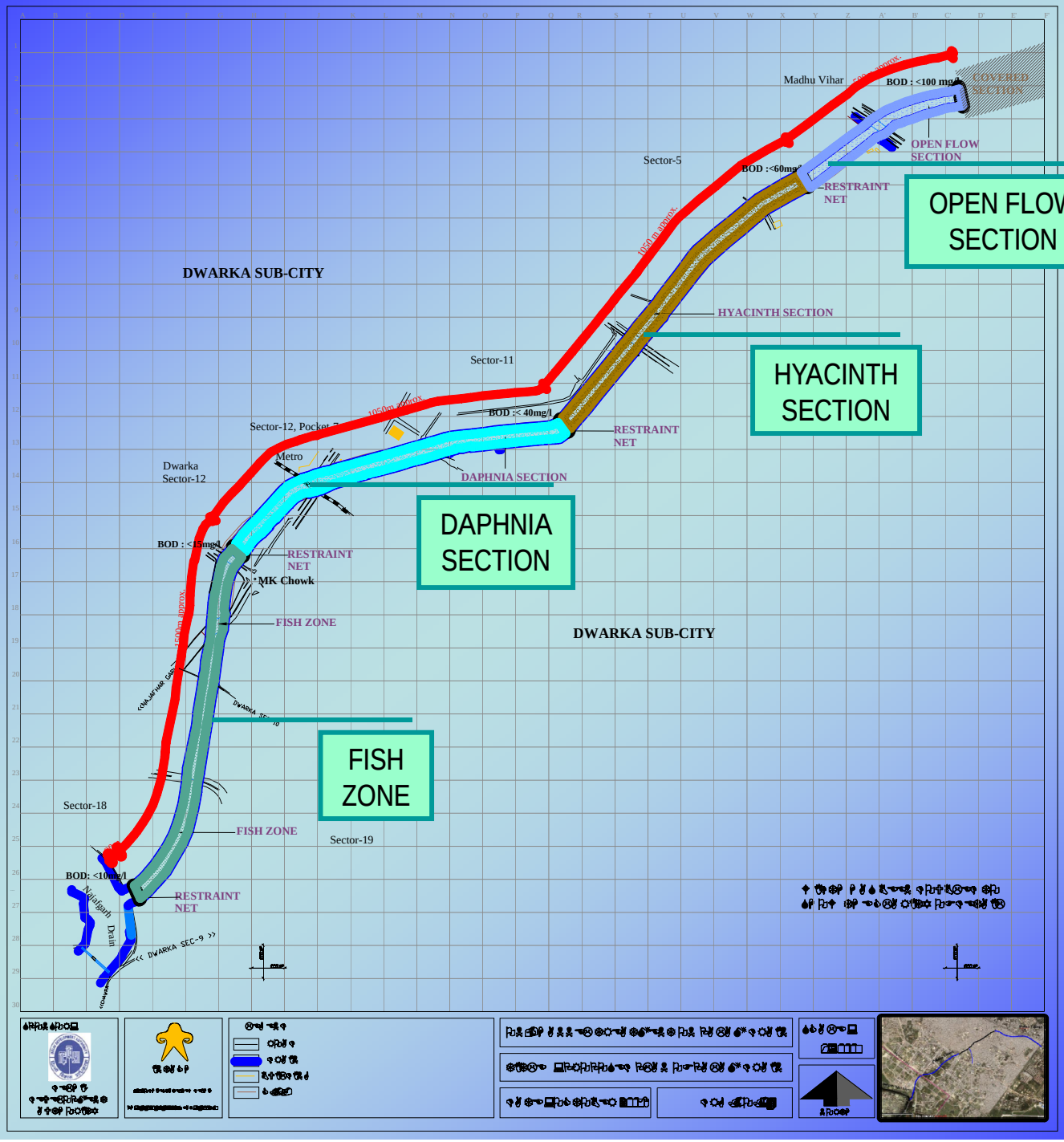
Satellite Image Of Palam Drain



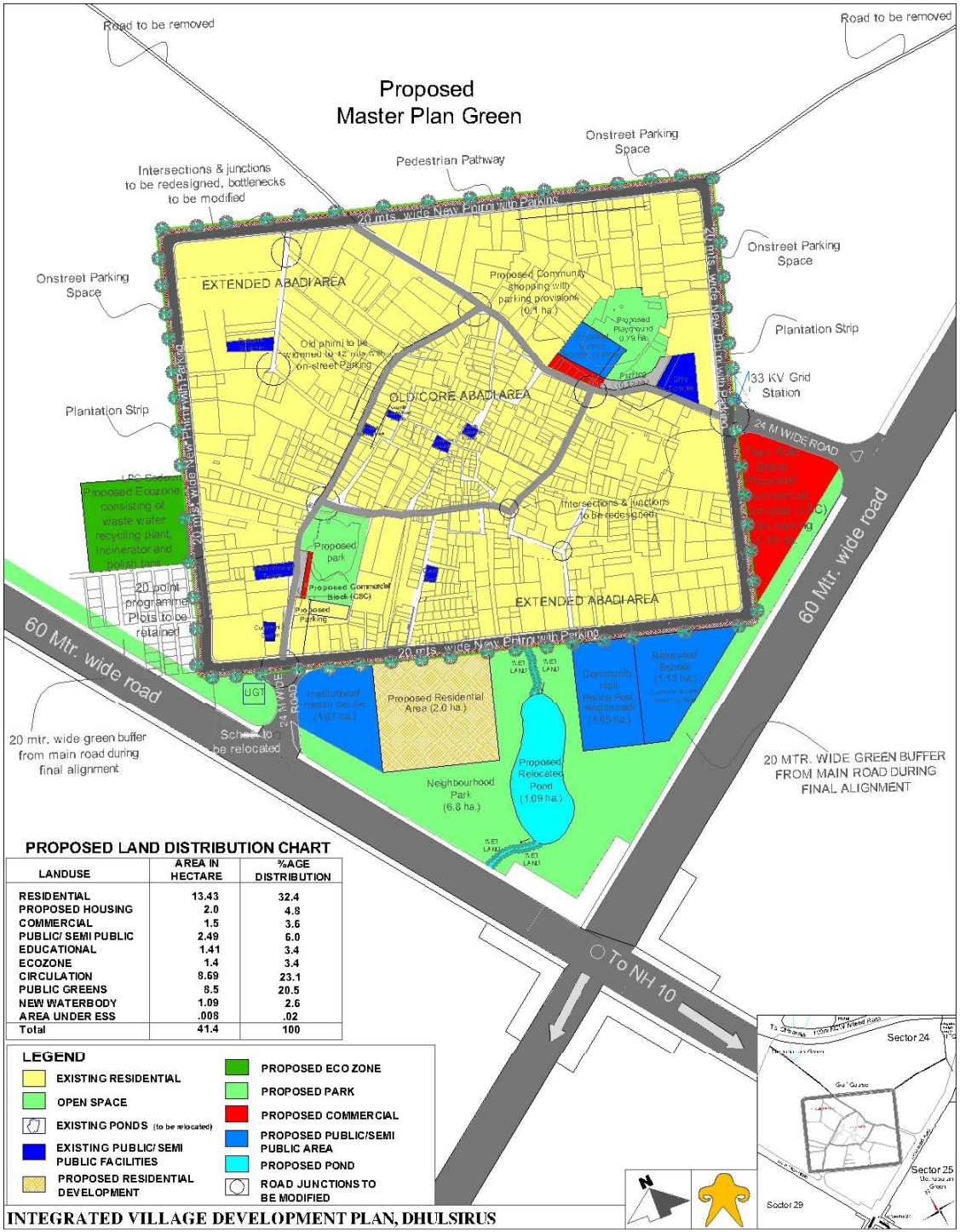

Madhu Vihar
BOD : <100 mg/l
COVERED SECTION
OPEN FLOW SECTION
Sector-5
BOD :<60mg/l
RESTRAINT NET
OPEN FLOW SECTION
1050 m approx.
DWARKA SUB-CITY
HYACINTH SECTION
HYACINTH SECTION
Sector-11
BOD :< 40mg/l
Sector-12, Pocket-7
RESTRAINT NET
105m approx.
Metro
Dwarka Sector-12
DAPHNIA SECTION
DAPHNIA SECTION
BOD : <15mg/l
RESTRAINT NET
MK Chowk
1250m approx
FISH ZONE
DWARKA SUB-CITY
FISH ZONE
Sector-18
Sector-19
FISH ZONE
BOD: <10mg/l
RESTRAINT NET
Najafgarh Drain
<< DWARKA SEC-9 >>


Madhu vihar
9.10.12

Village Dhulsirus
Contour Plan

Core Abadi = 106 Contour Level

New Phirni = 99 Contour Level



Urban Village :

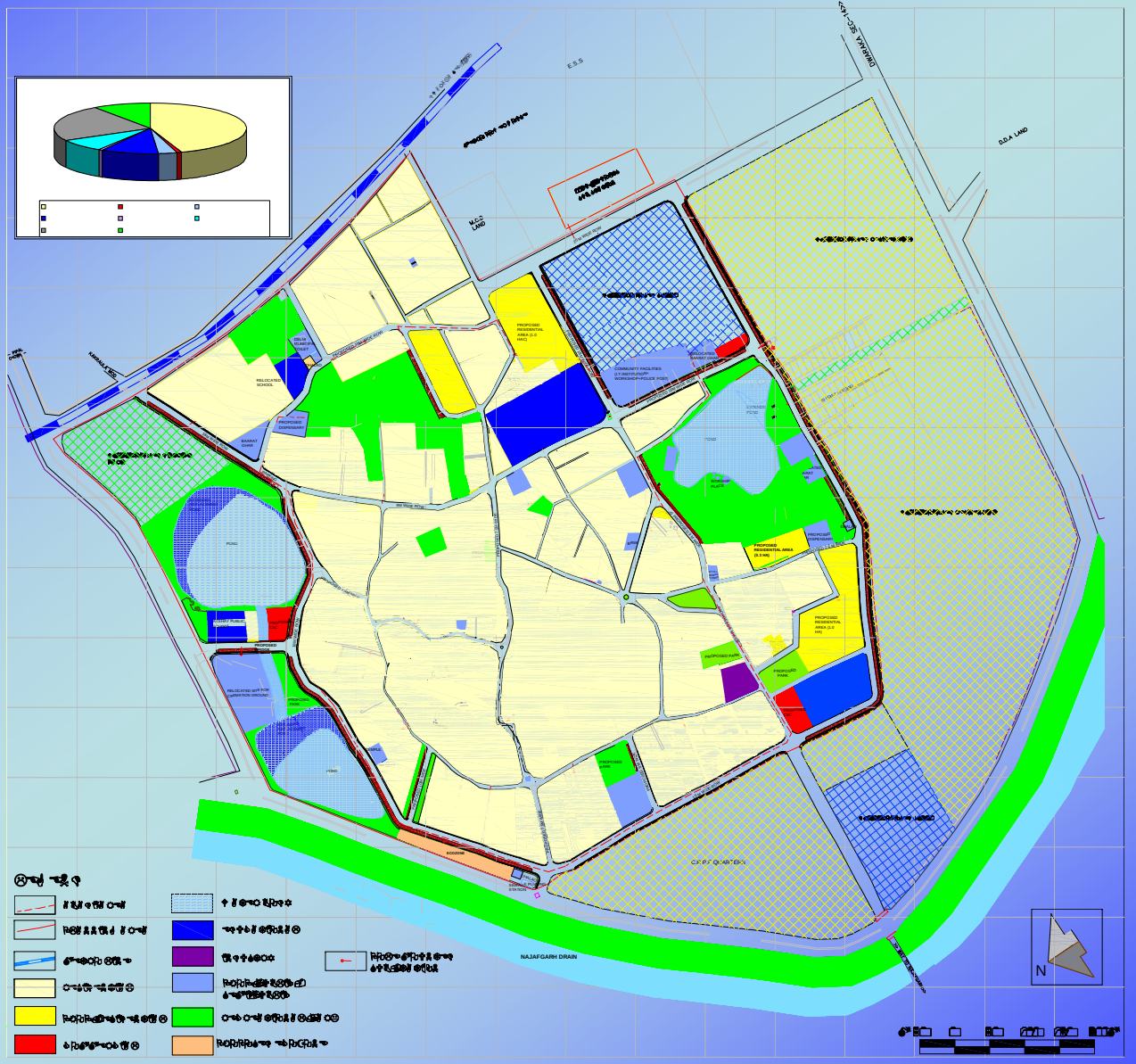
- ***Pond Bio-remediated***
- ***Receives Stormwater Discharge of Village***
- ***Receives Treated WasteWater of Village***
- ***Sustains TubeWell Based Supply For Village***

CONTOUR MAP

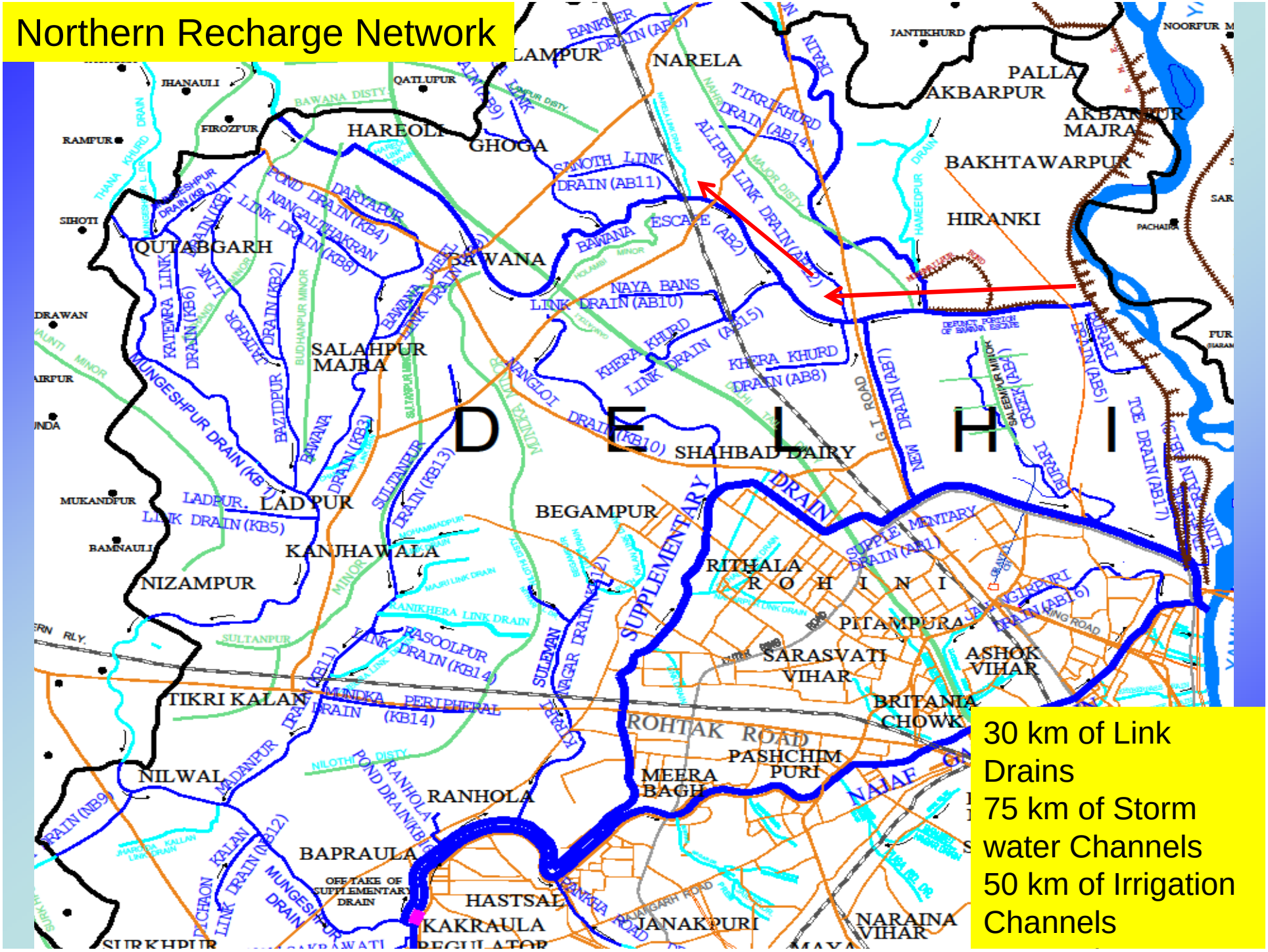
Contour Level at Outer road = 100.1

Contour Level in Core Area = 106.0

PROPOSED LANDUSE PLAN-2021



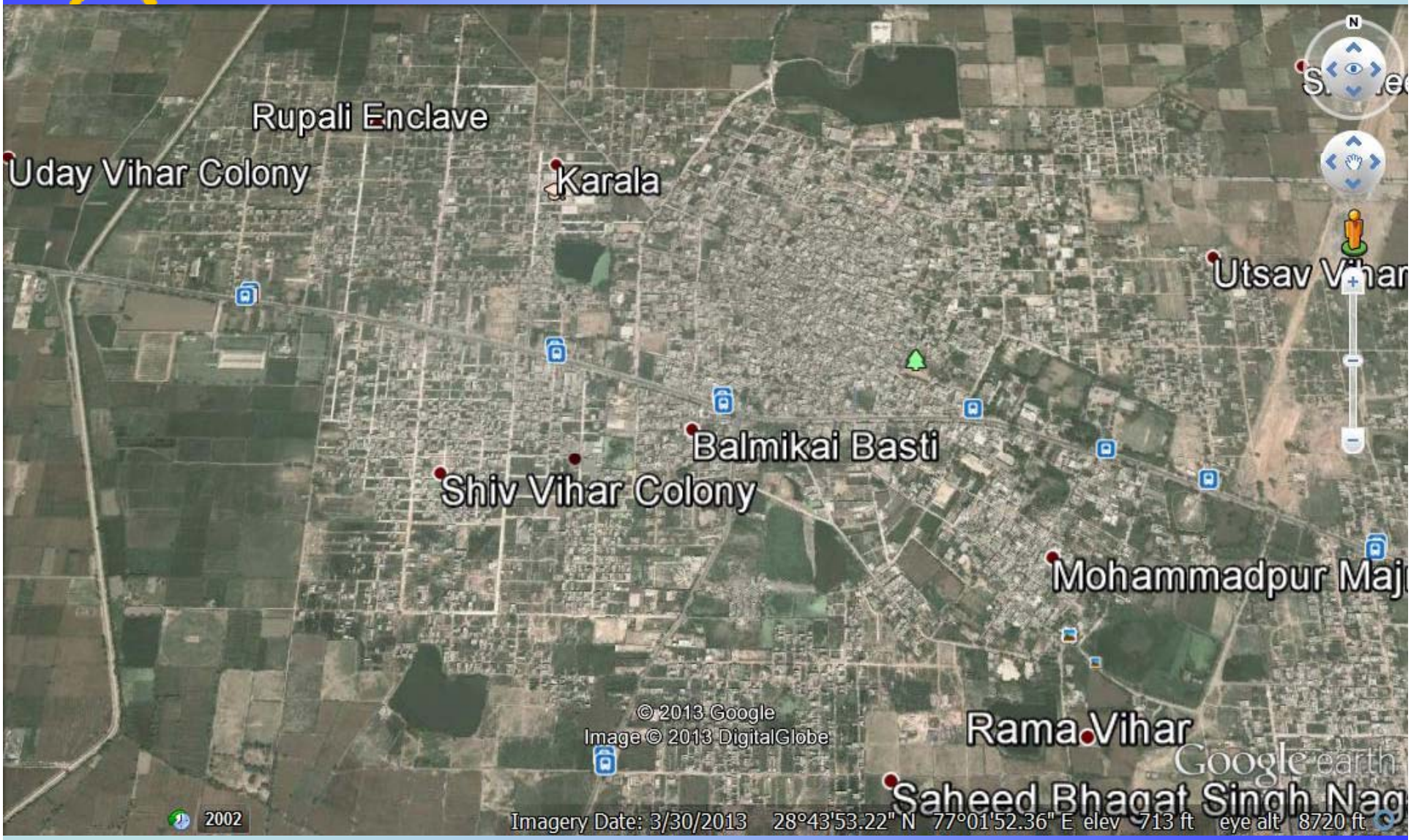
Northern Recharge Network

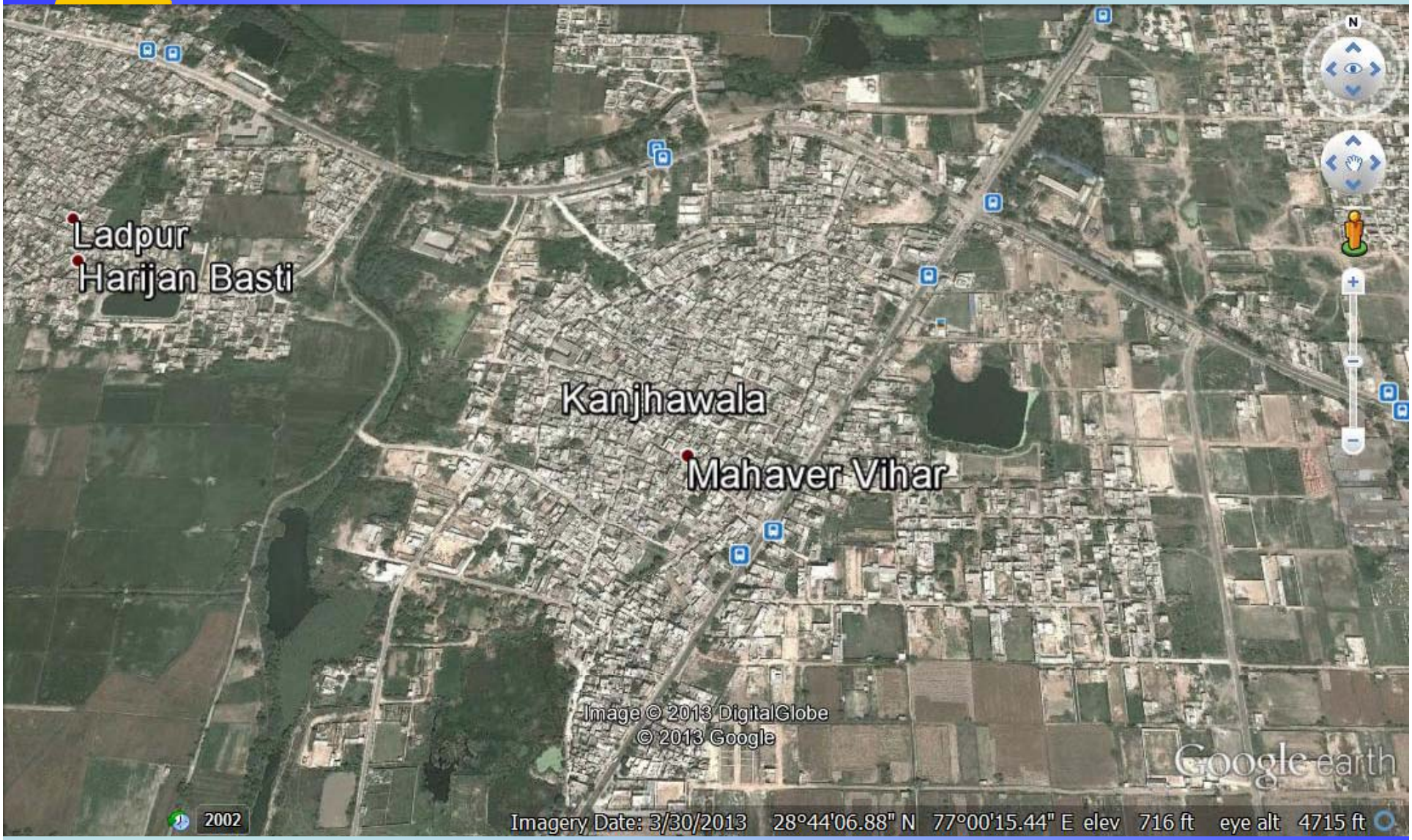


30 km of Link Drains
75 km of Storm water Channels
50 km of Irrigation Channels


JAYPEE
CEMENT

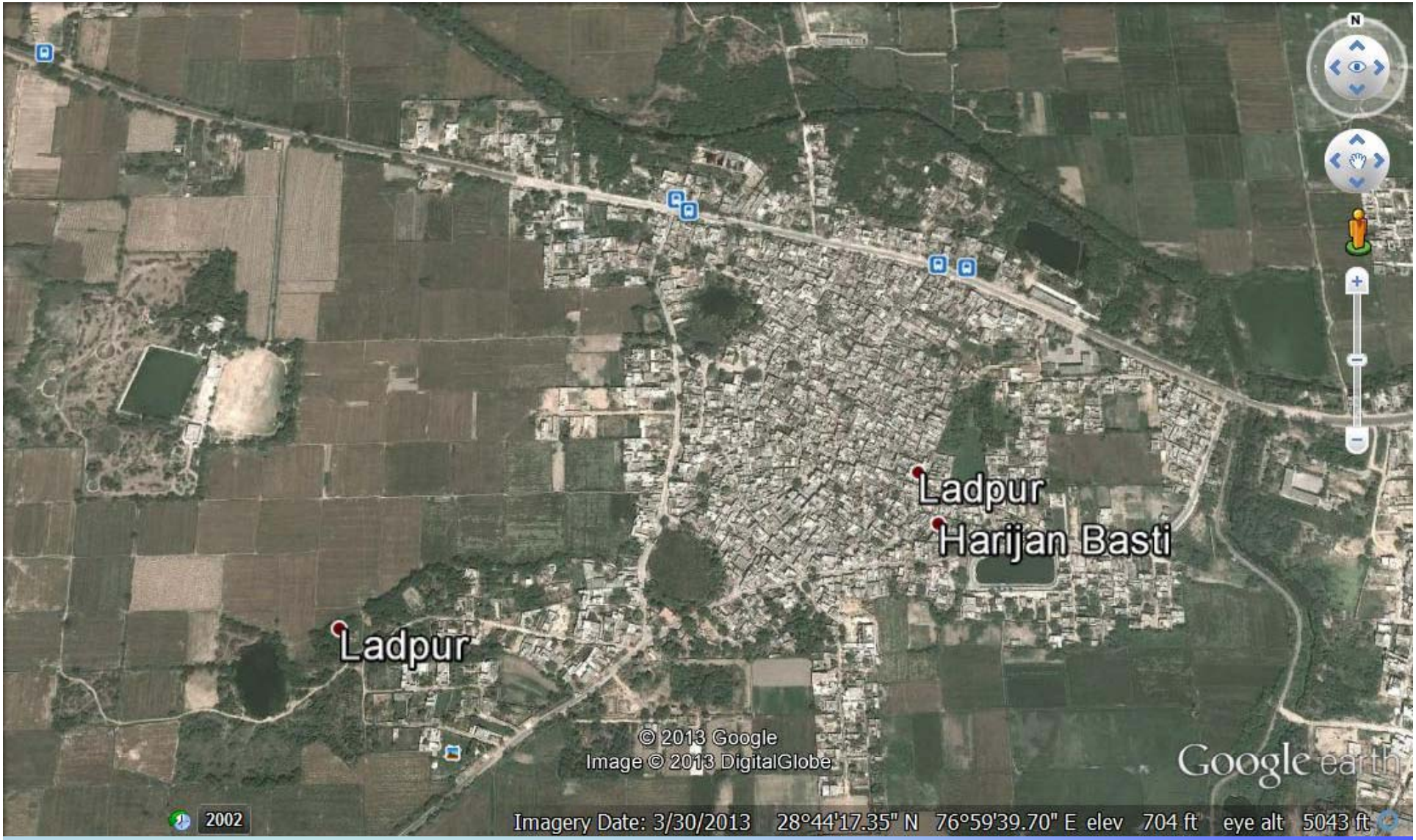
KARALA


Rupali Enclave
Uday Vihar Colony
Karala
Utsav Vihar
Balmikai Basti
Shiv Vihar Colony
Mohammadpur Maj
© 2013 Google
Image © 2013 DigitalGlobe
Rama Vihar
Google earth
Saheed Bhagat Singh Nag
2002
Imagery Date: 3/30/2013 28°43'53.22" N 77°01'52.36" E elev 713 ft eye alt 8720 ft


Ladpur
Harijan Basti
Kanjhawala
Mahaver Vihar
Image © 2013 DigitalGlobe
© 2013 Google
Google earth
2002
Imagery Date: 3/30/2013 28°44'06.88" N 77°00'15.44" E elev 716 ft eye alt 4715 ft

KANJHAWALA


BAWANA
Image © 2013 DigitalGlobe
© 2013 Google
2004
Imagery Date: 3/30/2013


Ladpur
Harijan Basti
Ladpur
© 2013 Google
Image © 2013 DigitalGlobe
Google earth
2002
Imagery Date: 3/30/2013 28°44'17.35" N 76°59'39.70" E elev 704 ft eye alt 5043 ft

LADPUR

THANK YOU