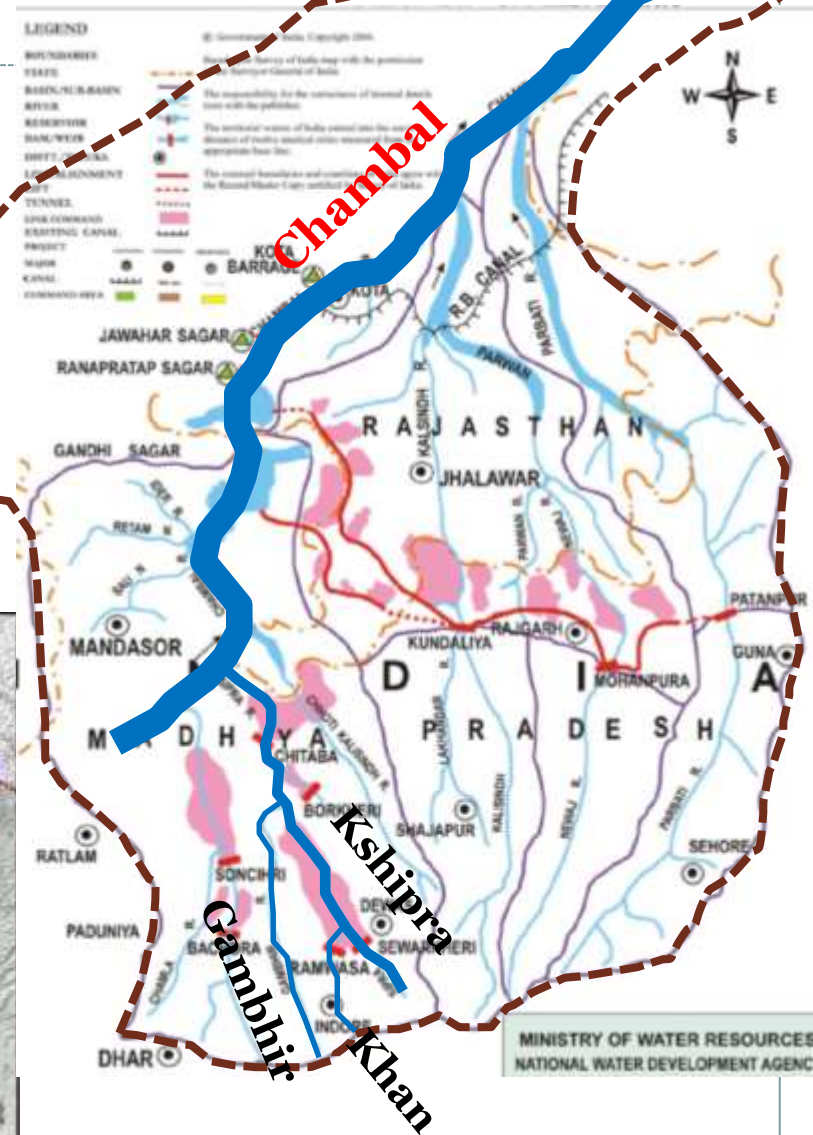


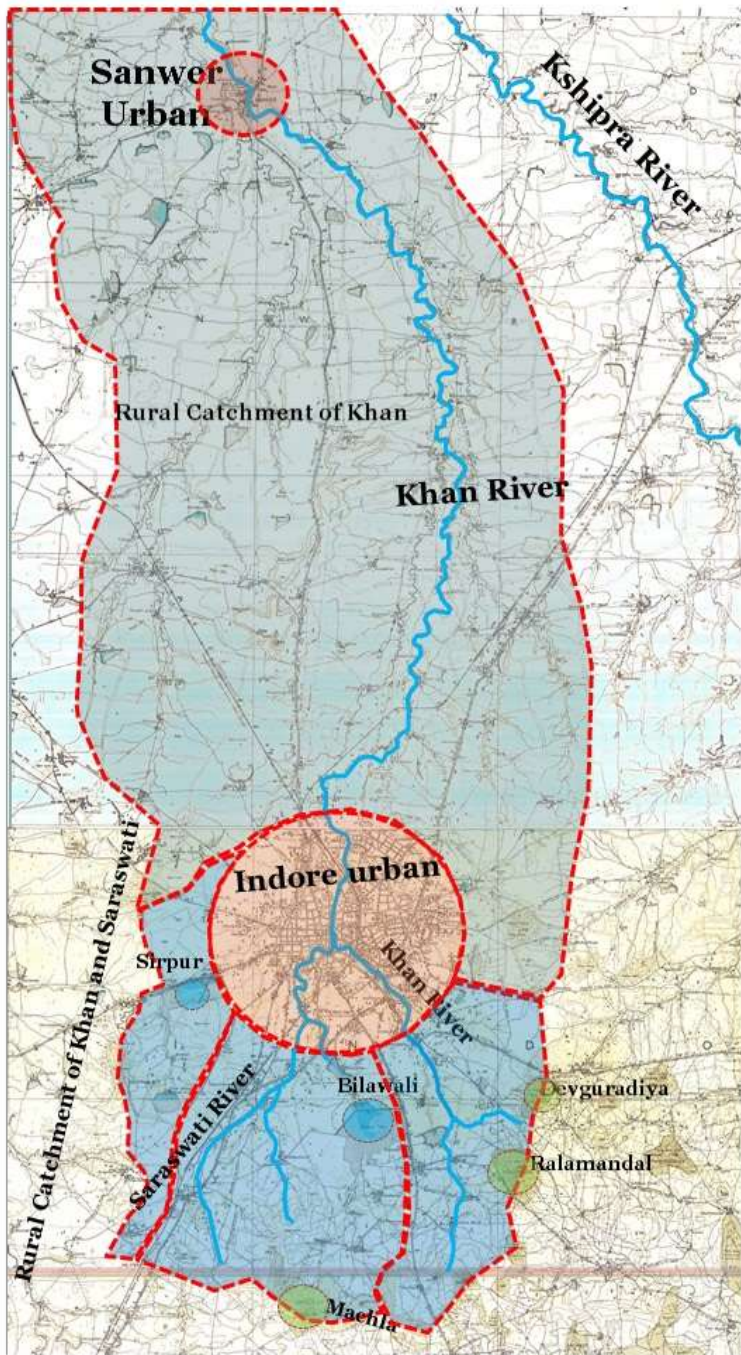
Water Systems in Indore – An integrated approach



**INDORE MUNICIPAL CORPORATION
INDORE**

Ganga River Basin and Sub-Basins



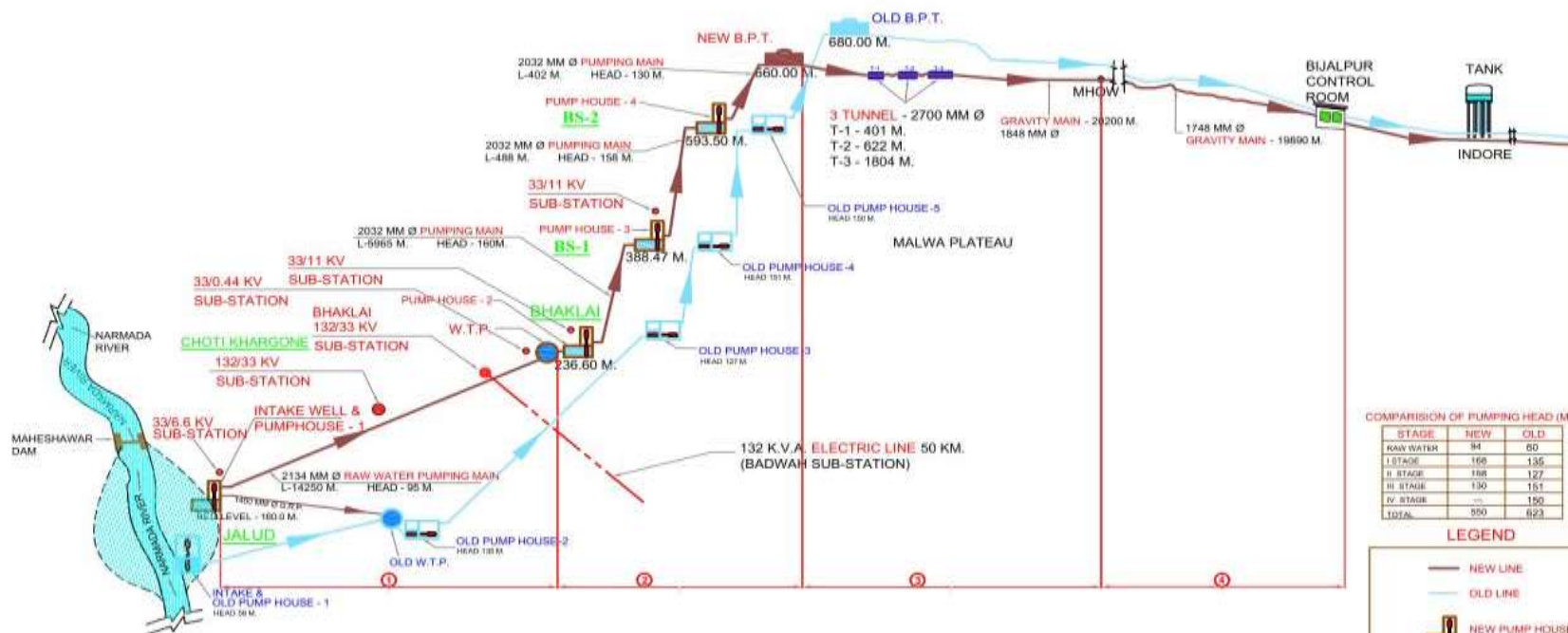


Knah and Kshipra Rivers



INDORE MUNICIPAL CORPORATION

NARMADA PROJECT PHASE I, II & III



COMPARISON OF PUMPING HEAD (M.)

STAGE	NEW	OLD
RAW WATER	94	60
I. STAGE	166	135
II. STAGE	188	127
III. STAGE	130	151
IV. STAGE	—	150
TOTAL	550	623

LEGEND



	1		2		C	3	4
	A	B	A	B			
	R.W.P.H. TO OLD W.T.P.	R.W.P.H. TO NEW W.T.P.	W.T.P. TO B.S. - 1	B.S. - 1 TO B.S. - 2	B.S. - 2 TO B.P.T.	B.P.T. TO MHOW	MHOW TO BIJALPUR
TOTAL PIPE LINE	G.R.P. 300M - 1400MM	14250 M. 21340	5965 M. 20340	427 M. 20340	402 M. 20340	20200 M. 18480	19690 M. 17480
NAME OF AGENCY	GRAPHITE (PACKAGE NO. 11, LOT - 1)	J.M.C. & T.A. (PACKAGE NO. 11, LOT - 2)	PRATIBHA (PACKAGE NO. 17)	PRATIBHA (PACKAGE NO. 17)	PRATIBHA (PACKAGE NO. 17)	J.M.C. & T.A. (PACKAGE NO. 12, LOT - 1)	J.M.C. & T.A. (PACKAGE NO. 12, LOT - 2)

DATE-22-09-2010

bUnkSj 'kgj & tula[;k fLFkfr

Ø-	o"kZ	tula[;k	Tkula[;k o`f)	n'kd Ok`f) nj	fjekdZ
1	1901	99000			
2	1911	60000	-39000	-21%	
3	1921	107948	47948	79.9%	vkSlr o`f) 37.55%
4	1931	147100	39152	36%	
5	1941	203695	56595	38.5%	
6	1951	310859	107164	52.6%	
7	1961	395000	84141	27.10%	
8	1971	572622	177622	44.90%	
9	1981	872000	299378	44.4%	
10	1991	1104000	232000	33.5%	
11	2001	1597000	492000	44.5%	
12	2011	2171000*	574000	35.94%	
13	2021	2953000*	782000	36.02%	jk"Vªh; vkSlr 30%
14	2024	3300000*	347000	39.16%	

Øa	vldgu vkkj	o'k2024 14yi nk , e- , y-Mhe2
1.	t ul ĩ; k ¹⁴ k ke2	33
2.	t ul ĩ; k & ?j swuy l aks u 183-75 i fr ' k ^{1/2}	27-64
3.	t ul ĩ; k & l lozfud uy 116-25 i fr ' k ^{1/2}	5-36
4.	vlo'; d t y ek-k	
	?j sw aks u & 135 i fr QfD i fr fnu	374
	l lozfud uy & 40 i fr QfD i fr fnu	22
	14uH2& l hi ĩ, p-b2ZkseSuy dksVsy Øekd 2-2½	
5.	vfxu' leu i ko/ku	06
6.	ekZdsxkeagsq ko/ku	05
7.	vkskd i ko/ku	30
8.	l bFkr i ko/ku	07
9.	egvgsq ko/ku	35
	buhSdUg #e rd dg vlo'; drk	479
10.	t yfor j.kQoLFkd hgku; k @ 15 i fr ' k	85
	dg vlo'; drk	564
11.	nek gsq ko/ku	10
	dg vlo'; drk	574
12.	or ĩku t yi nk & ueĳkt yi nk Hk 1 , oa2	170
	vĳ L=ks & ; ' loa l kxj & 20 fcy koy h&09 vĳ & 15	44
	dg ' lkvfu e Hk @ vlo'; drk	360

Lke;c) Tkyekax & tyvkiwfrZ foLr`r fooj.k

v-Ø-	fooj.k	o"kZ 2009	o"kZ 2012	o"kZ 2015	o"kZ 2018	o"kZ 2021	o"kZ 2024
1	tula[;k ?kjsyw dusD'ku lfgr (83.75%)	16.99	18.72	20.85	22.98	25.11	27.64
2	tula[;k lkoZtfud LVs.M iksLV ls (16.25%)	3.30	3.63	4.05	4.46	4.87	5.36
	dqy tula[;k	20.29	22.35	24.92	27.44	29.98	33.00
3	uxjh; ty ekax	263.41	292.06	328.12	363.35	398.41	438
4	vU; ekax						
	1- ekxZ ds xzke	02	03	04	05	05	05
	2- egw	15	17	20	25	30	35
	3- nsokl	10	10	10	10	10	10
5	forj.k gkfu;ka (15%)	49	55	62	69	76	85
6	dqy tyiznk; ekax	339.41	377.06	424.12	472.35	519.41	573.00
7	laHkkfor miyC/krk	214.00	394.00	484.00	574.00	574.00	574.00
8	vko';drk vfrfjDr vko/khZr {kerk	125.00	-	-	-	-	-

fjekdZ& mijksDr ekax dh vkiwfrZ ueZnk izFke pj.k] fjr;h; pj.k] r`rh; pj.k] ;'koar lkxj] fcykoyh o uydwi bR;kfn ls iw.kZ dh tkosxh A

Base Line Data: INDORE CITY

**Municipal Area
(original)** : 134 sq km

**Municipal Area i/c 29
villages recently
joined** : 275 sq km

**Population 2011
(original area)** : 19.61 lacs

**Population 2011 (i/c
29 villages)** : 21.00 lacs

**Total water supply at
present (For original
municipal area)** : 393 mld from all sources i/c Tube wells

**Main water supply
Source** : Narmada river (70 Km. away from Indore)

Sewage generation at present	: 270 MLD
Sewage conveyance Trunk main	: Laid about 80% i.e. in length of about 149.0 km to satisfy the need of 50.0 lacs projected population upto 2035.
Sewage treatment facility	: (i) 78 mld & 12 mld (existing) (ii) 245 mld under constuction Total 335.0 mld to satisfy the need of 30.0 lacs projected population upto year 2020
Sewerage Network Length	: About 950 km i/c primary line. About 72% of original area coverage of city.
Av. Rainfall	: 900 mm
Max. rainfall	: 1752 mm

Details of existing Water supply

- 1. Narmada River** : 300 mld
- 2. Yashwant Sagar** : 30 mld
- 3. Bilaoli Tank** : 3 mld
- 4. Tube Wells** : 60 mld
- 5. Total water supply at present (For original municipal area)** : 393 mld from all sources

Action Plan

1. (i) For strengthening of data base line City development Plan (CDP) is under preparation. TARU Leading Edge Pvt. Ltd.(ACCCRN) has collected water supply data for slum areas.
(ii) Mapping and collection of data of 15 local water bodies by TARU Leading Edge Pvt. Ltd.(ACCCRN).
(iii) Mapping, collection of data, preparation of estimates for preservation & revival of about 400 local water bodies (wells, bawadies etc.).
2. Compulsory roof water harvesting provision is made with building permission.
3. Tapping of Sewer outfalls joining the Kanh & Sarswati river and other 6 nallahs of the city under Simhasth -16.
4. Construction of 245 mld capacity Sewage Treatment Plant in order to treat overall 335 mld sewage generation upto year 2020 under JNNURM.
5. Construction of 4 mld capacity Effluent Treatment Plant in order to treat the Industrial effluent of Sanwer Road industrial area under Simhasth -2016.
6. 20 Kw electricity generation by screw hydro generator from effluent of 78 mld STP on PPP mode.

- 7. Treatment & reuse of 50000 Ltr/day sewage through decentralised STP at Zoo byTARU Leading Edge Pvt. Ltd.(ACCCRN) & IMC.**
- 8. Preservation of Khajarana lake water body by treating water through decentralised STP of capacity 2.0 lacs lit/day by TARU Leading Edge Pvt. Ltd.(ACCCRN) & IMC.**
- 9. Preservation of Lasuria Mori lake water body by treating water through artificial floating Island in which treatment through aeration, Bio-culture media & plantation has been adopted by TARU Leading Edge Pvt. Ltd.(ACCCRN).**



- 9. Conjunctive water management (CWM) in slums & peri-urban areas of Indore city by community level interventions in Rahul Gandhi Nagar, Devshree Nagar, Narwal Kankad & Ganesh Nagar to ensure water quality & availability during summer by rain water harvesting, installation of community storage tank.**
- 10. Rejuvenation of river systems in Indore.**

Details of River in Indore



- **Length of River Kanh in urban area :- 21 km**
- **Length of Sarasvati & Chandrabhaga :- 12 km**
- **Avg. Slope in urban area– about 1 in 500**
- **Kanh river width – from 10 m to 30 m**
- **Undefined river banks**

Existing Status of Kanh and Saraswati River



- **The river once an urban heritage of Indore has**
 - turned into a channel which carries sewage and drainage
 - become a Solid Waste and construction waste dumping site
 - been encroached upon by Low lying Slums
 - been surrounded by unauthorised developments
 - become Source of contamination of ground water

Existing Status showing Encroachments and discharge of waste water



Azad Nagar

Existing Status showing Encroachments

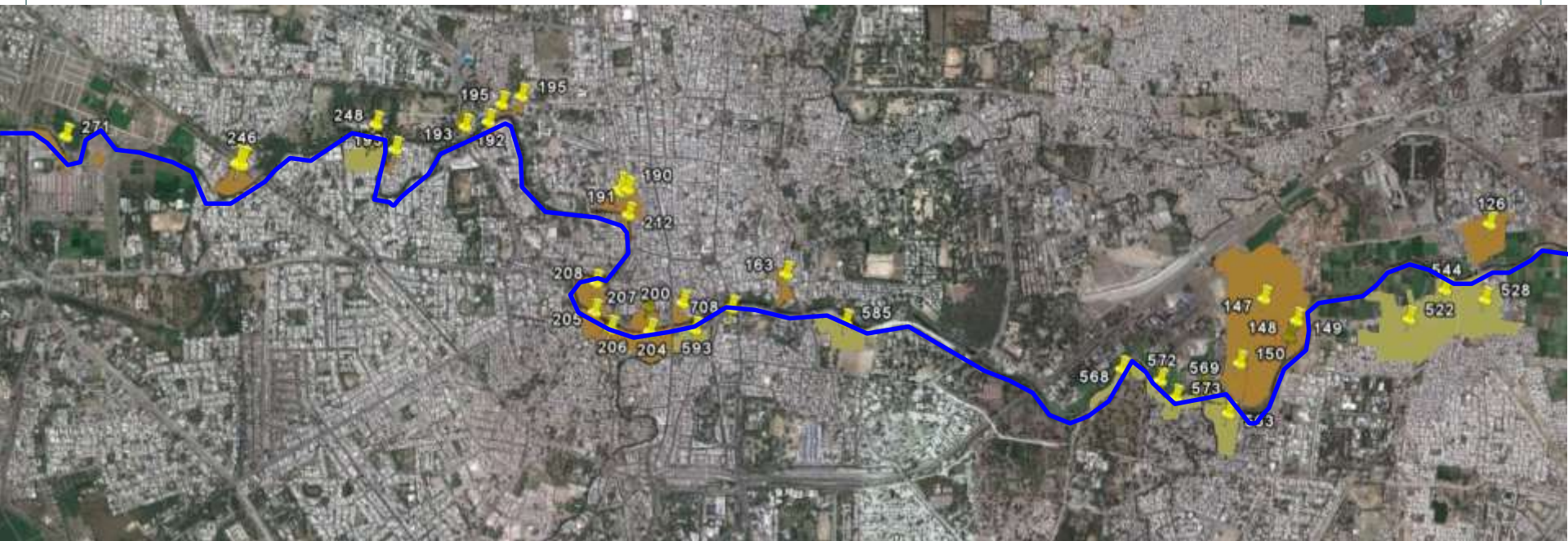


Badribagh Colony



Triveni Colony

Slums along River in Indore



S.No	Strategy	No. Of Slums	Households	Household requiring Relocation
1	Upgradation	2	547	0
2	Upgradation with Part Relocation	19	9628	3195
3	Redevelopment and Part Relocation	1	681	54
4	Relocation	11	1157	1157
	Total	33	12013	4406

Existing Status showing Slums along River



South Toda Slum



CP Shekhar Nagar Slum

Existing Status showing Sewage Discharge into River



Subhash Marg Bridge



Chandrabhaga Juni Indore

Existing Status showing degraded Water Quality



Khan and Sarawati River Confluence



Juni Indore

Existing Status showing Solid Waste Dumping



Madina Nagar



Lokhande Bridge

Knah River Rejuvenation Project Objectives



- River rejuvenation
- Keeping river clean through diversion of sewers
- Reconnect city to the river
- Create urban environment and public space like gardens, jogging track, walkways

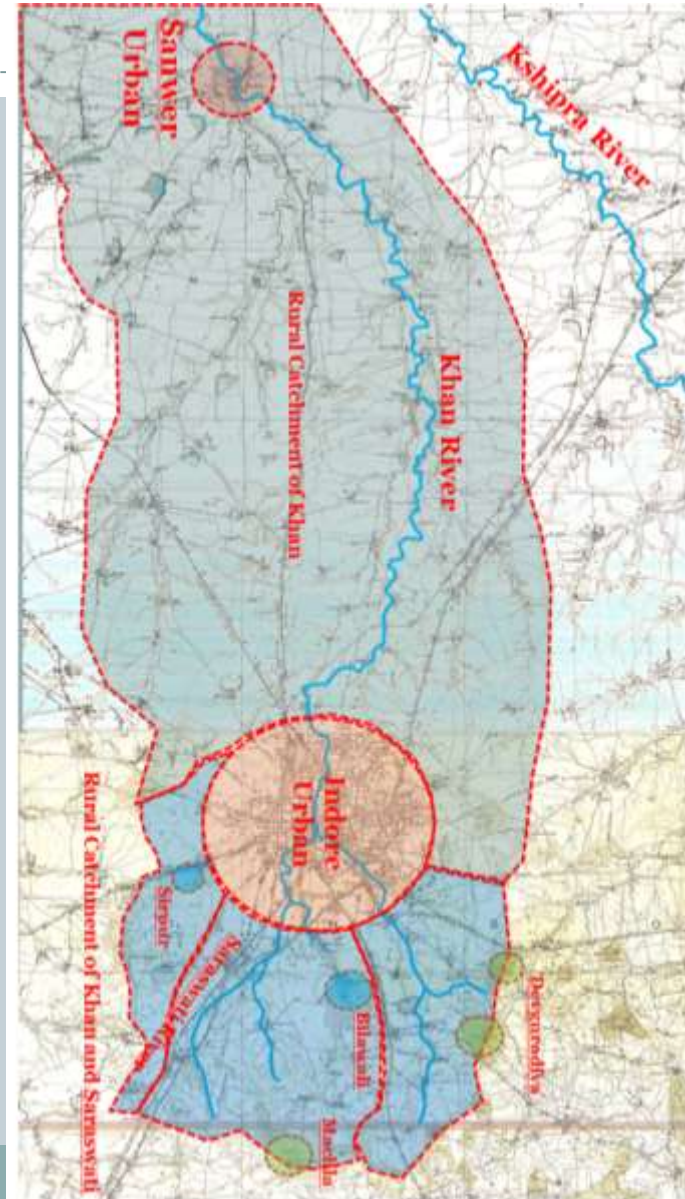
Proposals for Rejuvenation of River Systems



- **The proposals have been broadly categorised in five sets of Projects**
 - Catchment Area Conservation and treatment in Rural Catchments of Up-Streams and Down Streams
 - Pollution Control through tapping of Sewage Discharge in River
 - Effluent treatment of Industrial Waste
 - **Rehabilitation of Slums along River**
 - River Front Development and Conservation in Urban Areas

1. – Rural Catchment Area Conservation Proposals

- Catchment Area
– 650 Sq km
- Improvement in
Catchment Area
(Watershed
Management) @
Rs 15000 per Ha
- Total Project Cost – Rs 97.50 Crores



2. - River Front Development Proposal - Project Cost

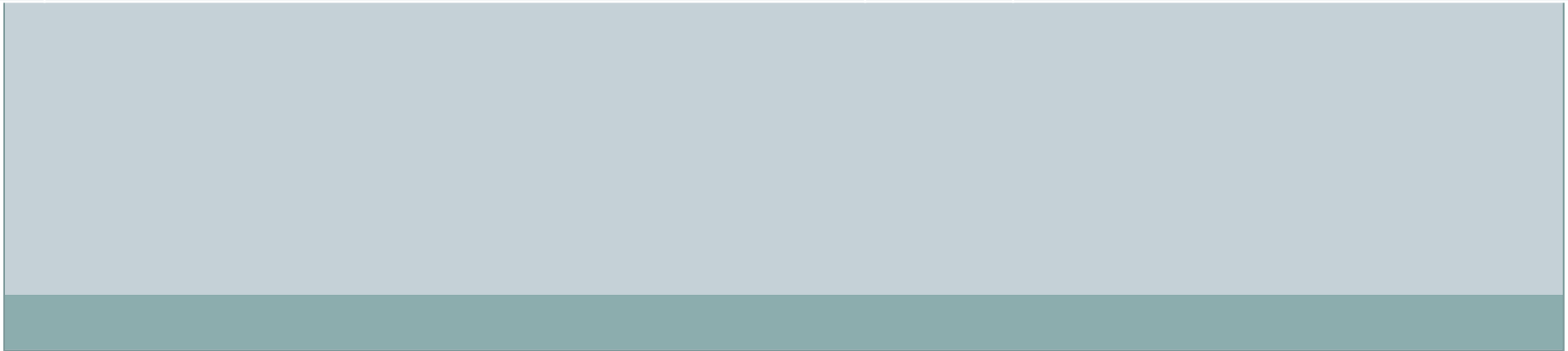
Project	Cost in Cr
River Front Development • Channelizing Flow • Widening of Bridges • BRT, cycle track, Footpaths, green buffer on side of channel	498.17

3. - Sewerage System Proposal to Control Pollution of River

S N	Name of work	Cost (Rs. Crs)	Remarks
1	Tapping of Secondary Sewerage in knah & saraswati river River & connected to primary line to STP for treatment under Simhasth -16.	59.75	Work is in progress
2	Treatment of Sanwer road industrial effluent discharging through Narwal Nalla & before discharging into Khan River under Simhasth -16.	20.00	Tenders has been received & approval is in process
3	Tapping of Secondary Sewerage discharging the sewage water directly in to the six nallas of city i.e Piliakhal, Palasia, Bamhori, Azad Nagar, Tulsi Nagar & Shakkarkhedi and joining to primary sewerage line under JNNURM.	102.00	Work is in progress
4	Construction of 245 Mld sewage Treatment plant under JNNURM.	193.78	The work is on execution stage & likely be completed up to Feb. – 2016.
5	To strengthen the existing stop dams, make arrangement for 18 sewer outlets for which levels are not proper to connect it in primary sewerage lines & to make new diversion weirs i/c decentralize STP as per feasibility etc.	100.0	To make the knah river free from all pollution & improve the quality of river.

Sewerage System Proposal to Control Pollution of River

S N 、	Name of work	Cost (Rs. Crs)	Remarks
6	Laying of secondary sewer line in unsewered area of city	400.00	Survey, design & DPR preparation work is in progress.
7	Sewerage network & treatment facility in recently joined 29 villages	450.00	Consultancy work tender yet to be called
	Total Amount required except STP & Simhasth work -(which is already available)	1052.0	



Rehabilitation of Slums along River

S N	Name of work	Est Cost (Rs. Crs)	Remarks
1	Relocation of 6000 Slum households (estimated) along River	360.00	In Planning Stage and covered under Slum Free City Plan of Indore approved by MoHUPA, GoI Once DPR approved the project will be executed
2	Affordable Housing for 1000 Households (estimated)	100.00	In Planning Stage and covered under Slum Free City Plan of Indore approved by MoHUPA, GoI Once DPR approved the project will be executed
	Total	460.00	



Summary of Proposals



SN	Proposal category	Cost in Rs Cr
1	Catchment Area Conservation and treatment in Rural Catchments of Up-Streams and Down Streams	97.50
2A	River Front Development and Conservation in Urban Areas – Saraswati and part of Kanh River	498.17
2B	River Front Development and Conservation in Urban Areas – remaining Part of Kanh River	150.00
3	Sewerage system proposals	1052.0
4	Effluent treatment of Industrial Waste	90.00
5	Rehabilitation of Slums along River and Affordable Housing Scheme	460.00
	Total Estimated Cost	2347.67

Challenges



- **Co-ordination among various government departments**
- **Legal issues**
- **Weak finances of local bodies**
- **Enforcement of municipal Act issues**

Implementation Mechanism



- **The project is proposed to be implemented by formation of a SPV**
- **SPV to have representation of**
 - Indore Municipal Corporation,
 - Indore Development Authority,
 - Para-statal Agencies and
 - relevant departments of GoMP

Implementation Mechanism- a Road Map



- Formation of SPV
- Preparation of DPR
- Submission of projects for approval and sanction
- Enforcement of Municipal act to prevent pollution of river
- Waterway delination and identification of revenue land as per land records
- Survey and rehabilitation of displaced households from slums and waterway

Thank You



INDORE MUNICIPAL CORPORATION

EFFLUENT TREATMENT PLANT

- Indore Municipal Corporation is tapping all the outfalls which were getting entry into River Khan and collecting the same and putting up full-scale Sewage Treatment Plants. It was necessary as River Khan is meeting River Kshipra before it enters Ujjain City and Ujjain City is hosting Sihastha Mela in 2016.
- Narval Nallah is originating before the Sanwer Road Industrial Area. It carries the overflow of the lakes. Due to the rapid growth, many townships are also developed in and around this area which discharges the septic tank overflows or directly the sewage into Narval Nallah in the absence of drainage network. Narval Nallah is the only natural drain which does not meet River Khan within Indore City. It meets Khan River after travelling 16 km. Near village Dhankhedi.
- Most of the Industries of Sanwer Road Industrial Area are discharging their untreated / partially treated and fully treated effluent as per the Pollution Control Board's norms in Narval Nallah. This has resulted in higher concentration of pollution levels of Narval Nallah.

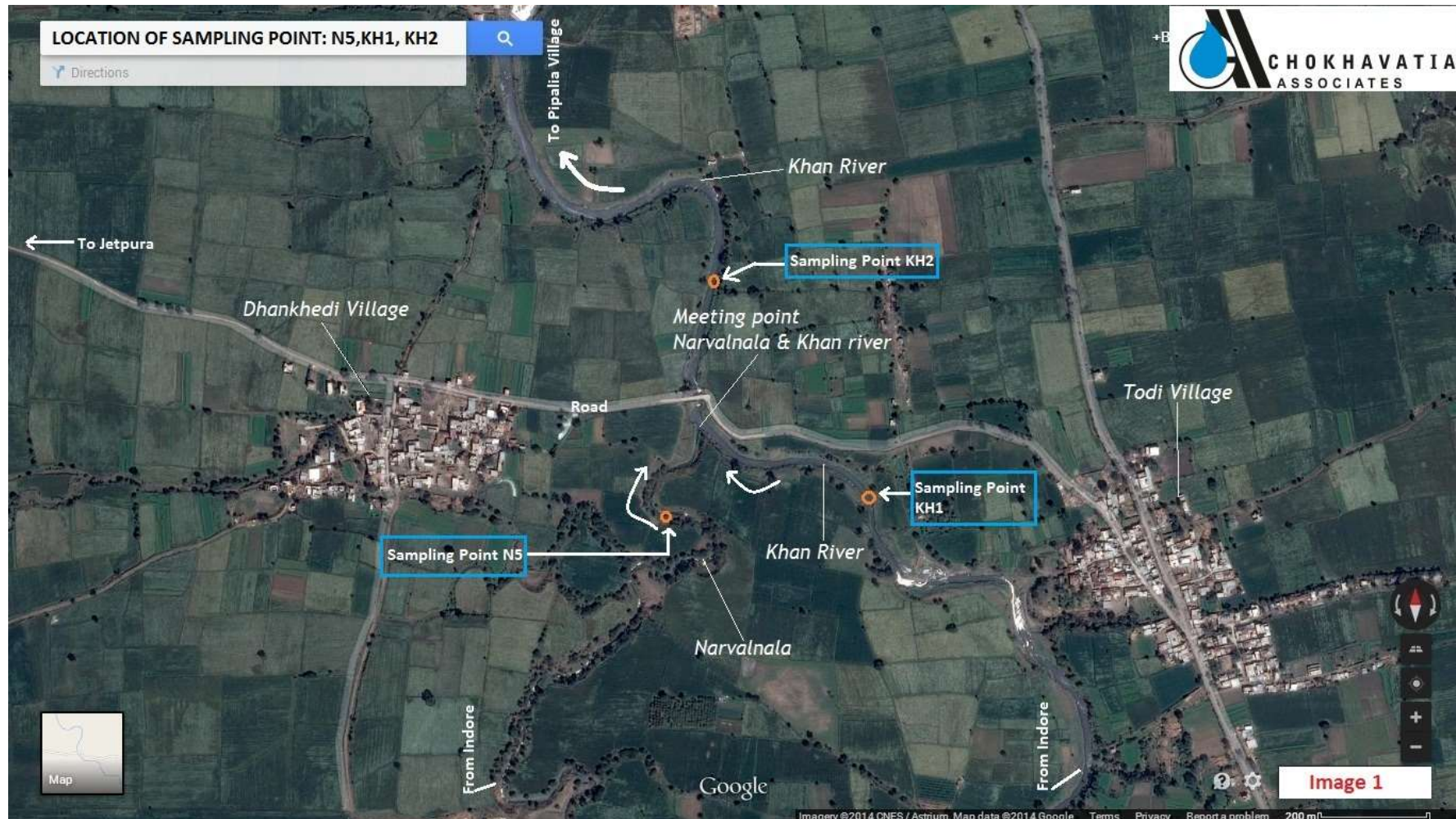
DESIGN BASE

S.No.	Description	Units
1.	Total Volume Of Wastewater	4 mld
2.	Domestic waste water quantity	3.428 mld
3.	Industrial effluent quantity	0.572 mld
4.	Design flow	4.0 mld
5.	Peak flow	8.0 mld

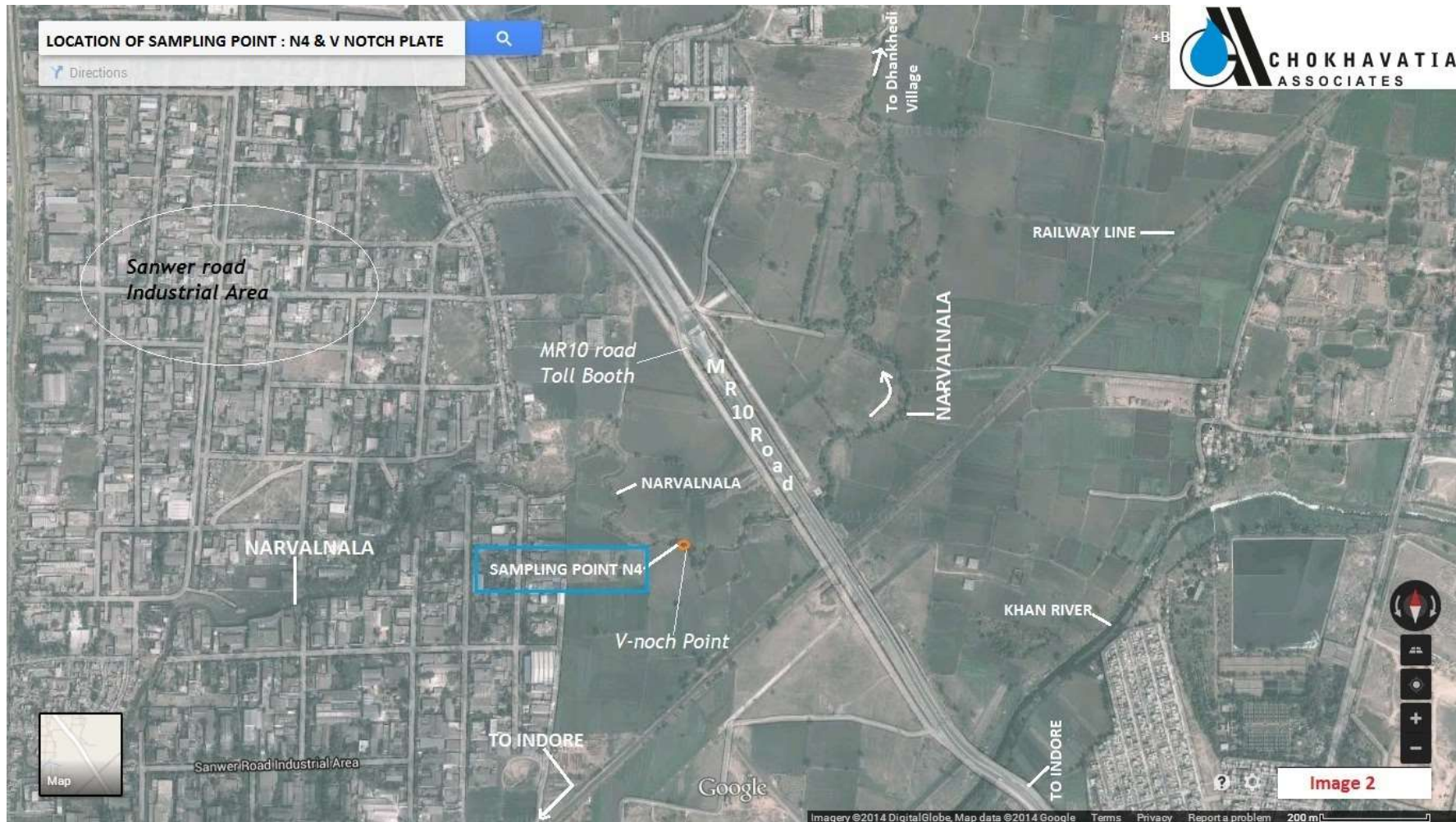
DESIGN BASE

S. No.	Parameters	Combined effluent characteristics	Treated effluent characteristics
1	pH	6-7	7-8
2	BOD	425 mg/l	20 mg/l
3	COD	1100 mg/l	100 mg/l
4	Suspended Solids	500 mg/l	30 mg/l
5	Dissolved Solids	4000 mg/l	4000 mg/l
6	Oil & grease	50 mg/l	10 mg/l
7	Ammonical Nitrogen	100 mg/l	50 mg/l

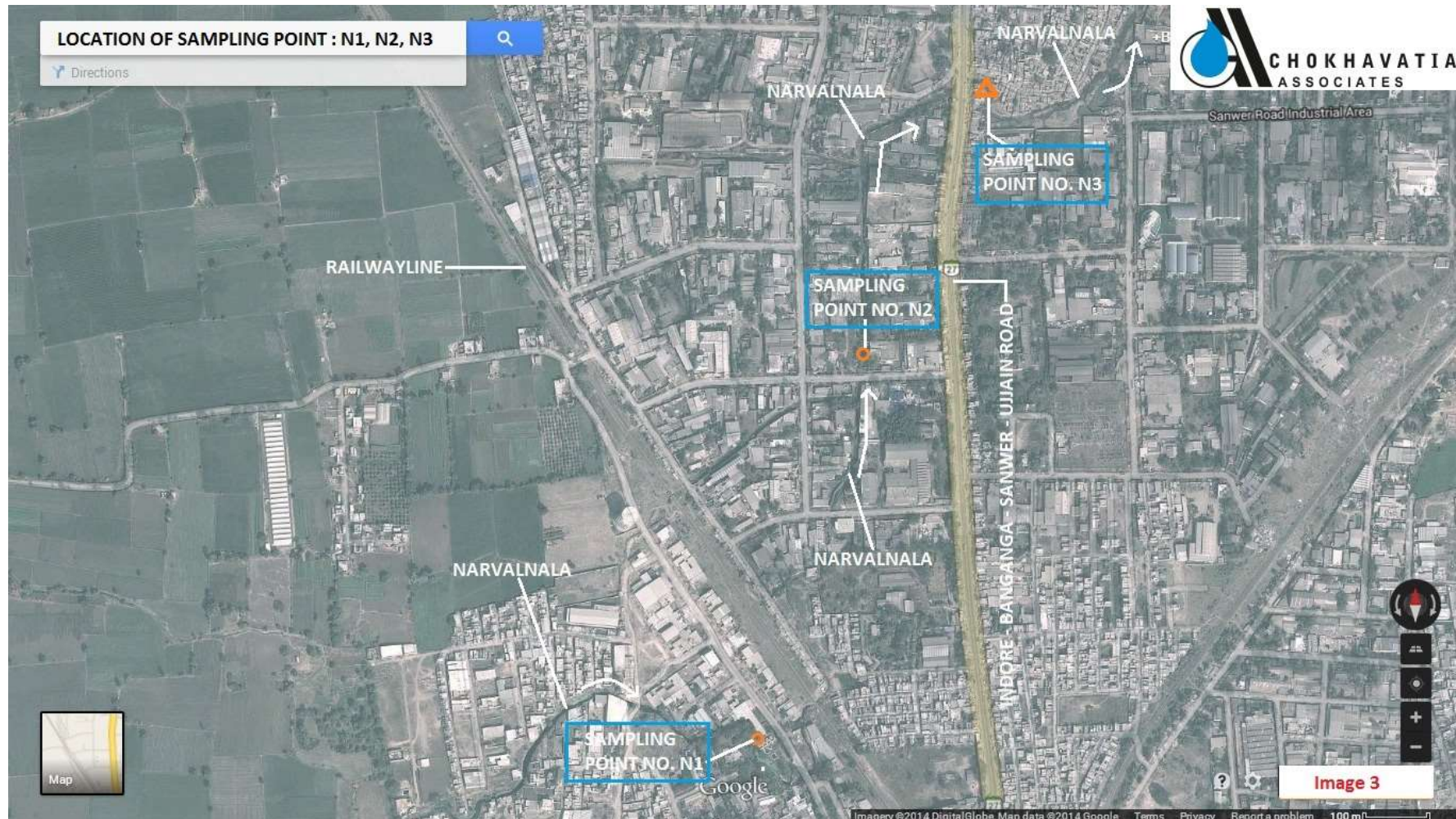
LOCATION OF SAMPLING POINT: N5, KH1, KH2

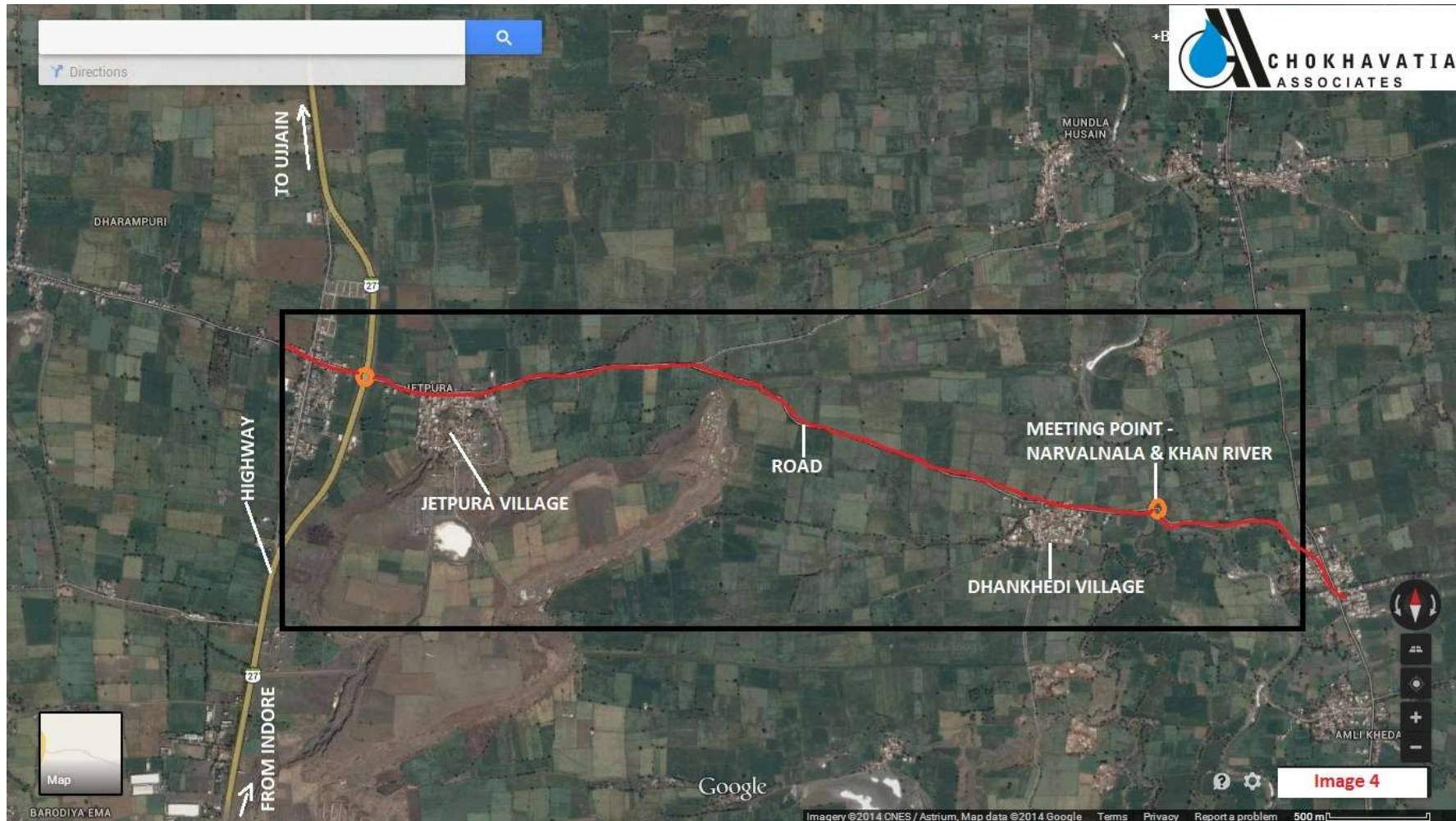


LOCATION OF SAMPLING POINT: N4 & V NOTCH PLATE



LOCATION OF SAMPLING POINT: N1, N2, N3



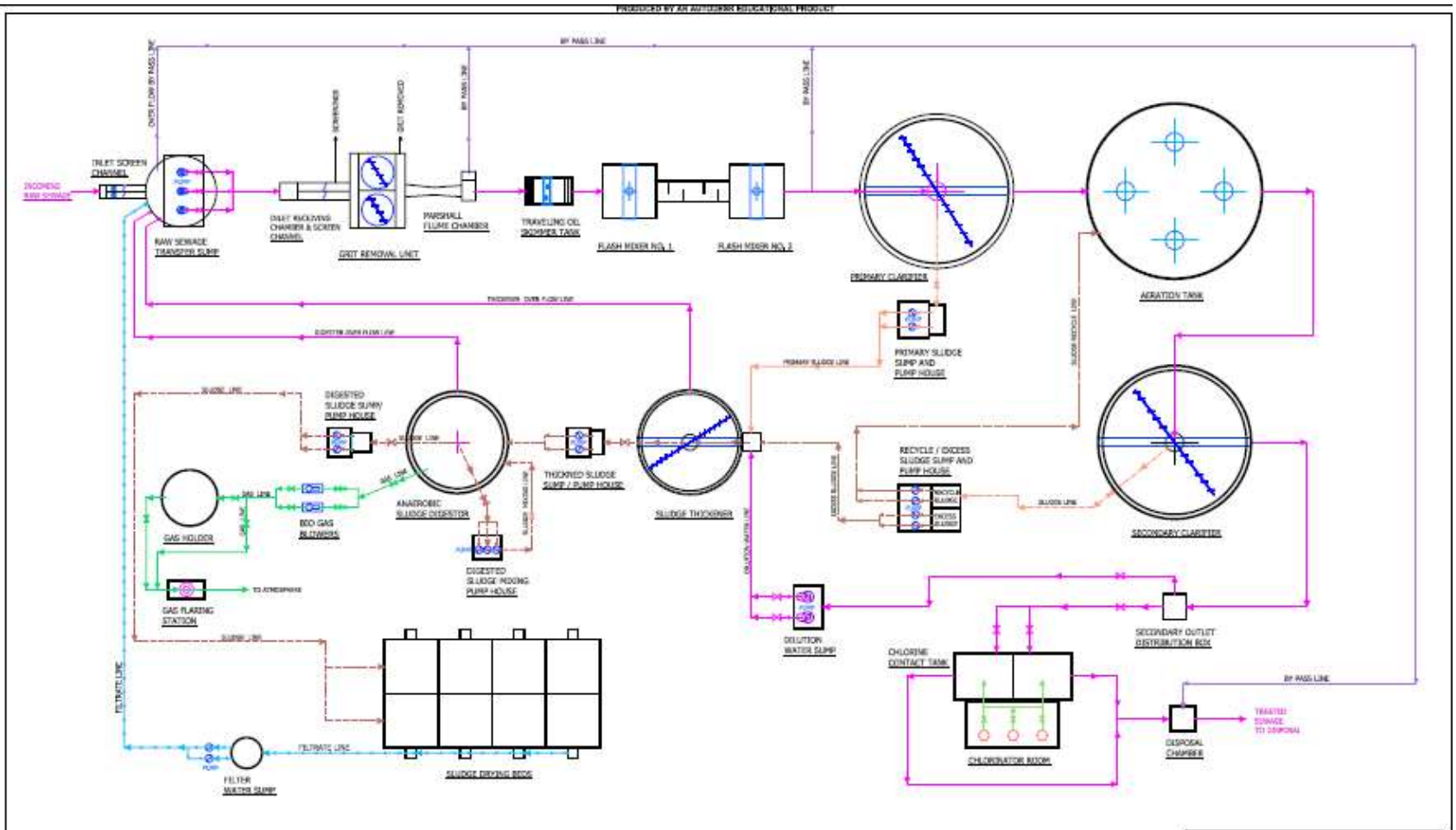


FIELD SURVEY – PROBLEM IDENTIFICATION

- Apart from above a Narwal nallah passes through the Sanwer road industrial area in which about 4 MLD flow (exact flow and characteristics of the industrial effluent is yet to know) goes and finally join to the Khan river beyond STP.



LINE DIAGRAM FOR PROPOSED S.T.P.

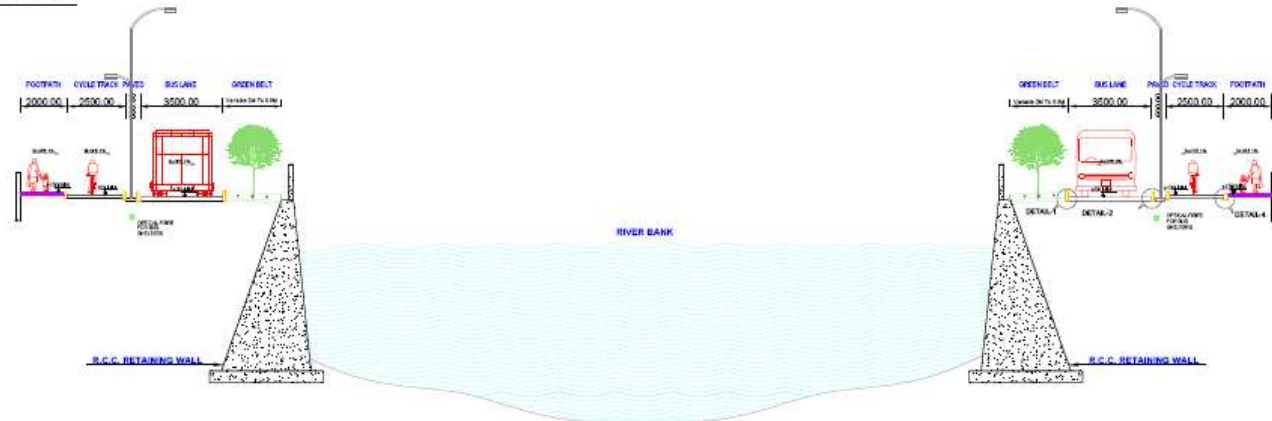


River Front Development Proposal



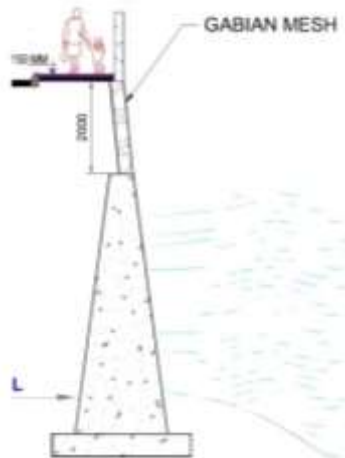
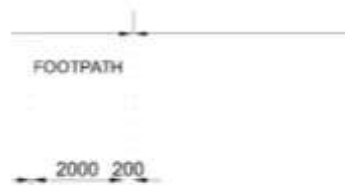
River Front Development Proposal - Typical Cross Section

Cross Section at Mid Block

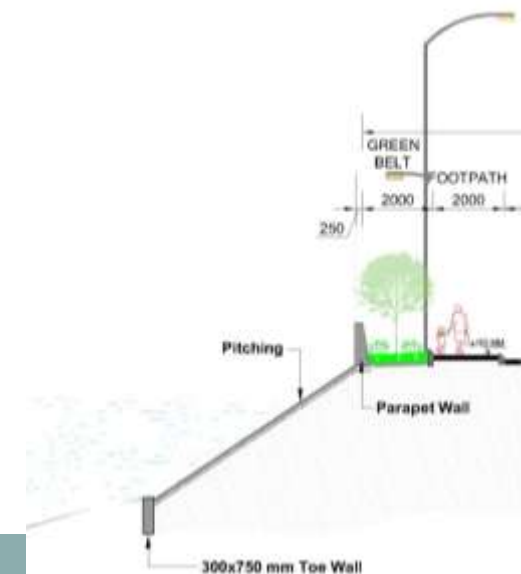


Cross Section with Retaining Wall

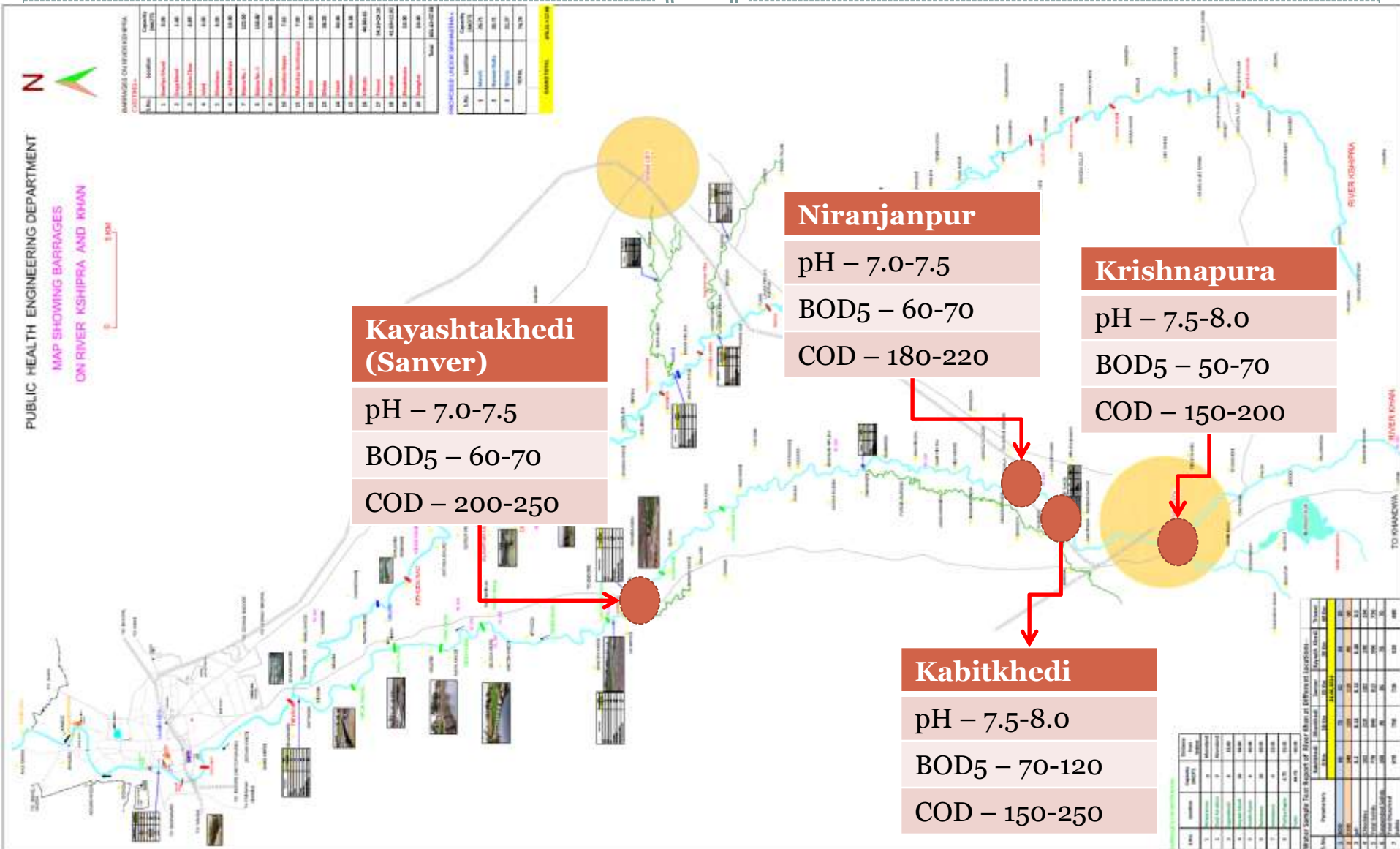
Stone Pitching with
Toe Wall



Retaining wall with
Gabion Mesh



Existing Status showing Water Quality



River in Urban Catchment

