

*Jn***NRM**

**Jawaharlal Nehru
National Urban Renewal Mission**

Government of India

Detail Project Report

for

**Planning, Designing, Erection & Commissioning of
75Mld WTP, Rehabilitation of Clear Water Sump at
Existing WTP
& Construction of Retaining Wall to stop scouring of
the Kanhan River Bank at Kanhan Water Treatment
Plant**



NAGPUR MUNICIPAL CORPORATION

Civil Lines, Mahanagarpalika Marg, Nagpur – 440 001 [M.S.] India

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Introduction

INTRODUCTION:

1.0 NAGPUR CITY :

- **Nagpur** is the 13th largest urban developing metropolitan city in India. Located near the geographical center of India it is the winter Capital of the state of Maharashtra and is also headquarters of Nagpur Division administration.
- Nagpur the second capital of Maharashtra is also called as Orange city. It has potential to become a cosmopolitan city since it is one of the fastest growing cities in India with one of the highest per capita income. All major National & State Highways passes through Nagpur.
- Nagpur is also the next most favoured IT destination in Maharashtra after the saturation in Mumbai and Pune. One of the biggest industrial estates namely a Botibori category under five star infrastructural facilities is located @ 25-30 km from the City. Nagpur also houses the Maintenance Command of the Indian Air Force and has an Ordnance factory for Indian Armed forces.
- City has very good quality network of internal IRDP roads. The city has been awarded first prize for 2004-2005 in Maharashtra for its overall performances in municipal services.

Nagpur Municipal Corporation (NMC) manages Water supply & wastewater collection, treatment and disposal and solid waste management in the corporation limits.

- NMC is the recipient of prestigious HUDCO award in the year 2001 for excellent infrastructure. NMC was also awarded by GoM with prestigious Sant. Gadgebaba award for year 2004 for cleanness of the city.
- The Government of Maharashtra (GoM) has decided to develop the existing airport at Nagpur as Multimodal International Hub Airport at Nagpur (MIHAN) and Special Economic Zone (SEZ) and along with related allied facilities. Multi-Modal International Hub Airport Nagpur (MIHAN) is a multi dimensional, multidisciplinary project of International Standard with proposed world-class facilities.

Nagpur is also selected as **Pilot city** for Project of “**Municipal Reuse of water**” under Water & Energy Nexus Project (WENEXA-II) of United State Agency for international development (USAID).

From Maharashtra state, Nagpur is the only city selected Under “Jawaharlal Nehru National Urban Reform Mission” (JNNURM), declared by Ministry Urban Development, Govt. of India and cleared Financial Aid for various infrastructural development projects.

1.1 CITY STATISTICS:

Location	Toposheet No. 55 O/4 21.15° N 79.08° E
State	Maharashtra, India
Altitude	300 meters above MSL
Area	217.56 km ²
Population (2004)	2,350,000
Population Density	10802 / km ²
Climate: Summers Winters Monsoon	• March to June (Avg high 46°C) • November to Jan (Avg low 10°C) • June to September ➤ (Annual Max. 1933 mm) ➤ (Annual Avg. 1242 mm) ➤ (Annual Min. 606 mm)
Present Water Resources	• Gorewada Lake (16 mld), • Kanhan River (100-120mld), • Pench Dam Canal (350-370 mld)
Present Pure Water Supply	470 mld (Yr.-2005)
Ave. LPCD rate of Supply	@135-150 ltrs./cap./day.

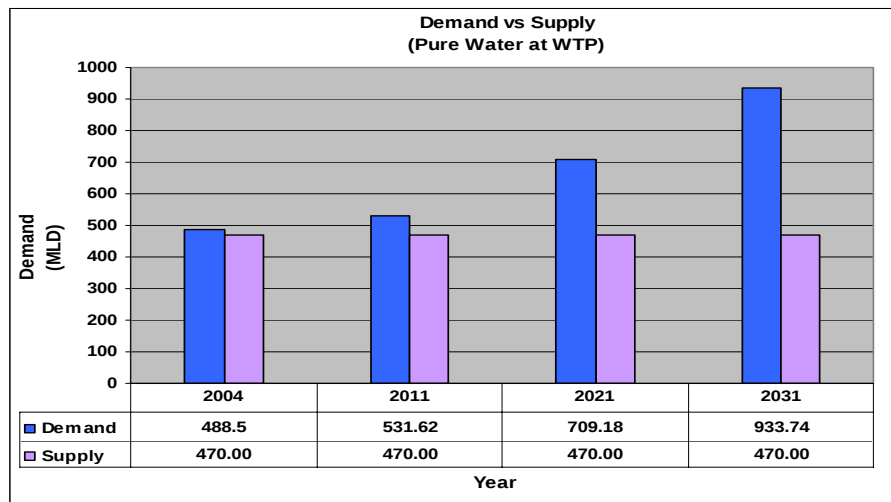
1.2 POPULATION PROJECTION (WITHIN NMC LIMITS)

Population Projection by Various Methods

Sr. No.	Method	Years			
		2001	2011	2011	2031
01.	Arithmetic Increase Method	18,36,145	20,47,538	22,58,931	24,70,325
02.	Geometric Increase Method	22,90,196	32,28,184	45,50,340	64,14,007
03.	Incremental Increase Method	18,92,434	21,60,122	24,27,808	26,95,493
04.	Migration-Birth / death Rate Method	19,97,397	24,90,808	32,05,884	42,08,420
05.	Graphical Trend Method	21,50,000	28,30,000	36,90,000	47,50,000

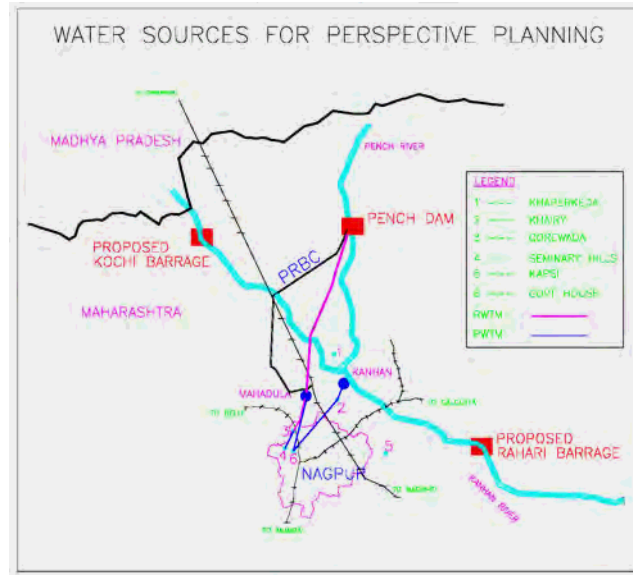
The Master Plan report and the population projections made therein have already been accepted by NMC. Hence **population projections by Graphical Trend Method adopted in Master Plan report** form a basis for calculation of water demand in the present report.

1.3 PROSPECTIVE WATER DEMAND Vs PRESENT SUPPLY TO CITY:



1.4 PROSPECTIVE WATER DEMAND VS SUPPLY UPTO 2031(MASTER PLAN)

Year	Demand (Treated water)	Supply (As on 2004)	Future Planning	Surplus/Deficit over Existing supply (+/-) Mld	Net surplus /deficit over existing + future planning supply
2011	532	470	113 (Pench-IV Additional + Kanhan Augmentation)	(-)62	+51
2021	709	470	113(Pench-IV) + 175 (Rahari-1)	(-)239	+49
2031	934	470	113(Pench-IV) + 175 (Rahari-I)+ 175(Rahari-II)	(-)464	(+)1



Prospective sources as per master Plan (2031)

1.5 MEASURES TAKEN-UP BY NMC TO IMPROVE EFFICIENCY OF SECTOR :

Nagpur Municipal Corporation, looking after Water supply & sewerage system of city has taken-up & planning for various projects to,

- Improvement to Existing Source & Effective Management to cater perspective water demand,
- Improve level of services & efficiency of system,
- Upgrading of existing infrastructure to increase the serviceability & minimized losses in system.
- Minimized operation & maintenance cost.
- Reuse of water to minimized stress on existing water source
- Augmentation/Development of New sources to meet prospective demand.

The Project Presented herewith focused on following:

- **Augmentation of Existing sources & Source Management to cater perspective water demand,**
- **Improve level of services & efficiency of system,**
- **Upgrading of existing infrastructure to increase the serviceability**
- **Minimized operation & maintenance cost.**

Chapter-1:Sector Background Context & Broad Project Rationale

CHAPTER-1: SECTOR BACK GROUND CONTEXT & BROAD PROJECT RATIONALE

1.1 EXISTING STATUS OF THE PHYSICAL INFRASTRUCTURE:

Water supply to Nagpur City was drawn from three surface sources viz. Gorewada Tank, Kanhan river, and Pench canal.

Gorewada tank source was developed in the year 1911. As city grew and the need for water increased, Gorewada tank source became inadequate. As augmentation was not possible due to site conditions, surface water source from river Kanhan 15 km. away from city was considered as perennial source.

In 1976, the Irrigation Department, Govt. of Maharashtra executed a storage dam across river Pench for hydroelectric project at Totaladoh and pickup dam at Navegaon Khairy.

With source as Pench Dam, Pench-I ,II & III Scheme was commissioned in 1982, 1984, and 2003 respectively. Pench-IV scheme is in design stage.

A) Old Gorewada Source:

This was developed in the year 1911. It consists of an earthen bund across river Pili at a distance of about 8 km towards North-East of Nagpur City having gross and live storage capacities 8.82 Mm³ and 7.92 Mm³ respectively. On the downstream of Gorewada Tank, conventional Water Treatment Plant of 16.0 MLD capacity is constructed. Treated water is collected in pure water sump and then pumped to Seminary hills G.S.R for further distribution

B) Kanhan Water Source:

Surface water intake located approximately 14 km from Nagpur City and 300 m. downstream of the confluence of the River Kolar and the River Kanhan was constructed in year 1940. In 1956 a barrage was constructed across Kanhan River about 500 m upstream of Kanhan head works with a storage capacity of 7.82 Mm³. Kanhan Water Supply Scheme was commissioned in four phases during the years 1940 - 1970. The first phase capacity in 1940 was 27.3 MLD which was augmented to 63.6 MLD in 1954. The capacity was further augmented to 86.3 MLD in 1966 and finally to 109 MLD in 1970.

Under this scheme, two intake wells in Kanhan river bed and two dry wells on the right bank of Kanhan River are constructed. Raw water is pumped to conventional treatment plant of 109 MLD capacity. Treated water from the Treatment Plant is pumped to G.S.R. of capacity 22.74 ML at Government House through 600 to 900 mm dia. M.S. parallel rising mains of length 15.24 km. which are interconnected to each other.

C) Pench Source:

Pench Project - Phase I

In this scheme 113.5 MLD water is drawn from Pench right bank canal by gravity to the Mahadulla pumping station. The raw water is pumped to the B.P.T. of capacity 5.7 lakhs liters through 1606 mm dia M.S. Rising Main of length 5624 m. from B.P.T. water is taken to the Gorewada balancing tank through 700 mm dia duplicate C.I. gravity mains each of length 400 m. from Gorewada Tank it is drawn to the conventional treatment plant of capacity 113.5 MLD through 1200 mm dia M.S. gravity main. The filtered and chlorinated water from the treatment plant is pumped to Seminary Hills G.S.R. of capacity 20.43 ML and Gittikhadan G.S.R. of capacity 5.94 ML. Sitabuldi G.S.R. is fed from Seminary Hills G.S.R. through 700 mm dia M.S. Feeder Main of length 4000 m.

Pench Project - Phase II

Under Pench Phase - II a baby canal from Pench right bank canal to Mahadulla pumping station was constructed to draw additional 136 MLD of water. The raw water is pumped to the existing B.P.T. of capacity 5.70 lakh ltrs. through 1626mm dia M.S. Rising Main of length 5.60 km from B.P.T. water is conveyed to Gorewada tank through 1500 mm dia P.S.C. 8 Kg.cm² gravity main of length 400 m. from Gorewada Tank water is taken to conventional water treatment plant of capacity 145 MLD through 1100 mm and 1000 mm dia P.S.C. 4 Kg./Sq.cm. gravity mains of length 650 m and 325 m respectively. Pure water is pumped to Seminary Hills G.S.R. of capacity 20.43 ML through 1321mm dia M.S. Rising Main of length 3760 m. In this scheme two E.S.R.s at Jaripatka and Sharda Rolling Mill each of capacity 22.7 lakhs liters are constructed.

Pench project -Phase III, Stage - I

Under Pench III Phase – I, additional 100 MLD water drawn from PRBC to Mahadula pumping station through the baby canal. Additional pumps are provided at Mahadula for Raw Water Pumping. A new treatment plant is also constructed at Gorewada. The system is identical to Pench - I & Pench - II project.

1.1.1 Present Annual Water Reservation & Actual Drawel_:

Present Annual Raw Water reservation from various source for city water supply & respective present drawel is as below:

Source	Annual Reservation		Actual Drawel (As per Billing to NMC)	
	Mm ³ / year	MLD	Mm ³ / year	MLD
Kanhan River	55.00	150.70	43.80	120.00
Pench Project (PRBC) @ Mahadula	112.00 (Confirmrd)	306.88	168.00*	460.00
	78.00 (upto Dec.2010)	213..72		
Gorewada Lake	5.80	16.00	5.80	16.00
Total	250.80	687.30	217.60	596.00

- As per billing by Irrigation department to NMC. Losses through Canal seepage in the length of 48.50 Km length of travel is @ 20-25% as per the observation of Water audit & Leak detecion project.

1.1.2 Existing Pure Water Supply:

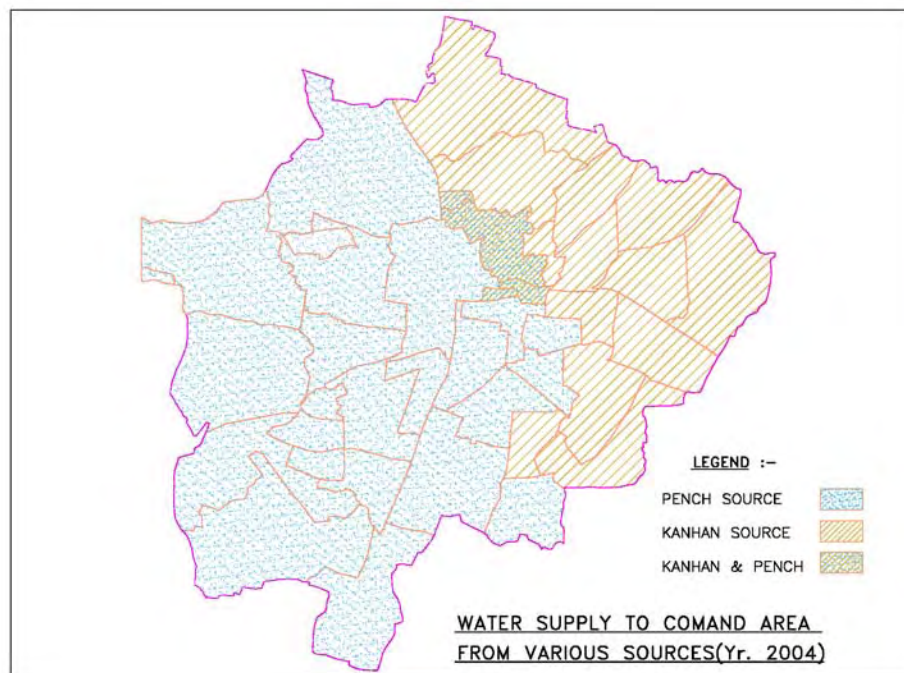
Treated Water from Various WTP

Kanhan Water Works	108.00 Mld
Pench Phase – I	113.50 Mld
Pench Phase – II	145.00 Mld
Pench Phase – III, Stage – I	100.00 to 120.0 Mld
Old Gorewada	16.00 Mld
Total	470.00 to 500.00 Mld

1.1.3 Present Water Distribution System:

Existing water distribution system to Nagpur city is broadly divided in to three areas.

- 1] North / East / South part of Nagpur city with water supply from Kanhan Head Works & WTP.
- 2] North / West / South / Central part of Nagpur city with water supply from Pench project and WTP at Gorewada.
- 3] North / Central part of Nagpur city with water supply from both the sources i.e. Pench & Kanhan.

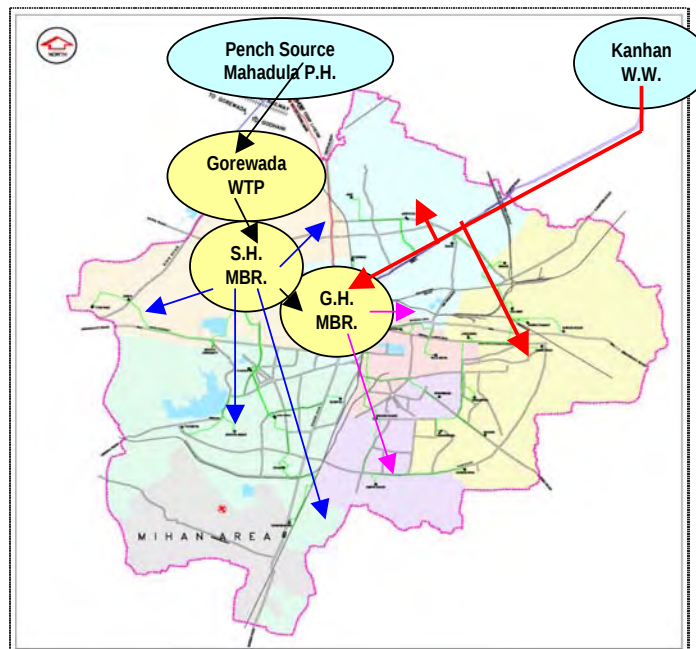


The total city area has been divided into ten water supply zones for better operation and maintenance, Details of existing ten water distribution zones are as follows,

EXISTING TEN WATER DISTRIBUTION ZONES

Zone No.	Name of Zone	ESR/GSR Included	Population (Yr. 2001)
I	DHARAMPETH	RAM NAGAR , DABHA	2,50,000
		SEMINARY HILLS SH-1, SH-2, SH-4 & SH-5)	
		GOVERNOR'S HOUSE (GH-3 & GH-4)	
II	LAXMI NAGAR	DHANTOLI , LAXMINAGAR, KHAMLA	2,50,000
		GAYTRI NAGAR, TAKLISEEM	
III	HANUMAN NAGAR	OMKAR NAGAR, HUDKESHWAR ,	2,00,000
		CHINCHBHUVAN	
IV	DHANTOLI	WANJARI NAGAR , RESHIMBAG	2,00,000
		SITABULDI FORT (SF-4)	
V	NEHARU NAGAR	SAKKARDARA , NANDANVAN , DIGHORI	1,45,000
VI	GANDHIBAG	SITABULDI FORT (SF-2 & SF-3)	2,60,000
		KILLA MAHAL	
VII	SATARANGI PURA	SITABULDI FORT (SF-1)	3,20,000
		GOVERNOR'S HOUSE (GH-2)	
		BORIAPURA , KALAMNA ,	
VIII	LAKADGANJ	SUBHAN NAGAR	1,60,000
		MINIMATA NAGAR , BHARATWADI	
		LAKADGANJ	
IX	ASHINAGAR	BINAKI , JARIPATKA / NARI , NARA	1,80,000
		WANJRI	
X	MANGALWARI	GITTIKHADAN , SEMINARY HILLS (SH-3)	2,05,000
		GOVERNOR'S HOUSE (GH-1)	
		BEZANBAG	

Water is supplied to the city by Master Balancing Reservoirs at Seminary Hills (SH) & Govt. House (GH). From Seminary hills and Govt. house master balancing reservoirs water is supplied to other reservoirs. These two MBR's also supply water to its command area.



There are 43 service reservoirs in the city at 31 locations. The existing storage capacity is 150.79 MI which @ 32 % of the total supply.

DETAILS OF M.B.R.s , E.S.R.s & G.S.R.s								
Sr. No.	Name of ESR	Nos	Capacity (ml)	G.L. (m)	F.S.L. (m)	L.S.L. (m)	St. Ht. (m)	Construction History
1	Semi Hill. Old GSR	1	4.54	349.700	356.180	348.180		During Gorewada Water Works
2	Governer House GSR	3	22.74	344.000	345.950.	339.850		During Kanhan Water Works
3	Ramnagar GSR	1	0.91	327.200	330.170	326.130		During Gorewada Water Works
4	Wanjarinagar(old)	1	2.27	305.860	326.220	321.650	15.790	
5	Laxminagar (old)	1	2.27	311.700	335.280	330.700	19.000	
6	Seminari Hills M.B.R	2	20.43	349.700	356.180	348.180		Constructed under Pench Phase-1
7	Gittikhadan GSR	1	5.94	338.500	341.840	335.840		
8	Sitabuldi Fort	2	22.74	334.300	338.400	332.400		
9	Laxminagar (New)	1	2.27	311.790	335.280	330.710	18.920	7 Nos. of ESRs are Constructed during Improvement to Distribution system Stage-I
10	Wanjarinagar (New)	1	2.27	305.860	326.220	321.650	15.790	
11	Minimatanagar	1	2.27	294.500	321.650	314.000	19.500	
12	Sakkardara	2	4.54	303.760	326.000	321.000	17.240	
13	Lakadganj	2	4.54	299.500	325.000	320.000	20.500	
14	Jariptka	1	2.27	295.760	321.760	316.760	21.000	Augmentation to Nagpur W.S.Scheme Pench Phase-II
15	Binaki	1	2.27	292.675	318.675	313.675	21.000	
16	Ramnagar ESR	1	2.27	327.200	344.500	339.200	12.000	7 Nos. of ESRs are Constructed during Improvement to Distribution system Stage-II
17	Khamla (Pande Layout)	1	2.27	309.460	329.460	324.460	15.000	
18	Jaripatka (Nari)	1	2.27	295.760	321.760	316.760	21.000	
19	OnkarNagar	1	2.27	297.120	323.120	318.120	21.000	
20	Nandanvan	1	2.27	298.000	324.000	319.000	21.000	
21	Subhan nagar	1	2.27	286.030	312.030	307.030	21.000	
22	Takali seem	1	2.27	320.850	339.850	335.850	15.000	
	Total	28	118.16					
23	Nara	1	2.27	296.000	322.000	317.000	21.000	Augmentation to Nagpur W.S.Scheme Pench Phase-III
24	Mahalginagar	1	2.27	298.000	324.000	319.000	21.000	
25	Wanjari	1	2.27	286.500	312.500	307.500	21.000	
26	Dhaba	1	2.27	346.000	372.000	367.000	21.000	
27	Dhantoli	1	2.27	305.500	328.500	323.500	18.000	
28	Reshimbag	1	2.27	299.500	325.500	320.500	21.000	
29	Boripura	1	2.27	308.000	334.000	329.000	21.000	
30	Gayatrinagar	1	2.27	318.000	344.000	339.000	21.000	
31	Chinchbhuvan	1	2.27	302.000	328.000	323.000	21.000	
32	Killa mahal	1	2.27	300.000	326.000	321.000	21.000	
33	Benzanbag	1	2.27	302.000	328.000	323.000	21.000	
34	Kalamna	1	2.27	291.000	317.000	312.000	21.000	
35	Bharatwada	1	2.27	288.000	314.000	309.000	21.000	
36	Dhigori	1	2.27	295.000	321.000	316.000	21.000	
	Total	14	31.78					
	Wadi Tekadi	1	0.85	359.480	385.48	380.48	21.000	
	Grand Total	43	150.79					

1.2 BASE LINE INFORMATION IN TERMS OF USERS COVERAGE & ACCESS:

1.2.1 Population Served, Area covered & Qty. Supplied in Water Dist. Zone

ZONE	POPULATION	AREA	QTY. SUPPLIED
	2004	Ha.	IN MLD
I DHARAMPETH	261666	4084.63	78.55
II LAXMI NAGAR	257960	3516.31	54.05
III HANUMAN NAGAR	165717	2181.52	27.91
IV DHANTOLI	236701	815.37	36.16
V NEHARU NAGAR	198411	1423.69	27.22
VI SOKTA BHAWAN	290076	556.07	61.03
VII SATRANJIPURA	336267	744.48	91.98
VIII LAKHADGANJ	176716	2406.16	16.04
IX ASHI NAGAR	225881	3225.02	23.14
X MANGALWARI	204606	2109.06	44.26
PUMPING/FEEDER MAIN			29.65
Total	2354001	21062	490.00

Source: Water Audit & leak detection Report March-2004

1.2.2 Water Distribution Zone Wise Consumers Data:

Z.N	Zone	Total No. of Connections (Year –2004)	Regular	Semi-Bulk	Bulk
1	Dharampeth	20525	16194	1441	436
2	Laxminagar	19266	15510	2058	266
3	Hanuman Nagar	13498	9793	195	33
4	Dhantoli	14346	10578	798	111
5	Neharunagar	21906	16558	169	52
6	Gandhibag	21498	15282	804	89
7	Satarangipura	20271	9822	268	27
8	Lakadganj	11594	8760	388	88
9	Ashinagar	24112	10115	130	57
10	Mangalwari	14700	9946	541	151
	Total	183720	122558	6792	1310

Source: Water Audit & leak detection Report March-2004

1.2.2 Urban Poor in Total Population:

- Slum population with house connections (2004) 4,94,340 souls
- Slum population on stand post supply (2004) 3,29,560 souls
- Total Slum Population 8,23,900 souls**

1.3 LIST OF VARIOUS PROJECT FOR THE SECTOR IN CDP:

City Investment Plan Summary 2005-2011							
Sector	Investment in Rs crores			Source of Funding			
	2005-11	1st Year	Balance Period	PPP	State Government	MHADA / NIT / SRA	NMC
Water supply and distribution							
Pench IV	422	163	260	-	-	-	422
Leak detection	3	3	-	-	-	-	3
Energy and water Audit projects	50	50	-	-	-	-	50
Strengthening of WS System	115	44	71	-	-	-	115
Total	590	260	331	0	0	0	590
Sewerage							
North zone	130	-	130	-	-	-	130
Central zone	239	-	239	-	-	-	239
South zone	147	-	147	-	-	-	147
Total	515	0	515	0	0	0	515
Storm water drainage							
Drainage along side Road	45	-	45	-	-	-	45
Nalla canalization	56	-	56	-	-	-	56
Strengthening exisiting nallas	45	-	45	-	-	-	45
Rejunevation of Nag and Pilli rivers	50	-	50	-	-	-	50
Lake rejunevation	50	-	50	-	-	-	50
Total	246	0	246	0	0	0	246
Solid Waste Management							
Sanitary landfill	25	25	0	-	-	-	25
Bin free city	25	-	25	-	-	-	25
Total	50	25	25	0	0	0	50
Slum Development / Housing							
NIT (EWS/ LIG)	125	-	125	-	-	125	-
MHADA	42	-	42	-	-	42	-
SRA	1350	-	250	1100	-	250	-
Urban poor ameneties	75	-	75	-	-	-	75
Total	1592	0	492	1100	0	417	75
Water recycling and reuse	250	0	0	250	0	0	0
Roads							
Outer Ring Roads 6-lane highways	650	90	560	-	650	-	-
Seven ROBs within city limits	128	90	38	-	-	-	128
10 Flyovers	100	-	100	-	-	-	100
Road widening /improvements(>24 m)	200	19	181	-	-	-	200
Bridges over rivers (Three)	8	8	-	-	-	-	8
Total	1086	207	879	0	650	0	436
MRTS and Traffic Management							
Traffic management	50	10	40	0	-	-	50
MRTS	1500	-	0	1500	-	-	0
Total	1550	10	40	1500	0	0	50
Social Amenities							
Destitute Home (one)	1	0	1	0	0	0	1
Marriage Halls (ten)	5	0	5	0	0	0	5
Night Shelters (four)	4	0	4	0	0	0	4
Public Toilets	5	0	5	0	0	0	5
Total	15	0	15	0	0	0	15
Grand Total	5894	502	2542	2850	650	417	1977

SUBMISSION OF DPR'S TO JNNURM (Phase-I)

- In Phase-I NMC submitted 10 DPRs in various sectors.
- Namely ♦ Pench-IV, Part-I ♦ Flow Meters ♦ Water Audit ♦ Energy Audit ♦ Strengthening of Water Supply Network ♦ ROB at Ram Mandir ♦ ROB Kalmana ♦ Development of Land Field Site ♦ Road Widening Works ♦ Traffic Improvement Project
- 1st Seven Projects got approval by CSMC and remaining three are under revision.
- The GoM has released an amount of Rs. 23.31 Crores as a grand to NMC against the sanctioned Seven Projects
- The Seven works are under progress

SUBMISSION OF DPR'S TO JNNURM (Phase-II)

Sr. No.	Name of the Sector	Name of the Projects		Cost of the Project in Rs. Crores
01]	Water Supply	a)	WTP Pench-IV, Part-2	62.47
		b)	ESR's Pench-IV, Part-3	86.47
		c)	D/Network Pench-IV, Part-4	110.75
		d)	WTP at Kanhan	83.59
02]	Water Reuse	a)	Water Recycling & Reuse	131.30

Sr. No.	Name of the Sector	Name of the Projects		Cost of the Project in Rs. Crores
03]	Road Sector	a)	RUB near Anand Talkies	25.40
		b)	RUB at Mominpura	10.00
		c)	ROB at Maskasath	2.91
		d)	ROB near Itwari Rly. Station	10.47
		e)		
04]	MRTS & Traffic Management	a)	Traffic Management System	4.60
TOTAL				527.96

1.4 LIST OF OTHER CAPITAL EXPENDITURE PROJECT SUPPORTED BY OTHER SCHEME FOR THE SECTOR:

Refer Para 1.3 above, which also indicates list of Project from other sector to be submitted for JnNURM funding.

1.5 EXISTING TARIFF AND COST RECOVERY METHODS:

1.5.1 Summary of Water recovery in Last Five year:

Statement of Demand and Receipt on A/c of Water Supply to Nagpur City				
Rs. in Lakhs				
Year	Demand	Receipt	% of Receipt	Remarks
1998-1999	2909.92	1483.89	50.99	
1999-2000	3391.11	1812.46	53.62	
2000-2001	5167.92	3190.11	61.73	
2001-2002	7087.93	4431.64	62.52	
2002-2003	7130.66	4568.97	64.07	
2003-2004	7150.00	4993.00	69.83	Recovery is inclusive of arrears receipt.

Source Water Audit Report (2004)

1.5.1 Existing per Unit cost:

Cost of Water for Rated Capacity of 470 Mld				
(Based on 2003-2004 revised budget)				
Fixed Cost				
	Establishment Expenses	5.50	Crore	
	O & M Expenses	7.02	Crore	
	Loan Repayment	26.20	Crore	
	TOTAL	38.72	Crore	Rs. 2.25/Unit
Variable Cost		34.36	Crore	Rs. 2.00/Unit
Development Cost*		22.13	Crore	Rs. 1.30/Unit
	Net TOTAL	95.21	Crore	
Total cost on rated capacity of WTP				Rs. 5.55/Unit

*Development cost taken in line of sinking fund / Depreciation.

$$\text{Cost of water on billed} = 5.55 \times \frac{470}{241} = 10.82/\text{Unit}$$

Source Water Audit Report & leak detection report (March-2005)

1.5.1 Existing Water Tariff Structure: (Refer Annexure- for more details)

I) Water Supply without Meter:

A consumer having an authorized connection but having no meter fixed to his water supply pipe, shall be charged according to the following rates, namely :-

Size of Connection	Rates	
	Residential	Non Residential
15 mm dia	Rupees 75	Rupees 300
20 mm dia	Rupees 150	Rupees 600
25 mm dia	Rupees 350	Rupees 2000

The rates shall be per month per house or unit (Tenement) :

Provided that in notified slum water rate for 15 mm dia connection shall be charged according to the following rates namely: -

Type of House	Rates
Roof without slab	Rupees 25
Roof with slab	Rupees 50

II) Water Supply by Meter:

- Water supplied by meter to the residential buildings & Non residential Building **In R1 Category.**

1 st 10,000 liters	at	Rupees 3.00 per 1000 liters
Next 30,000 liters	at	Rupees 3.50 per 1000 liters
And above	at	Rupees 4.00 per 1000 liters

- Water supplied by meter to Institution & Commercial organization **Rs.12 per 1000 liters.**
- Water supplied by meter to Industries **Rs.20 per 1000 liters.**

1.6 EXISTING AREAS OF PRIVATE SECTOR/ COMMUNITY PARTICIPATION:

NMC has enter into an agreement & allowed private participation in following fields of the Water Supply & Waste Disposal

- Operation & Maintenance of Pench-II & Pench-III WTP handed over to Private Firm.
- Collection solid waste form various Zone of city.

1.7 KEY ISSUES, IMPORTANCE OF THE PROJECT, EXTENT OF THE PROJECT:

1.7.1 Key Issues of the Sector:

Followings are some of the Key Issues related to this sector:

- Reduction of UFW in raw & treated water.
- Improvement & upgrading for energy efficiency of system.
- Rehabilitation of old assets i.e. Head works, WTP & ESRs
- Increasing of Coverage of supply Network from Existing 85% to 100%
- Recovery of O & M cost through tariff revision.
- Improvement to services to consumer.
- Augmentation of source to meet prospective demand.
- Services to urban poor by implementing W.S. policy for slum.
- Arranging low cost (life cycle cost) funds and technology
- Capacity building of operation staff.
- Efficient Metering, billing & collection system.

1.7.2 Importance & Extent of this Project:

By undertaking this project following goal could be achieved in the sector

- Augmentation of source to meet prospective demand.
- Rehabilitation of old assets i.e. Head works, WTP
- Improvement & upgrading for energy efficiency of pumping system.
- Effective management of Raw & treated water.
- Increasing of Coverage of supply Network from Existing 85% to 100%
- Improvement to services to consumer.

Chapter-2: Project Definition Concept & Scope

CHAPTER-2: PROJECT DEFINATION, CONCEPT & SCOPE

2.0.1 PROJECT CONCEPT:

Nagpur city, is presently getting water for from two major sources namely **Kanhan River** (Head work located near village Juni Kamptee) & **Pench Dam** (through Right Bank Canal with Lifting Point at Mahadula @ 48.5 Km of canal).

1. Kanhan Water Supply Scheme was commissioned in four phases during the years 1940 to 1970. The first phase capacity in 1940 was 27.3Mld which was augmented to 63.6Mld in 1954. The capacity was further augmented to 86.3Mld in 1966 and finally to 109Mld in 1970. Present supply from this source is @ 109 to 120Mld.
 - **Component executed during first phase at Kanhan Water Works has completed their use full life and needs rehabilitation / replacement.**
2. Pench-I, Pench-II & Pench-III Scheme was commissioned in 1982, 1984, and 2003 respectively. Pench - 4 is in design stage.
 - Existing Reservation of water in **Pench Project** for city **112 Mm3/year** (315mld)
 - **Additional reservation of 78mm3 over & above 112Mm3 is upto 2010. Irrigation Department is insisting NMC for developing of new captive source for their prospective drinking water requirement.**
3. Present Quantum of supply of pure water from both the source is 470 MLD. Prospective demand of pure water works out for the city as per Master Plan in year 2011, 2021 & 2031 is 532 MLD, 709 MLD & 934 MLD respectively. Hence augmentation of source is necessary to cope up the intermediate demand upto year 2016.
4. NMC is planning for construction Rahari barrage as prospective source to meet the prospective demand of total 350 MLD. (Ph-1 175 MLD by year 2016 & Ph-2 175 MLD by year 2026)
5. Kanhan River has More than 500 Mld of Untapped water during Monsoon period & post monsoon period to lift and supply to city with due augmentation.

2.0.1 PROJECT SCOPE:

NMC has undertaken this project, to minimize gap between demand & supply of the city for the intermediate period (2005-2016) till supply from prospective source starts, along with Augmentation and Replacement of existing infrastructure (old WTP with new WTP)

Accordingly NMC had invited proposals from reputed Project Management Consultant for,

1. Planning, Designing, Erection and commissioning of 120MLD Water Treatment Plant.
2. Rehabilitation of Clear water sump.
3. Construction of retaining wall to stop scouring of riverbanks at Kanhan Water works.

M/s. Dinesh Rathi & Associates (DRA), Nagpur had submitted their proposal, which was adjudged to be the most responsive proposal, after techno-economic evaluation.

DRA was therefore entrusted with the assignment vide NMC's Work Order No. NMC /WW/EE/01/2006 Dated 15th Feb. 2006.

2.0.3 OBJECTIVES OF PROJECT:

- Kanhan River has More than 500 Mld of Untapped water during Monsoon period. (Refer Annexure-1 River Gauging data)
- This additional Quantum available in Kanhan River can be lifted and supplied to city during Monsoon & Post Monsoon Period by utilizing existing system with Minimum possible augmentation at existing Headwork.
- **Replace existing old WTP with Enhance capacity to match Scenario of additional lifting.**
- To Study the feasibility of additional flow from Kanhan River during monsoon & part quantum and extending this system for lifting of back water of Rahari Project reaches at Kanhan Water works by utilizing existing component with augmented capacity. This will save energy in lifting the same Quantum from Rahari barrage with separate system.

Enhancement Of Scope With Additional Studies:

- *Lifting of additional water will be by utilization of maximum existing infrastructure at Kanhan along with required augmentation / rehabilitation of components for enhances capacity.*
- *Hence while studying feasibility of rehabilitation of the WTP this report has also focused on additional availability of water in Kanhan River for Max. Possible Augmentation upto 120 mld.*
- *The study has also focused on feasibility of Kanhan Augmentation works for future linking of Kanhan Water works with Rahari Project.*

2.0.4 PROJECT PLANNING:

Works planed under Rehabilitation & Augmentation of Kanhan source is with following considerations.

- Old WTP (61mld Design capacity) is constructed in Year 1940– Design Life period (50 Year) is already over hence construction of new WTP of additional enhance capacity of 120mld along with rehabilitation of existing WTP.
- Augmentation of Kanhan System for additional 120mld of water.
- Utilization of excess water available in Kanhan River (July to January) in lie of Pench water. This will save 22Mm3/ year water in Pench to utilize during summer to meet water demand of city upto year 2015.
- Protection of River Banks near existing Headwork.
- Rehabilitation of Existing infrastructure at Kanhan Water works.

2.0.5 WATER BALANCE OF CITY WITH PROPOSED KANHAN AUGMENTATION:

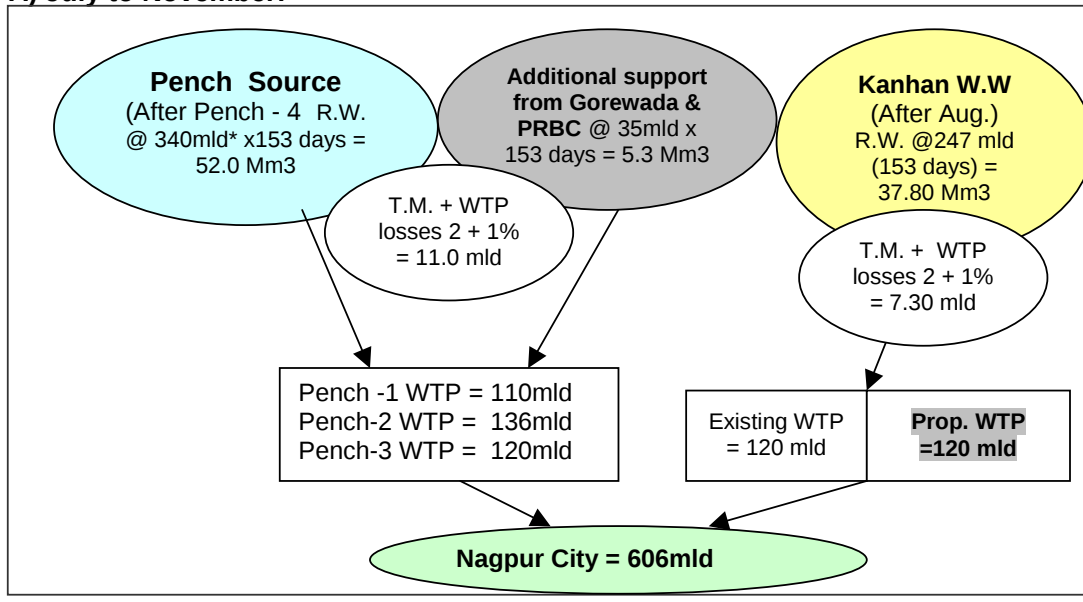
Table 2.1 shows the Prospective Water Demand of raw & pure water of city.
(Ref. Annexure -2)

Table 2.1

Particulars		Yr.- 2011	Yr.-2015	Yr.-2021
Raw water @ Intake from all the source	Mld	548.00	621.20	731.00
	Mm ³ /Yr	200.00	226.70	266.80
Pure water @ WTP from all the source	Mld	532.00	602.80	709.00
	Mm ³ /Yr	194.20	220.00	258.80

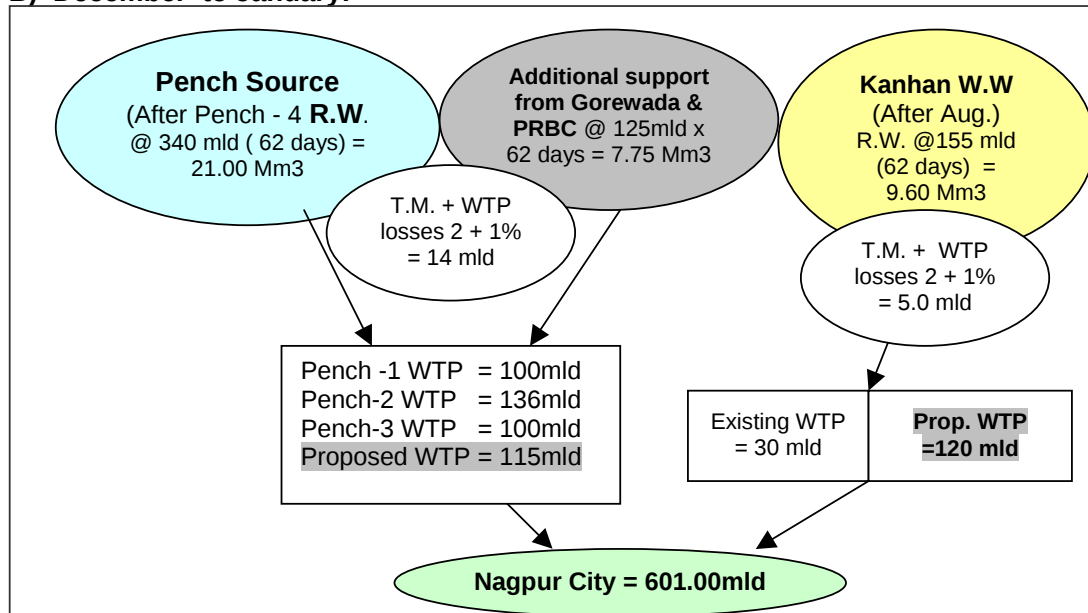
This Prospective water demand of the city up to Year 2015 (till Rahari Project Executed) can be fulfilled by proposed scenario of lifting additional Flow from Kanhan river by utilizing existing infrastructure to its Max. Capacity with due rehabilitation & Augmentation for Max. Capacity of 120 mld. at Kanhan & Part –II Works of Pench-IV Project. Same is elaborated below.

A) July to November:

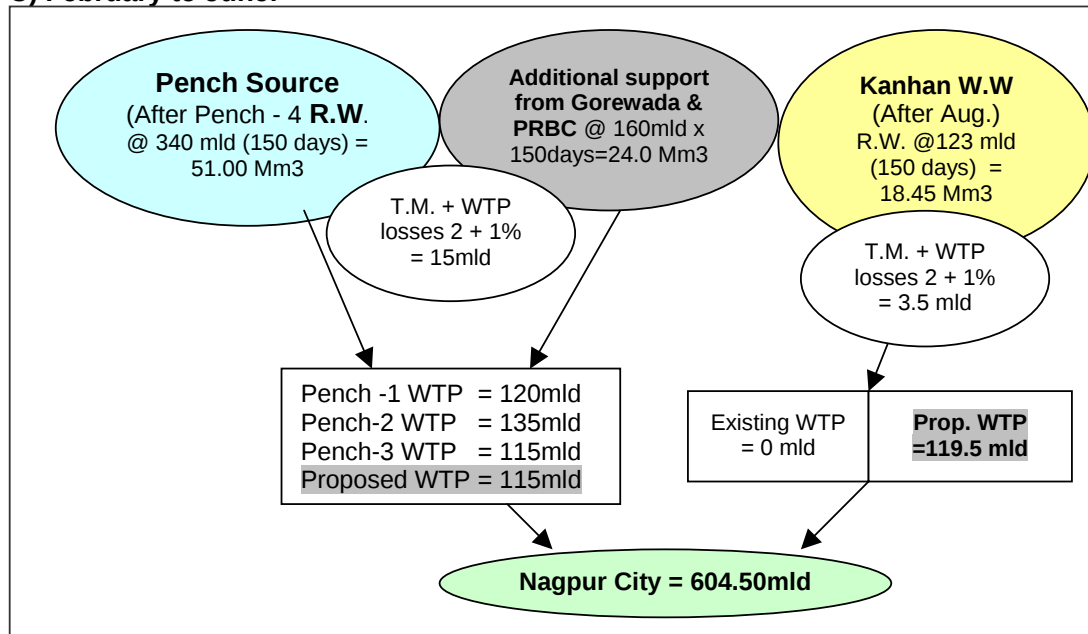


Note:

- 1) Reservation in Pench Dam is for 112 Mm3/year i.e. equivalent to 307mld.
- 2) * 10% over drawl is within same tariff.
- 3) Pench-4 Pipe line can carry @ 20% more discharge.
- 4) Hence total quantum $(307 \times 1.1) + 35 = 373\text{mld}$, can be conveyed through Pench-4 Pipe line. Hence no need of lifting water from Canal.
- 5) **Pure water Demand upto Year 2011 is 532mld which shall be fulfilled by existing reservation at Pench & Additional lifting with augmentation from Kanhan.**
- 6) To meet the prospective demand by Yr 2015, additional reservation of 43Mm3/year is required in Pench Dam.

B) December to January:

- Note:
- 1) Additional Support from PRBC is required @ 125mld.
 - 2) **Proposed WTP of 115mld has to be executed** to match supply schedule till Yr.2015 against seasonal variation in lifting of water from different sources.

C) February to June:

- Note:
- 1) Additional Support from PRBC is required @ 160 mld.
 - 2) **Proposed WTP of 115mld at Godhani as proposed in Pench-4 has to be executed** to match supply schedule till Yr.2015 against seasonal variation in lifting of water from different sources.

2.0.6 PROPOSED DRAWL FROM VARIOUS SOURCES

(After Kanhan Augmentation):

Abstract of proposed seasonal drawl from various sources after augmentation at Kanhan is as follows. This will fulfill the requirement of city upto year 2015.

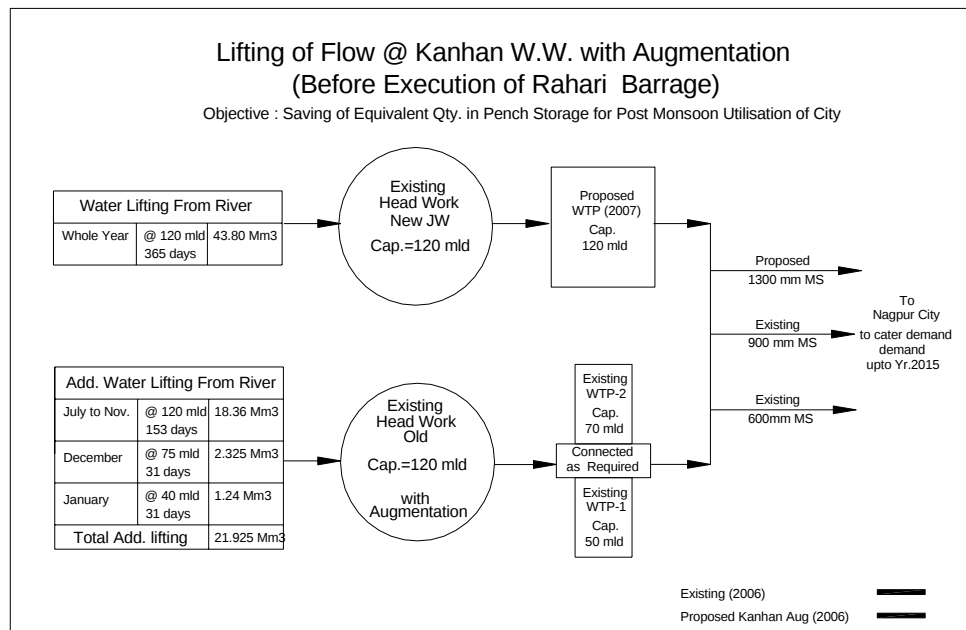
Table 2.2

Source	July - November	December - January	February - June	Total	Remark
	Mm3	Mm3	Mm3	Mm3	
Pench Dam	52.00	21.00	51.00	124.00	(Against Present reservation 112Mm3 + 10% over drawl)
Additional Support					Against Additional Reservation
Pench	0.00	7.75	24.0	31.75	
Gorewada	5.30	0.0	0.00	5.30	Quantum from self catchment @ 17 mld
Kanhan River	37.80	9.60	18.45	66.30	Additional lifting @ 22.0 Mm3 from July to Jan.
Total				227.35	Mm3

- **Total Reservation Req'd. Pench dam** = 124 + 31.75
- = **155.75 Mm3**
- **Present confirmed Reservation** = **112 Mm3**
- **Additional reservation required** = **43.75 Mm3**
- **Present Billing to ID** = **167 Mm3**

2.0.6 FEASIBILITY OF FUTURE CONNECTIVITY WITH RAHARI BARRAGE:

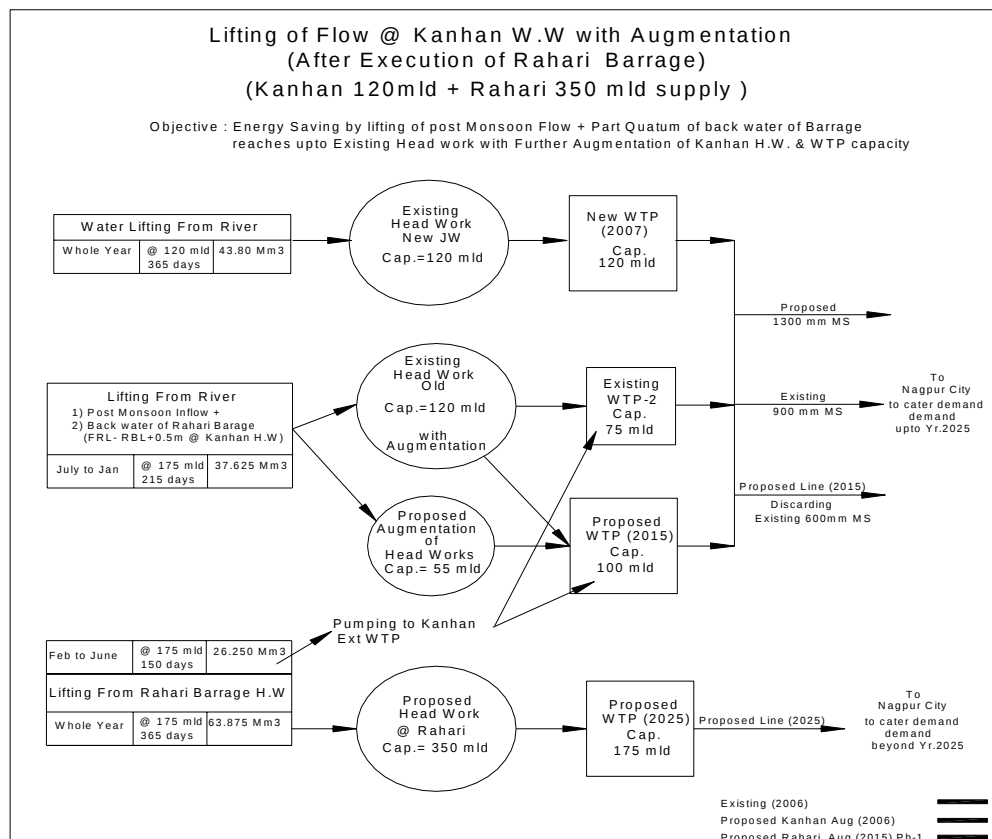
Existing System with augmentation at Kanhan W.W. before Execution of Rahari Barrage :



2.0.7 HIGHLIGHTS OF STUDY:

- 95% dependable Monsoon flow (July to October) in Kanhan river is more than 500MLD against required (120mld Existing +350mld prospective) 470mld.
- FRL of Rahari Barrage is 270.000m, where as Ave. River bed level at Existing Head work is 268.000 m. Storage capacity at RL 268.000 is 31.82 Mm3.
- Back water which reaches upto Existing H.W (RL 270.00-268.00) can be lifted in addition to 95% inflow in river (Nov. to Feb.)
- Existing capacities of various component i.e. Head work, WTP & Transmission main from Kanhan to City after proposed augmentation will be of 240 MLD.
- Total capacity of system after execution of Rahari Ph-1 of 175 MLD will be $(120 + 175) = 295$ MLD. Hence For inter connection of Rahari Ph-1 to Nagpur city through Existing Kanhan; additional augmentation for 55mld will be sufficient instead of separate system for 175 MLD.
- Cost of linkage of Rahari Barrage source with Kanhan water works + further augmentation for additional 55mld will be Rs. @125.0 Crores against Rs. 168.00 Crores for separate system of 175 Mld. I.e saving of Rs 43.00 Crores capital Cost. (Refer Annexure-3 Comparative Costing attached herewith)

Proposed System with Utilization of Kanhan W.W after Execution of Rahari Barrage :



2.0.8 CONCLUSION & RECOMMENDATIONS:

- *Modern Technology WTP plant of 120mld design capacity has to be constructed for replacement of old WTP of 61mld with enhance capacity for operational flexibility for seasonal lifting of maximum additional flow available.*
- *Additional quantum (40 – 120mld) than present max. drawl (120mld) is available at Kanhan from July to January*
- *Existing Infrastructure has to be rehabilitated to match scenario of lifting additional flow available in Kanhan river.*
- *Parallel Pumping main for additional capacity (Max. 120mld) has to be laid for @ 10.0 Km (Kanhan WTP to Automotive Square)*
- *Execution of Part-2 of Pench-4 should be expedited for operational flexibility of seasonal lifting of water from Kanhan & Pench.*
- *Further Linking to existing network of feeder main with prospective source Rahari is Possible with least augmentation.*
- *Kanhan augmentation can be Part of Rahari-Ph-1(for 120mld) as lifting of additional lifting of 120 mld is possible over ext. 120 mld at Kanhan Head works throughout the year with lifting as detailed below:*
 - July to Dec - From River Flow - 240mld
 - Jan- June - From Flow - 120mld
From Back water of Rahari
Reaches @ Kanhan H.W - 120mld
- *With this argumentation Rahari Project can be Phase out as:*
 - Rahari Phase - 1 120 MLD (Water Lifting @ Kanhan H.W)**
 - Rahari Phase – 2 230 MLD (Water lifting @ Rahari H.W)**

2.0.9 PROJECT COMPONENTS:

Major project Components of the projects are as follows.

- Augmentation of Head works for lifting additional discharge 120mld.
- Construction of New WTP 120mld capacity
- Transmission main for additional 120mld capacity
- Rehabilitation of existing infrastructure i.e. Head work, WTP, PW Sump & pump House to match the scenario of additional availability of water.
- Protection of Riverbanks near Head works for scouring.

2.1 LAND:

Details of land required for various component of this project & existing status of it is as under

Sr. No	Components	Details of land holding	Remark / Status
1	Head work & bank protection work	Land at exiting Headwork belongs to NMC	No need to acquire additional land for augmentation work.
2	Construction of New Intake works	Land required 0.5 ha Land belongs to Revenue Dept.	NMC has already moved proposal to transfer this land to NMC
3	Construction of Additional WTP	Proposed WTP is located in available land at Existing WTP belongs to NMC	No need to acquire additional land for construction of New WTP.
4	Laying of Additional Transmission Main 10.km	Proposed line will be laid parallel to existing pipeline along National High way No.7 in acquired road boundary.	NMC has already moved proposal for permission for laying of additional pipe line parallel to existing pipe line & road in acquired land width belongs to National high Dept.

2.2 PHYSICAL INFRASTRUCTURE:

COMPONENT 2.2.1: SOURCE INVESTIGATION

Detailed Study for Availability of Additional Water from Kanhan River Source in monsoon and post monsoon Period is given in Chapter- 2, Para 3.1 of Detailed Project Report submitted separately.

COMPONENT 2.2.2: AUGMENTATION OF HEAD WORKS

Detailed investigation about lifting capacity of existing headwork, their limitations in augmenting the capacity, proposed planning for construction of New Intake, merits & demerits of various alternatives for proposed intake and conclusion is discussed in details in Chapter 3.0, Para 3.3 “ Augmentation of Kanhan Head Works.

COMPONENT 2.2.3: PROPOSED WATER TREATMENT PLANT

New treatment plant is proposed to be constructed in the existing premises of Kanhan water works. The enhance capacity this WTP will be 120mld considering replacement of capacity of the old inefficient WTP & to match the augmented supply scenario as indicated in Chapter-2 of DPR.

Old WTP, with necessary rehabilitation can be continue to work for short period to supplement demand of city and to match operational flexibility as discussed in Chapter –3 of DPR.

All other details i.e. Availability of land, Input & Output Parameters, Hydraulic capacities, Selection of treatment process, various components in proposed WTP, Merits of proposed technology plant, Hydraulic flow sheet of WTP is given in Chapter 3. Para 3.4 of DPR submitted separately

COMPONENT 2.2.4: AUGMENTATION OF TRANSMISSION SYSTEM

Details of Existing Scenario of supply with twin Pumping main of 600 & 900 mm dia and Flow Management with utilization of Existing twin lines with Proposed 1300mm line for additional water (Max.120 mld) proposed to be lifted during Monsoon & few months of Post Monsoon, is explained in details in Chapter-3, Para-3.5 of Detailed Project Report submitted separately.

Status of Existing Infrastructure (i.e. Headwork, raw water pumping machinery, old WTP, pure water sump & pump house etc.) their capacity limitation for further augmentation, and proposed planning of rehabilitation of it is elaborated in Chapter 3 & 4 of said DPR.

Also necessity of protection of riverbanks near existing head works, recycling system for filter backwash etc are discussed and their details are incorporated in Chapter–4 of Detailed Project Report submitted separately.

Site/source investigation data, drawings of Existing infrastructure, Detailed Design of proposed components, detailed drawings of proposed structure & annexure to DPR are incorporated in Detailed Project Report as indexed below.

- | | |
|---|--------------------------|
| • Site/source investigation data, | Refer Annexure-1 |
| • Drawings of Existing infrastructure, | Refer Reference Drawings |
| • Detailed Design of proposed components, | Refer Chapter-5 |
| • Detailed drawings of proposed structure | Refer Project Drawings |
| • Annexure to DPR | Project Drawings |

Contd. ____

2.3 ENVIRONMENTAL COMPLIANCE / PROTECTION MEASURES / IMPROVEMENT MEASURES:

2.3.1 Environment Impact Assessment:

2.3.2 Environment Management plan:

2.4 REHABILITATION AND RESETTLEMENT:

The project is for augmentation and rehabilitation of old infrastructure at Kanhan water work for enhance capacity. All these augmentation and rehabilitation work will be carried out in existing premises of Kanhan water works. Hence there will be no resettlement of habitation.

2.5 SPECIALIZED PROCURED SERVICES FOR DESIGN, INDEPENDENT SUPERVISION & QUALITY ASSUARANCE:

2.5.1 Project Management Consultancy:

NMC has hired the services of professional consultant for "Survey, Investigation & Preparation of Project Report, Tender documents" etc.

Supervision & quality assurance during execution of project will be done through "Project Management Consultancy" appointed by NMC.

2.5.2 Special Design Consultancy:

Proposed water treatment plant 120mld capacity will be design with modern ideal technology available to cater the abnormal turbidity variation (10 NTU to 8000 NTU) during monsoon period in Kanhan River.

Hence NMC may think for specialized services during execution from subsidiary National/ International companies having sufficient experience in this field, under Design Built & Operate (DBO) contract for this component only.

2.6 OTHER INFORMATION:

2.6.1 Details of Survey Investigation:

Survey data of Kanhan Water works area including data for proposed intake site is plotted and given in detailed layout plan, as well as respective para of component in attached in DPR submitted herewith.

2.6.2 Assessment of requirements related to utilities shifting:

Augmentation work will be carried out in exiting premises hence this is not applicable for this project.

2.6.3 List of Clearances:

Most of the Augmentation work will be carried out in exiting premises hence there is no need of further clearances for these components. However for execution of following few components, clearances are necessary from the authorities as mentioned below. NMC had already perceive for this and Status of same is as given in tabular format.

Sr. No.	Components	Clearances required	Authority	Present status
1.0	Construction of New Intake in Kanhan River	Water lifting permission	Collector / Irrigation Dept.	NMC has already perceive the matter
		Transfer of Revenue Land	Collector	NMC has already perceive the matter
2.0	Proposed Transmission Main	Laying of pipeline along National Highway No-7 as indicated in L-section of alignment	National Highway Authority of India	NMC has already perceive the matter

2.6.4 Disaster related risk assessment: Not applicable

Chapter-3: Project Cost

CHAPTER-3: PROJECT COST

Sr. No	Components	Estimated Cost	Total
		(Rs. Crores)	(Rs. Crores)
3.1	LAND ACQUISITION / SITE DEVELOPMENT		0.00
3.2	PHYSICAL INFRASTRUCTURE (As per Sec.2.2)		
I)	AUGMENTATION WORKS		
1	Proposed Intake Structure		
a	Intake Chamber	0.27	
b	Connecting Main	0.60	
c	Collecting chamber	0.17	
2	Proposed W.T.P. Cap.=120mld	35.00	
3	P.W. Sump & Pump House	0.85	
4	P.W. Pumping Machinery	4.00	
5	Augmentation of Transmission Main	24.70	
6	Proposed Branch Transmission Main	6.60	
			72.19
II)	REHABILITATION OF EXISTING COMPONENTS		
1	Protection of River Banks (240m length)	4.50	
2	Rehabilitation of Misc. Components at Kanhan Water works		
a)	Replacment of Existing Raw water Pumping Machinery at Old Pump Wells	1.35	
b)	Rehabilitation of Existing Sump (2 Nos)	0.50	
c)	Wall Compound to Kanhan Water works Premises (Total Length =740 m)	0.26	
d)	Repairs & Strengthening to Old WTP (61+ 67 mld)	4.41	
e)	Recycling of Filter Back wash water (5.0 Mld cap.)	0.40	
			11.42
	SubTotal (I + II)	83.61	
3.3	ENVIRONMENTAL COMPLIANCE COST		0.00
3.4	REHABILITATION & RESETTELMENT COST		0.00
3.5	COST OF SURVEY & PROJECT PREPARATION		0.25
3.6	COST OF SHIFTING UTILITEIS		0.00
3.7	COST OF CONSULTANCY SERVICES (PMC)		1.25
3.8	OTHER STATUTORY COMPLIANCE COST		0.00
3.9	FINANCE/ INTEREST COST DURING CONST.		1.23
3.10	CONTINGENCIES (Physical Contingencies included In Estimates)		0.00
3.11	ANY OTHER COST		0.00
	TOTAL PROJECT COST (Rs. Crores)		86.34

Note: For Detailed Estimate please refer Volume –II of DPR

Chapter-4: Project Institutional Frame Work

CHAPTER-4: PROJECT INSTITUTION FRAME WORK

4.1 ROLE OF DIFERENT INSTITUTION INVOLVED IN CONSTRUCTION PHASE:

- Existing utility (Kanhana water works) is presently Operated & Maintained by ULB, Nagpur Municipal Corporation (NMC).
- NMC has appointed the Consulting agency for "Design, Planning & Preparation Project Report" the Consulting Agency will also be responsible for Project Management.
- Proposed component of augmentation work under this project will be executed by appointing "Executing Agency" through tendering process.
- Executing Agency should have necessary expertise and desired past experience of undertaking project of similar nature & magnitude.
- Executing agency appointed for execution of above work will also be responsible for Operation and maintenance as an "Operator" for Operation and Maintenance of utility (Kanhana water works) after augmentation.

4.1.1 Responsibility Matrix:

Sr. No.	Responsibility	State / Central Govt.	NMC	Executing Agency	Project Management Consultant	Operator
1.0	Statutory Permissions		✗			
2.0	Funding	✗	✗			
3.0	Project Drawing /Specification.		✗		✗	
4.0	Patented design of component			✗		
5.0	Execution of work			✗		
6.0	Supervision & Quality Monitoring		✗		✗	
7.0	Operation & Management		✗			✗
8.0	Revenue Collection		✗			

4.2 MANNER OF UNDERTAKING CONSTRUCTION WORK:

As stated in Para 4.1, Executing agency appointed by ULB (NMC) through tendering processes will execute the work under strict supervision of Project Management Consultant appointed by NMC.

4.3 INVOLVEMENT OF THE CONSTRUCTION ENTITY IN THE SUBSEQUENT O & M:

NMC can evaluate the following options for Operation & Maintenance of the utility,

Sr. No.	O & M Responsibility	Option -1	Option -2	Option -3
1.0	Lifting of Raw water	⊗	⊗	■
2.0	Treatment of water (Old WTP)	⊗	■	■
3.0	Treatment of water (New WTP)	■	■	■
4.0	Pumping & transmission of Pure water	⊗	⊗	■

⊗ NMC ■ Executing Agency (Operator)

Period of Operation & Maintenance for operator shall be **5-15years** as per the agreement between ULB (NMC) & operator at the time of tendering.

However for any one of the option as discussed above, Operation & maintenance of the of Modern Water Treatment plant, for Minimum period of **Five years** will be with executing agency for this WTP.

4.4 AREAS OF INVOLVEMENT OF PRIVATE SECTOR:

1.	Project Feasibility Studies	√
2.	Project Engineering Design	√
3.	Specialized Survey	√
4.	Construction Works	
5.	Supervision Consultant	√
6.	Quality Assurance	√

4.5 CONSTRUCTION “PACKAGES” FOR WORKS CONSTRUCTION:

Total Augmentation work under this project is proposed to split in following packages,

Package No	Package Description	Estimated Cost (Rs. Crores)	Total Cost (Rs. Crores)
1.0	Construction of Proposed Intake,	1.04	48.31
	Construction of Proposed WTP (120mld Cap)	35.00	
	Construction of Proposed sump & Pump House	0.85	
	Protection of River bank, Recycling system, and Rehabilitation of existing infrastructure (I.e. HW, WTP, RW Pumping)	11.42	
2.0	Proposed Pure water Pumping Machinery (120mld cap.)	4.00	35.30
	Proposed Pumping Main (120mld cap.)	24.70	
	Proposed Branch Transmission Main	6.60	

Chapter-5: Project Financial Structuring

CHAPTER-5: PROJECT FINANCIAL STRUCTURING

5.1 Over all Financial Structuring of the Project:

1	2	3	4	5	6	7
Sr. No.	Govt.	Project contribution source	Amount (Rs. Lakhs)	% share by Specific Source	% share by Govt. Entity	Remarks on when and how state and ULB shares would arranged
1	Central	ACA Grant	4180.5	50%	50%	Not applicable
2	State	Grant towards its share in project	1672.2	20%	20%	
3		Govt. towards its share				
4	ULB / Parastatal	Devolved funds			30%	
5		Own surplus resource				
6		Debt/Term Loan taken from State govt.				
7		Debt/Term Loan taken from bank / FI	1254.15	15%		From Schedule Bank during Execution period
8		Debt: from accessing capital market				
9		Private equity / community resource funding others	1254.15	15%		Capital Share during Execution period & will be returned in EMI during O & M period as per Agreement of Monthly Water Bill
Total amount			8361.00	100%	100%	

5.2 Review for Institutional Debt & Private sector Participation (Extract from CDP)

• Financing strategies for the CIP

NMC plans to raise resources and fund the CIP by:

- Accessing the grants available under the JNNURM framework
- Using available internal resources and improving upon the same through:

Increasing property tax collection by improving collection efficiency and increasing the average yield per property through reassessment

Increasing revenues from water supply by reducing non-revenue water and rationalization of tariffs.

NMC would also explore the option of raising **debt** to bridge the investment deficit.

For projects, which are out of bounds of NMC, various other funding options would be explored.

• ULB finance projections

Current ULB finances are projected under built-in growth assumptions for income and expenditure items to assess the impact of each such revenue enhancement measure being suggested. The projections also aim at estimating the surplus that will be available for servicing new debt. A part of the surplus will be utilized to meet the O&M expenses on newly created assets.

A spreadsheet FOP model has been customized to depict the financial position of NMC and work out the investment sustaining capacity of NMC, based on the FOP's assumptions. The model can be used to calculate future surpluses under various scenarios involving combinations of internal revenue improvement, state support, financing terms, etc.

Municipal Account – growth projections and assumptions

The standard assumptions under which the projections are carried out and certain expenditure control and revenue augmentation measures proposed in line with the mandatory and optional reforms under the JNNURM framework are presented below.

Important Assumption Made are:

Head	Assumptions
Octroi	
Growth in octroi	Octroi to increase at 12% CAGR
Property Tax	
Growth in PT assessments	Property tax assessments to increase by 5% per annum
Collection efficiency	85% collection efficiency to be attained from current level of 51% by 2011-12
Growth in tax rate	No revision in tax rates envisaged; reassessment to result in 20% increase in average yield in 2007-08
Widening the tax net	Identification and assessment of all properties in the ULB by 2007-08 through GIS based survey
Water charges	
Growth in HSCs and demand	Connections to increase by 3% per annum
Collection efficiency	85% collection efficiency to be attained by 2011-12
Water rate & new connection deposit	Revision in rates in 2008-09 by 25%
Reduction in UFW	UFW to be 25% in 2009-10 compared to 38% currently

Head	Assumptions
Other income items and capital grants	To increase within a band of 5-10% CAGR
Expenditure items growth rate	To increase within a band of 5-10% CAGR
Salaries/ wages	To increase by 7% per annum
Project financing terms under JNNURM framework (All urban infrastructure/ governance/urban poor related projects except land acquisition costs)	JNNURM framework 50% GoI grant, 20% GoM grant Revolving fund <u>Urban infrastructure/governance projects</u> - Contribution of 25% of the total grants received under JNNURM framework to the State Infrastructure Fund by 2011-12 <u>Urban poor/slums projects</u> - Contribution of 10% of total grants received under JNNURM framework to the State Infrastructure Fund by 2011-12. O&M expenses on new assets (urban poor and slums projects) also to be met from the fund
Loan terms for commercial borrowings of NMC	Loan period: 7 Repayment method: Equal annual installments Interest rate: 7.5%-9% per annum
Debt Service Coverage Ratio	DSCR of at least 1.25
O & M expenditure arising from new assets (from 2007-08)	The incremental O & M for new assets is calculated based on the following norms (O & M cost as a % of capital costs): Water supply 4% Sewerage 4% Solid waste management 7% Roads & bridges 7% Storm water drainage 4% Traffic management 10% Road widening and improvements 2% Non-JNNURM capex 5% For the second year and beyond a growth rate of 5% is assumed on the base O & M cost.
Outstanding debt liabilities	Repayment in equal installments over a 7-year period starting 2006-07; NMC also owes MJP an amount equivalent to Rs.88 crores; it has been projected that this amount would be repaid over two years: Rs.53 cores in 2006-07 and Rs.25 cores in 2007-08

- **Investment capacity/ sustenance**

Given the existing financial position of NMC, the revenue and capital accounts of NMC are projected against the growth scenario and assumptions presented above. The revenue improvement and expenditure control measures coupled with the availability of grants under the JNNURM framework give NMC an investment capacity of Rs.2273 crores (escalated costs) over the next six years against NMC's investment need of Rs.3727 crores (at current costs) by 2011-12. The investment capacity even with implementation of reform measures is still found to fall short of the funding requirements.

- **Impact of JNNURM reforms on investment capacity**

It is observed that following current growth trends, NMC can sustain an investment of Rs.428 crores only. The implementation of the reform agenda as desired by JNNURM, along with some amount of leverage, will allow NMC to raise its investment capacity to Rs.735 crores. When this amount is supplemented with JNNURM funds and debt raised by NMC the investment capacity of NMC increases to Rs.2273 crores.

- **Sources of funding**

The CDP has identified projects, which are estimated to cost Rs.5894 crores at current prices. However, NMC's would be responsible for projects costing only Rs.3727 crores. However, JNNURM grants, internal accruals of NMC and debt can together fund projects worth Rs.2273 crores at escalated prices, factoring in the price escalation on the project costs over the six year period. The source of Rs. 2273 crores would be as follows:

Source of funding	Source	Amount (Rs. crores)	% of Total Investment
GoI Grants	JNNURM	1137	50.0
GoM Grants	JNNURM	455	20.0
Loan	Open Market/ FIs	185	5.6
Own sources	NMC	496	24.4
Total		2273*	100.0

*This is the escalated cost while at current prices the cost is Rs1977 crores.

- **Bridging the investment deficit**

Identified NMC's investment projects during the tenure of JNNURM are estimated to cost Rs.3727 crores while the investment capacity is Rs.2273 crores. NMC has identified opportunities for bridging the investment deficit. Some of the identified projects like MRTS and water recycling and reuse can be funded through the public private partnership (PPP) route. The investments in these two projects aggregate to Rs.1750 crores at current prices.

- **Nagpur City Development Plan Projects**

The identified projects along with their respective implementing agencies are shown in the table below.

Sector	In Rs crores	PPP	State Govt MHADA / NIT / Source of Funding	NMC / JNNURM
Water supply and distribution	590	-	-	590
Sewerage	515	-	-	515
Storm water drainage	246	-	-	246
Solid waste management	50	-	-	50
Slum development / housing	1592	1,100	-	75
Water recycling and reuse	250	250	-	-
Roads	1086	-	650	436
MRTS and traffic management	1550	1,500	-	50
Social amenities	15	-	-	15
Grand total	5894	2,850	650	1,977

Chapter-6: Project Phasing

CHAPTER-6: PROJECT PHASING :

6.1 SCHEDULE OF TENDERING / SELECTION FOR PROCUREMENT OF SERVICES:

I) Consultants/ Firm for Supervision and quality assurance:

Nagpur Municipal Corporation (NMC) has already appointed Project Management Consultant for extending their services to assist NMC in following activities,

- Survey & investigation of project,
- Design & Preparation Detailed project report,
- Preparation of Tender documents
- Preparation of construction & working Drawing
- Supervision and Quality assurance during execution of work.

Nagpur Municipal Corporation (NMC) may extend the scope of Project Management Consultant for rendering their services to assist NMC in following activities,

- Preparation of Project Report In Prescribed format and documentation required by funding organization and necessary follow for same.

II) Consultants/ Firm for Specialized Activity:

This has been already covered in above para. However for any specialized scope of work i. e Design of Modern WTP, Third party checking of structural & hydraulic design of components submitted by consultant from well reputed Organization working in field e.g. VNIT, VJTI, IIT NEERI etc.

This activity will be simultaneously done as soon as the project is submitted for technical & financial approval to funding organization

III) Construction Contractor:

After clearance to the project from CSMC, Nagpur Municipal Corporation (NMC) will go for tendering to finalized the Executing Agency within **Three Months.**

6.2 SCHEDULE OF BRINGING IN STATE & ULB LEVEL CONTRIBUTION TO PROJECT.

Schdule of Financial Contribution and Sources Table (in Rs. Lakhs)													
Sr. No.	Sorces	Total Cost	FY 07-08					FY 07-08					FY 09-10
			Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total	Scheduled Amount
			Schedule Month and Amount					Schedule Month and Amount					
1	GoI (50%)	4180.5	1045		1045	1045	3135		1045			1045	
			25%		25%	25%	75%		25%			25%	
2	State (20%)	1672.2	418		418	418	1254		418			418	
			25%		25%	25%	75%		25%			25%	
3	ULB (30%)												
a	Bank Loan	1254.15	125	125	125	125	500	125	125	125	125	500	251
			10%	10%	10%	10%	40%	10%	10%	10%	10%	40%	20%
b	PPP	1254.15	125	125	125	125	500	125	125	125	125	500	251
			10%	10%	10%	10%	40%	10%	10%	10%	10%	40%	20%
Total		8361.00	1713	250	1713	1713	5389	250	1713	250	250	2463	502.4
Total cost of Project Rs. 8361 lakhs													

6.3 SCHEDULE OF OBTAINING ALL CLEARANCES:

Sr. No	Clearances Required	Present status	Schedule Date of
1.0	Water lifting permission for lifting additional 120mld water from River	In Process	Three Months
2.0	Transfer of revenue land for construction of New Head work	In Process	Three Months
3.0	Permission to for crossing & laying of proposed pipe line along National High way	In Process	Three Months
4.0	Permission to crossing Railway line for proposed pipe line	In Process	Six Months
5.0	Additional Power supply for Augmented capacity.	In Process	Three Months

6.4 SCHEDULE OF SHIFTING UTILITIES:

Not applicable for this project.

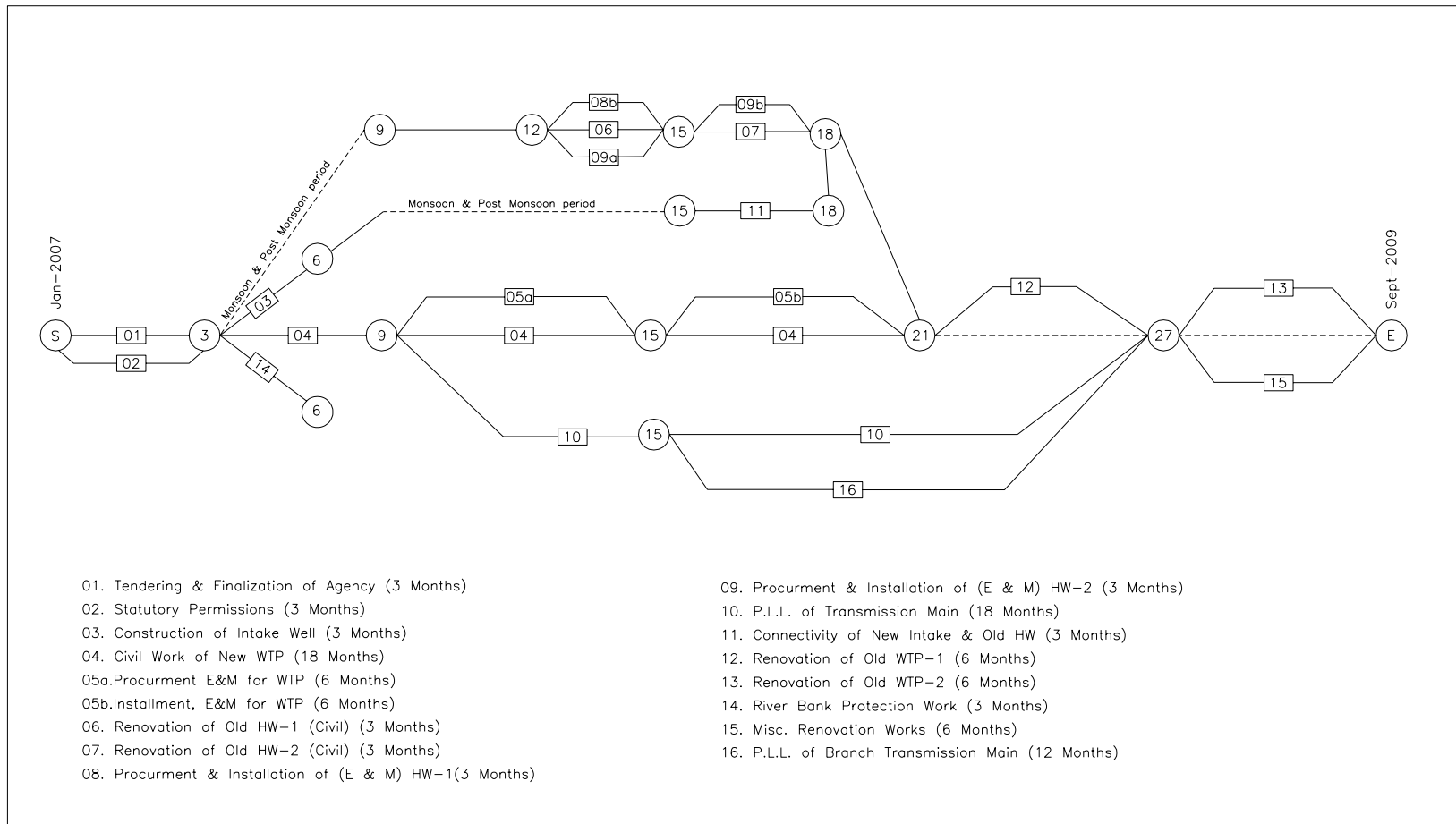
6.5 PROJECT INFRASTRUCTURE COMPONENT-WISE IMPLEMENTATION: Bar-Chart for Key activities

S N.	Item / Activity	April to June 2007	July to Sept. 2007	Oct. to Dec. 2007	Jan. to Mar. 2008	April to June 2008	July to Sept. 2008	Oct. to Dec. 2008	Jan. to Mar. 2009	April to June 2009	July to Sept. 2009
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
1.	Head works Construction of New Intake										
	Cost Rs. Crores	0.27				0.17					
	Connectivity with old intake-2										
	Cost Rs. Crores					0.60					
	Renovation of Existing Intake -1										
	Cost Rs. Crores				0.25						
	Renovation of Existing Intake -2										
	Cost Rs. Crores					0.25					
2.	Raw Water Pumping Machinery										
	Renovation at Existing Pump well -1										
	Cost Rs. Crores			0.50	0.175						
	Renovation at Existing Pump well -2										
	Cost Rs. Crores				0.50	0.175					
3.	Water treatment plant										
	Construction of New WTP & sump & PH										
	Civil Cost (60%) Rs. Crores	2.50	4.50	4.50	4.50	3.00	2.85				
	Electro-Mech. Cost (40%) Rs. Crores			6.00	6.00	1.00	1.00				
4.	Pure water Pumping Machinery Cost			1.50	1.50	0.50	0.50				
5.	Renovation of Existing WTP –1										
	Cost Rs. Crores							1.21	1.00		
6.	Renovation of Existing WTP –2 & Sump										
	Cost Rs. Crores									1.20	1.00
7.	Pure Water Transmission Main										
	Cost Rs. Crores			2.50	5.00	5.00	5.00	5.00	2.20		
8.	Branch Transmission Main										
	Cost Rs. Crores					1.30	2.00	2.00	1.30		
9.	Misc. Renovation work										
	Cost Rs. Crores									0.40	0.35
10.	River Bank Protection Work										
	Cost Rs. Crores	4.50									
	Total Cost	7.27	4.50	15.00	17.925	11.995	11.350	8.21	4.50	1.60	1.35

Civil Works Electro-Mechanical Works Procurement of Machinery

- Note:
- Existing Head works St-3 (U/s of Barrage), existing WTP & existing pumping main will be in operation till New WTP, starts its functioning without affecting present supply.
 - Old WTP will be taken for renovation only after new WTP starts its working.
 - Existing Pure water pumping machinery will be renovated in separate tender (Energy Audit Project)

6.6 CPM/ PERT CHART:



Chapter-7: Project O & M Planning

CHAPTER-7: PROJECT O & M PLANNING

7.1 INSTITUTIONAL FRAMEWORK (ORGANIZATION & OPERATION) STRATEGY

7.1.1 Institution Engaged for O & M

AT Present NMC is looking after Operation & Maintenance of the Kanhan Water Works.

Operation & Maintenance of some of the WTP (Pench-3 Cap.120mld) & Bhandewadi STP in the city are given private O & M operator on yearly contract. Considering the past experience of NMC with private O & M operator and having good results there through, NMC may go for long term hardening over of Kanhan water works, either partially or fully to Private O & M Operator.

As stated earlier in Para 4.3, NMC has to evaluate following various options of handing over of plant for O & M either partially or fully considering the utilization of existing O & M staff of NMC.

The various options of O & M are,

Sr. No.	O & M Responsibility	Option -1	Option -2	Option -3
1.0	Lifting of Raw water	⊗	⊗	■
2.0	Treatment of water (Old WTP)	⊗	■	■
3.0	Treatment of water (New WTP)	■	■	■
4.0	Pumping & Transmission of Pure water to Storage reservoir connected on line	⊗	⊗	■



NMC



Private O & M Operator

Period of Operation & Maintenance for operator could be **5-15years** as per the agreement between ULB (NMC) & operator at the time of tendering.

Broad Condition / Responsibility Matrix for O & M for various options with NMC are as follow:

Sr. No.	O & M Responsibility / Conditions	Partial Contract		Full Contract	
		NMC	Operator	NMC	Operator
1.	Making Available Required Quantum of Raw water	●		●	
2.	Raw Water Lifting & Transmission to WTP	●			■
3.	Treatment of Water (Old WTP)	●			■
	Quality & Quantity Monitoring	●		●	■
	Maintenance of WTP	●			■
	Chemical, Consumables & Spares	●			■
4.	Treatment of water (New WTP)		■		■
	Quality & Quantity Monitoring	●	■	●	■
	Maintenance of WTP		■		■
	Chemical & Consumables		■		■
5.	Pure water Pumping & Transmission	●			■
6.	Recycling system	●			■
7.	Maintenance of all other Asset @ Kanhan Water works	●			■
8.	Pure Water Distribution Management	●		●	
9.	Payment of Energy charges	●		●	
10.	Collection of Water Charges	●		●	

7.1.2 Brief Outline of the Existing Method of Billing & Collection

A) Raw Water:

At present NMC pays raw water bill for lifting of water from Kanhan to revenue department @**Rs. 1.15/cum** + water cess @20%. Present method of assessment for annual billing of raw water lifted from river is calculated on the basis of existing designed discharging capacity of pumping machinery (in operation).

Existing average lifting of raw water @ 120mld (43.80 Mm3). Annual raw water billing is @ Rs. 60.00 lakhs/Annum

B) Pure Water:

Quantity of pure water transmitted through this utility (Kanhan water works) is measured by flow meter installed on both the pure water transmission main. Pure water from this utility is supplied to different service reservoir connected to this pumping main.

Collection of revenue from consumers in different service reservoir zone is the responsibility of Zonal authority.

Under “Energy efficiency & Leak Detection Project”, Installation of flow meter at inlet of service reservoir is in progress. This will help in assessing inflow to zone & collection revenue against quantity of water supplied to Zone.

7.1.3 Selected Performance Matrix of Billing & Collection

a) Billing & Billable Ratio: b) Cost of Billing & Collection:

Nagpur city is getting water from two major sources namely, Kanhan river (25%) & Pench dam (72%). Combined Physical & financial status of billing & collection based on finding of “Water Audit & Leak Detection Study” of the utilities are as follows”

SUMMARY OF PERFORMANCE INDICATORS		
Sr. No.	Description	
01.	Population of Nagpur City	23,50,000 souls
02.	System Input Volume	625 mld
03.	Actual Water Supply in Distribution System	490 mld (78%)
04.	Actual Water Sales	241 mld (38%)
05.	UFW (Gross)	384 mld (62%)
	5.1] UFW for Raw Water upto WTP	135 mld (22%)
	5.2] UFW for Treated Water	249 mld (40%)
06.	Total Non-Revenue Water (Administrative + Real)	384 mld (62%)
	6.1] Administrative losses (apparent losses + free water)	236 mld (38%)
	6.2] Real Losses	104 mld (17%)
	6.3] Unidentified Losses	43 mld (7%)
07.	Water cost / unit (1000 ltrs.)	Rs. 5.55/unit
08.	Minimum Water Tariff (1000 ltrs.)	Rs. 3.50/unit
09.	Total Water Connections (inclusive of authorized unbilled)	Appx. 2.0 lakhs
10.	Avg. no. of persons / connections (90% piped water)	10-11
11.	Total Water Connection (inclusive of unauthorized)	Appx. 2.45 lakhs
12.	Total Treated Water Losses (Real + Apparent) excluding raw water losses [490 mld – (billed consumption + unbilled authorized consumption)]	227 mld
13.	Treated Water Losses / Connections (12÷11)	926 ltrs./connection/day
14.	Treated Water Losses / Person (12÷1)	97 ltrs./person/day

Note :- All figures in % given with reference to System Input Volume (625 mld).

Selected Performance Matrix of Billing & Collection for Kanhan Water Works Supply. (As per Preliminary Report of water Audit 2003-04)

- Irrigation Raw water Billing Quantum = 150.7 mld (55Mm3)
- Actual Flow (As per measurement during study) = 121 mld
- Qty. of water for which Excess charges paid to ID = 29.7 mld
- Avg. inflow from Kanhan WTP = 109 mld
- Present raw water tariff = Rs.1.15/cum+20%

Pure water from Kanhan source is broadly supplied to following Zones out of 10 Zones as mentioned below in ratio as indicated below:

- Zone No-5, Neharunagar, 90% of total Demand = 24.50 mld.
- Zone No-6, SoktaBhawan, 20% of total Demand = 12.20 mld.
- Zone No-7, Satrangipura, 40% of total Demand = 36.80 mld
- Zone No-8, Lakkadganj, 100% of total Demand = 16.04 mld
- Zone No-9, Ashinagar, 85% of total Demand = 19.67 mld
- Total = 109.21 mld**

Composite study results for all 10 Zones as per Preliminary water audit report are as follow

WATER AUDIT SUMMARY TABLE									
Sr. No.	ZONE	POPULATION	AREA	QTY. SUPPLIED		QTY. BILLED		NET UFW (MLD)	
		2004	Ha.	IN MLD	LPCD	IN MLD	BILLING %	MLD	%
1	I DHARAMPETH	261666	4084.63	78.55	300	48.29	61.47	30.27	12.17
2	II LAXMI NAGAR	257960	3516.31	54.05	210	33.80	62.53	20.25	8.15
3	III HANUMAN NAGAR	165717	2181.52	27.91	168	11.08	39.69	16.83	6.77
4	IV DHANTOLI	236701	815.37	36.16	153	19.21	53.13	16.95	6.82
5	V NEHARU NAGAR	198411	1423.69	27.22	137	16.99	62.44	10.22	4.11
6	VI SOKTA BHAWAN	290076	556.07	61.03	210	25.74	42.18	35.29	14.19
7	VII SATRANJIPURA	336267	744.48	91.98	274	22.14	24.07	69.84	28.09
8	VIII LAKHADGANJ	176716	2406.16	16.04	91	9.55	59.56	6.49	2.61
9	IX ASHI NAGAR	225881	3225.02	23.14	102	15.31	66.15	7.83	3.15
10	X MANGALWARI	204606	2109.06	44.26	216	39.27	88.72	4.99	2.01
11	PUMPING/FEEDER MAIN			29.65				29.65	11.93
TOTAL POPULATION FOR 10 ZONES		2354001	21062	490.00	196	241.38	52.43	248.62	100.00

7.1.4 Key Issues and Obstacles in Regard to O & M (Billing & Collection Issues)

- Proper mode of metering for assessment of raw water lifted from source.
- Installation of meter on pure water transmission main @ WTP and at inlet of each service reservoir, for assessment of pure water supplied from WTP & at individual reservoir.
- Shifting of Direct tapping point on transmission main to proposed service reservoir in area.
- Bulk metering for supply to slum area for revenue collection on flat monthly rate.
- 100% consumer meter supply other than slum area.
- Reduction in raw water losses by minimizing losses @ WTP by recycling of filter backwash water.

- Replacement of leaky valves, replacement of age-old piping, non operating consumer meters etc.
- Controlling over illegal connection.
- Meterization for subsidized NMC consumers.
- Shifting of bulk consumer directly on feeder main to ESR main or through service reservoir.

7.1.5 Action Plan To Reduce Water Losses

(Based on Draft Report on Water Audit & Leak Detection Program)

A] Reduction In Raw Water Losses: -

Sr. No.	Description of Water Losses	Action Plan
01.	Excess billing of Raw Water	Installation of Flow Meter at Raw Water Off-take points
02.	WTP Losses	Recycling of backwash of WTP water

B] Reduction In Treated Water Losses: -

Sr. No.	Description of Water Losses	Action Plan
01.	Un-metered Unbilled Consumption	• Proposed Slum Policy & improvement to slum connectivity • Meterisation to NMC Properties • Improvement to billing system. • Meterisation of all ESR/GSR for better accountability • 89% of bills prepared are not based on meter readings. • Complete metering / reading / billing system needs improvement • PPP for better accountability maximum losses are in service connections • Most of leakages are in pipes less than 100 mm • May be taken up by NMC active leak control program
02.	Un-authorised Consumption	
03.	Minimizing Metering errors	
04.	Water Leaks in Distribution System	
05.	Other Losses (Discovered Leakage)	

7.1.6 The Scope of Private Entity to be involved in O & M :

PPP can play major role in following,

- O & M of water utility i.e. Raw water lifting, Treatment & transmission.
- O & M of Distribution network in service reservoir Zone & collection of revenue from that zone on the basis of performance index.

7.1.7 Requirement of Manpower, Energy, Spare & Consumable for O & M:

a) Existing O & M cost of the utility is as follows:

➤ Existing Raw water charges	Rs. 63.7679 lakhs
➤ Annual Establishment Cost	Rs 113.2640 lakhs
➤ Annual Energy Cost(2004-05)	Rs 610.7100 lakhs
➤ Annual Chemical Cost	Rs. 55.3750 lakhs
➤ M & R Expenditure	Rs. 49.2680 lakhs
➤ Proportionate O & M cost of Dist. System (@ 0.41/ M ³ for 109 mld supply)	Rs. 163.1185 Lakhs

Total Rs 1055.50 lakhs

b) Proposed O & M Cost of the utility for Additional lifting of 120mld only will be as follows:

Statement of Annual Burden (Augmentation Works 120 MLD)									
A) Annual Maintenance & Repair Charges									
Sr. No.	Capital cost of the Project Component	Amount (Rs. Lakhs)	Gross cost with 10% ETP Charges (Rs. Lakhs)	90% of Gross cost with (Rs. Lakhs)	Life of component	Depreciation Factor	Depreciation Cost (Rs. Lakhs)	M & R %	M & R Charges (Rs. Lakhs)
1	Proposed Intake Structure								
a)	Intake chamber	27.00	29.7	26.73	50	0.0076	0.20	1.0	0.30
b)	Connecting pipe	60.00	66	59.4	33	0.0166	0.99	0.5	0.33
c)	Collecting chamber	17.00	18.7	16.83	50	0.0076	0.13	1.0	0.19
2	Water treatment plant	3500.00	3850	3465	50	0.0076	26.33	0.5	19.25
3	P.W. Sump & Pump House	85.00	93.5	84.15	50	0.0076	0.64	1.0	0.94
4	P. W. Pumping Machinery at WTP, Elect. & Mech. Works	400.00	440	396	15	0.0354	14.02	2.5	11.00
5	Pure Water Transmission (WTP to Automotive Sqr) L=10km	2470.00	2717	2445.3	33	0.0166	40.59	0.5	13.59
6	Branch Feeder main (Shantinagar to Subhan Nagar)	660.00	726	653.4	33	0.0166	10.85	0.5	3.63
	Total Cost (Rs Lakhs)	7219.00				Depreciation	93.75	M & R	49.23
B) Establishment (CPHEEO manual Appendix 13.5)									
	Designation	Nos	Ave. Salary Rs./ month	Ave. Salary Rs./ Year					
1	Dept. Engineer	1.0	16000	193920					
2	Jr. Engr	4.0	13000	624000					
3	Operators	16.0	8000	1536000					
4	Chemist	1.0	8000	96000					
5	Fitter	18.0	6000	1296000					
7	Electrician	4.0	8000	384000					
8	Mechanic	1.0	8000	96000					
9	Valveman	1.0	4000	48000					
10	Helper/Mazdoor	4.0	3000	144000					
11	Watch man	4.0	3500	168000					
	Total Rs		4585920			Establishment Cost (Rs. Lakhs)			45.86
C) Miscellaneous Cost (Communication, transport, stationary, water sample testing & sundries etc) @ Rs.100000/-per month									
									12.00
O & M Cost (A+B+C) (Rs Lakhs)									107.09
D) Energy Charges (Ref. Month Wise Energy Cal. Sheet) (Rs. Lakhs)									
									320.00
E) Chemical charges (For 120 MLD) Ave. additional supply 60 mld i.e. 21.90Mm3									
	CL @ 2+2ppm @ Rs.12750/ MT		87.60	12750.00	=		1116900	47.09	47.09
	PAC @15-20ppm @ Rs.8200/MT		438.00	8200.00	=		3591600		
Note: Chlorine Cost is subject to selection of disinfection method. For estimation purpose chlorination has been considered.									
Total Operating Cost (A+B+C+D+E) (Rs Lakhs)									474.18

F) Raw Water Charges					
i) Additional Quantum of water to be lifted from Kanhan = 21.90 Mm ³ at Rs.(1.30 x 1.2) = 1.56 lakhs/ Mm ³		34.16			
Total Raw water Charges (Rs Lakhs)					34.16
F) Repayment of Loan (For 30 years Payback period) Installment as per Cash flow statement					
Total Capital Cost		8359.00	Rs.Lakhs	Rate of Intrest	
JNNURM (50+20) %		5851.30	Rs.Lakhs		
NMC contribution 30%		2507.70	Rs.Lakhs		
Total Loan Amount		2507.70	Rs.Lakhs		
Annual Loan Installment		222.8	Rs.Lakhs		
Annual Loan Repayment (Rs Lakhs)					222.80
Total Annual Burden (Operating cost+ R.W.Cost+ Annual repayment) (A+B+C+D+E+F+G) (Rs Lakhs)					731.14
Total Cost of Production (Annual Burden + Depreciation) (Rs Lakhs)					824.89
O & M Cost + Unit Cost of Water					
1	Total Quantum of Water/Year =	=	21.920	MM ³	
2	Quantity Actual Used = 85% Considering 15% UFW	=	18.632	MM ³	
			Total Cost (Rs. Lakhs)	Unit Cost Of water (Rs./ 1000 lits)	
3	Total Annual Operating	=	474.18	2.54	
4	Total Annual Burden (Operating+Repayment+Raw water)	=	731.14	3.92	
5	Cost of Production (Annual Burden + Depreciation)	=	824.89	4.43	

Note: Total O & M Cost will be Addition of addition of a) Existing O & M cost + b) Proposed O & M cost. Refer Annexure 4C

7.2 TARIFF AND USER COST RECOVERY:

7.2.1 Tariff revenue model for customer/ user group

a) Existing customer

Z.N	Zone	Total No. of Connections (Year –2004)	Regular	Semi-Bulk	Bulk	% in Kanhan Source
1	Dharampeth	20525	16194	1441	436	0
2	Laxminagar	19266	15510	2058	266	0
3	Hanuman Nagar	13498	9793	195	33	0
4	Dhantoli	14346	10578	798	111	0
5	Neharunagar	21906	16558	169	52	90
6	Gandhibag	21498	15282	804	89	20
7	Satarangipura	20271	9822	268	27	40
8	Lakadganj	11594	8760	388	88	100
9	Ashinagar	24112	10115	130	57	85
10	Mangalwari	14700	9946	541	151	0
	Total	183720	122558	6792	1310	

Source: Water Audit & leak detection Report March-2004

b) Existing tariff

I) Water Supply without Meter:

A consumer having an authorized connection but having no meter fixed to his water supply pipe, shall be charged according to the following rates, namely: -

Size of Connection	Rates	
	Residential	Non Residential
15 mm dia	Rupees 75	Rupees 300
20 mm dia	Rupees 150	Rupees 600
25 mm dia	Rupees 350	Rupees 2000

The rates shall be per month per house or unit (Tenement) :

Provided that in notified slum water rate for 15 mm dia connection shall be charged according to the following rates namely: -

Type of House	Rates
Roof without slab	Rupees 25
Roof with slab	Rupees 50

II) Water Supply by Meter:

Water supplied by meter to the residential buildings & Non residential Building
In R1 Category.

1 st 10,000 liters	at	Rupees 3.00 per 1000 liters
Next 30,000 liters	at	Rupees 3.50 per 1000 liters
And above	at	Rupees 4.00 per 1000 liters

- Water supplied by meter to Institution & Commercial organization **Rs.12 per 1000 liters.**
- Water supplied by meter to Industries **Rs.20 per 1000 liters.**

c) Forecasted (Yr.2015) Customer

(Additional forecasted demand will be managed from Kanhan + Panch as & when required)

Z. No	Zone	Total Population (Year:2004)	Total No. of Connections (Year –2004)	% in Kanhan Source	Population on Kanhan Source Col 3 x 5	No. of Connection on Kanhan	Forecasted No. of Connection (Year :2015) Col. 7 x 1.5
1	2	3	4	5	6	7	8
5	Neharunagar	198411	21906	90	178570	19715	29573
6	Gandhibag	290076	21498	20	58015	4300	6449
7	Satarangipura	336267	20271	40	134507	8108	12163
8	Lakadganj	176716	11594	100	176716	11594	17391
9	Ashinagar	225881	24112	85	304940	20495	30743
	Total	1227351	99381		852762	64212	96319

Note: 1) Growth rate is assumed as @ 35% per decade. i.e ($P_{2004} \times 1.35$)

2) No. of connection are forecasted to be 1.5 times upto Yr-2015

7.2.2 Tariff Revenue Model For Customer/ User Group

Existing Connection :

Sr. No	Water Distribution Zone served from this Utility	Total Population of Zone (2004)	Total No of Connection in Zone (2004)	% Area supplied through this source	Proportionate Population of this Zone	Proportionate Connection of this Zone	Recovery % of Zone & weighted Ave.
Z-5	Neharunagar	198411	21906	90	178570	19715	100.00
Z-6	Soktabhavan	290076	21498	20	58015	4300	100.00
Z-7	Satrangipura	336267	20271	40	134507	8108	100.00
Z-8	Lakkadganj	176716	11594	100	176716	11594	100.00
Z-9	Ashinagar	225881	24112	85	191999	20495	100.00
Total		1227351	99381		739807	64212	100.00

Source as per NMC Water Audit Report 2004

Project Revenue :

- a) Present Ave. Pure water Supply through the Source 120.00 mld
 b) less 15% Distribution losses 18 mld
 c) Net supply to Consumer **102.00 mld**

Sn.	Consumer	Daily supply (mld)	Monthly Units	Existing Tarrif (Rs/Unit)	Total Demand Rs.	Actual Recovery (Ave.85%)
1	Residential consumer (85% supply)	86.7	2601000	3.50	9103500	9103500
2	Commercial consumer (10% supply)	10.2	306000	20.00	6120000	6120000
3	Institutional consumer (5% supply)	5.1	153000	12.00	1836000	1836000
Total		102	3060000	35.5	17059500	17059500

Total Recovery / Annum = Rs 204714000

7.2.3 Out Line Plan to Restructure Tariff:

Restructure of tariff under process with NMC subject to approval of General Body of NMC is as follow:

DEFINATIONS :

1.0] Slum Category (SI) :-

Slums authorized by NMC will be charged as a part of property tax.

- "Kachha Structured" :- Roof other than Reinforced Cement Concrete (RCC).
 "Pacca Structured" :- Roof with Reinforced Cement Concrete (RCC)
 "Double Storied Structure" :- Structure with Construction of First Floor above Ground Floor (G+1)

Any structure more than G+1 in Slum area or total area of structure exceeding 500 sq.ft. shall be charged as per normal tariff.

Slum tariff shall be part of property tax and shall be collected accordingly.

2.0] Residential (R-1) :-

Dwelling unit used only for residential purpose and no institutional & commercial activities are carried out in the dwelling unit.

1 dwelling unit = 1 flat or 1 tenant or 1 family for minimum rates and shall be multiply by no. of dwelling units in one premises.

3.0] Institutional (I) :-

Charity Hospitals registered with Charity Commissioner, Public Institutes like Govt. Aided Schools, Religion Places, Government Hospitals, Govt. Aided Colleges Govt. Aided Research Institutes, Railways Quarters, Defence establishment with Residential Colony, Government Premises attached with residential colony or colonies attached with Govt. Institutes, WCL Quarters, Govt. & Semi Government Employees Quarters.

4.0] Small Business & Shop (SB): -

- a] Like Clinic, Shops, Offices occupied less than 300 Sq.Ft. of area.
- b] Part of residential buildings used by owners for own commercial purpose (limited to 1/3 of area used for own business) office or any other non-residential purpose.

5.0] Commercial Consumer-1 (C-1): -

Poly Clinic (Without bed), Unaided Colleges & Schools, Computer Institutes, Coaching Classes, Banks, Offices, Shops more than 300 Sq.Ft., Non-residential Premises where water used for drinking purpose only.

6.0] Commercial Consumer-2 (C-2): -

Pvt. Hospitals (With Bed), Railway Workshop, Railway Stations, Airports, Bus Stand, Petrol Pumps, Lodge, Hotels, Restaurants (bigger than 300 Sq.Ft.), Swimming Pools, Clubs, Lawns, Community Halls, Industry, Vehicle Service Centers (Washing) and Non-residential Premises where water also used for other than drinking purpose, Laundry, Dhobi Ghat.

7.0] Mineral Water Packaged Water / Beverage/ Bottling Plant (C-3): -

Packaged water/soft drinks, Beverage, Packaged artificial juice plants, Pharmaceutical manufacturing unit & factories where water is being used as a major part of product, Ice factory.

Proposed water tariff for consideration by NMC

Slum (SL) :-

“Kachha Structured” :- Rs. 30/- per Structure per Month.

“Pacca Structured” :- Rs. 50/- per Structure per Month.

“Double Storied Structure” :- Rs. 80/- per Structure per Month.

Size	Residential (R-1)			Institutional (I)		Small Business Including SOHO (SB)		Commercial-1 (C-1)		Commercial-2 (C-2)		Commercial-3 (C-3)	
	Min.	Unit	Units	Min.	Unit	Min.	Unit	Min.	Unit	Min.	Unit	Min.	Unit
15mm	*150	7.50	20	300	15.00	300	30.00	1,000	30.00	1,500	40	15,000	250
20 mm	450	7.50	60	900	15.00	900	30.00	1,800	30.00	2,700	40	15,000	250
25 mm	810	7.50	108	1,620	15.00	3,240	30.00	3,240	30.00	4,860	40	25,000	250
40 mm	1,725	7.50	230	3,450	15.00	6,900	30.00	6,900	30.00	10,350	40	35,000	250
50 mm	3,200	7.50	425	6,400	15.00	12,800	30.00	12,800	30.00	19,200	40	50,000	250
80 mm	7,500	7.50	980	15,000	15.00	30,000	30.00	30,000	30.00	45,000	40	80,000	250
100 mm	12,750	7.50	1,700	25,500	15.00	51,000	30.00	51,000	30.00	76,500	40	1,00,000	250
150 mm	28,000	7.50	3,740	56,000	15.00	1,12,000	30.00	1,12,000	30.00	1,68,000	40	1,50,000	250
200 mm	50,850	7.50	6,780	1,01,700	15.00	2,03,400	30.00	2,03,400	30.00	3,05,000	40		
250 mm	80,000	7.50	10,600	1,60,000	15.00	3,20,000	30.00	3,20,000	30.00	4,80,000	40		
300 mm	1,15,000	7.50	15,260	2,30,000	15.00	4,60,000	30.00	4,60,000	30.00	6,90,000	40		

Note: However for Financial Calculation subsequent Tariff Revision will match the rate of Inflation.

Chapter-8: Project Financial Viability & Sustainability

Annexure 4 : Project Cash Flow
Annexure 4A

PROJECT CASH FLOW FOR JNNURM																				
Particulars	Block 1 - JNNURM Duration						Block 2 - Beyond JNNURM Duration													
	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2016-19	2016-20	2016-21	2016-22	2016-23	2016-24	2016-25	2016-26
1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Cash Flow during Construction phase																				
Inflows		Construction Period 2.5 Years																		
Central Government Grant - JNNURM (50%)		3135	1045																	
State Government Grant (20%)		1254	418																	
ULB's own contribution (30%)																				
Loans from banks/ FIs (15%)		500	500	251																
Others (PPP) (15%)		500	500	251																
Debentures/ Bonds																				
Beneficiary contribution																				
Sub Total (A)		5389	2463	502																
Outflows																				
Capital expenditure (Note 1)		4470	3601	290																
Interest during construction																				
Project related Establishment charges																				
Others (Consultancy Charges)																				
Sub Total (B)	8361	4470	3601	290																
Net cash flow during Construction phase (A-B)(C)	2502	919	-1138	212	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cash flow during O&M phase																				
Inflows																				
User charges (Revenue from Water bill)		2047.14	2047.14	2169.968	2300.167	2438.176	2584.467	2739.535	2903.907	3078.142	3262.83	3458.6	3666.116	3886.083	4119.248	4366.403	4628.387	4906.09	5200.456	5512.483
Revenue grant from State Government																				
Other income (Please specify)																				
Income earmarked for the Project etc. (Note 2)																				
Others (Please specify)																				
Sub Total (D)		2047.14	2047.14	2169.968	2300.167	2438.176	2584.467	2739.535	2903.907	3078.142	3262.83	3458.6	3666.116	3886.083	4119.248	4366.403	4628.387	4906.09	5200.456	5512.483
Outflows																				
O&M charges																				
Energy Charges		610.71	647.35	1806.19	1066.56	1130.55	1198.38	1270.28	1348.5	1427.29	1512.93	1603.71	1699.93	1801.93	1910.05	2024.65	2146.13	2274.9	2411.39	2558.07
Chemical & Consumables		55.378	58.70	109.31	115.87	122.82	130.19	138.00	146.28	155.06	164.36	174.22	184.67	195.75	207.50	219.95	233.15	247.14	261.97	277.69
Establishment charges		113.26	120.06	173.12	183.51	194.52	206.19	218.56	231.67	245.57	260.3	275.92	292.48	310.03	328.63	348.35	369.25	391.41	414.89	439.78
Communication		0	0	12	12.72	13.48	14.29	15.15	16.06	17.02	18.04	19.12	20.27	21.49	22.78	24.15	25.6	27.14	28.77	30.5
Repairs & Maintenance		212.3665	225.13	287.87	305.14	323.45	342.86	363.43	385.24	408.35	432.85	458.82	486.35	515.53	546.46	579.25	614.01	650.85	689.9	731.29
Raw water charges		63.7679	67.59	105.81	112.16	118.89	126.02	133.58	141.59	150.09	159.1	168.65	178.77	189.5	200.87	212.92	225.7	239.24	253.59	268.81
Loan repayments (Principal)																				
Interest		40	83.2	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8
Others (Please specify)																				
Sub Total (E)		1095.5004	1202.03	1917.1	2018.76	2126.51	2240.73	2361.8	2490.14	2626.18	2770.38	2923.24	3085.27	3257.03	3439.09	3632.07	3836.64	4053.48	4283.31	4526.94
Net cash flow during O&M phase (D-E) (F) (Note 4)	12.75	-40	-83.2	252.8684	281.4065	311.6665	343.7371	377.7351	413.7672	451.9616	492.4501	535.36	580.846	629.0529	680.1579	734.3328	791.7469	852.6101	917.1455	985.5429
NPV and IRR (O&M)	2,502.61	(35.48)	(65.45)	176.42	174.13	171.04	167.31	163.07	158.42	153.48	148.32	143.01	137.61	132.18	126.76	121.38	116.07	110.86	105.76	100.80
IRR (O & M)	17.60			475.67	504.21	534.47	566.54	600.54	636.57	674.76	715.25	758.16	803.85	851.85	902.96	957.13	1,014.55	1,075.41	1,139.95	1,208.34
	2,507.76			292.47	263.62	237.62	214.18	193.06	174.01	156.85	141.38	127.43	114.86	103.53	93.32	84.11	75.81	68.34	61.60	55.52
Net cash flow during Construction and O&M phase (C+F) (G)	1,950	-5429	-2546.2	-249.132	281.4065	311.6665	343.7371	377.7351	413.7672	451.9616	492.4501	535.36	580.846	629.0529	680.1579	734.3328	791.7469	852.6101	917.1455	985.5429
NPV and Project IRR (overall)	0.89	(5,324.85)	(2,449.44)	(235.07)	260.43	282.90	306.02	329.84	354.37	379.65	405.73	432.62	460.37	489.01	518.60	549.16	580.74	613.38	647.15	682.08

Chapter-9: Project Benefit Assessment

CHAPTER-9: PROJECT BENEFIT ASSESSMENT

9.1 A LIST OF BENEFITS FROM SOCIAL PERSPECTIVE:

- 1) With lifting of additional available water from Kanhan River in monsoon & post monsoon period, Water demand of Kanhan Zone could be improved & fulfilled upto Year-2015
- 2) Due to change in water course towards another bank during summer,, availability of water at existing intakes gets reduce, this leads to frequent breakdown in supply to consumer supplied water from Kanhan source. This will be eliminated by constructing New intake on another bank.
- 3) Due to abnormal turbidity in Kanhan River during monsoon period & limitations of age-old Water treatment plant, it could not be possible to treat water to desire parameters. This will be taken care by new water treatment plant proposed to replace the same.
- 4) Existing Age old asset (Water Treatment Plant) will be replace with New WTP with enhance capacity. This will upgrade the further serviceability of utility.
- 5) Filter back wash water presently let out in River is proposed to be recycled. This will reduce the contamination of water in River.
- 6) Structure constructed in first phase (1940-1956) of at Kanhan water works has already completed their useful life. Rehabilitation same will increase the serviceability and reduce the operational risk.

9.2 A LIST OF NEGATIVE EXTERNALITIES:

(Adverse Impact From Social Perspective)

There will be no adverse impact of this project as planning of this project is for replacement of old asset with new asset of enhance capacity to be built in same premises.

9.3 ECONOMIC INTERNAL RATE OF RETURN (EIRR)

For Project Above 100 Crores):

Not applicable for this project

Annexure

Annexure – A

WATER TARIFF STRUCTURE

GOVT. OF MAHARASHTRA NOTIFICATION
EXTRA ORDINARY
Mantralaya, Mumbai, Wednesday, 30th August, 2000

CITY OF NAGPUR CORPORATION ACT, 1948.

No. NMC-2300-1115-CR-137-2000-UDA-26 –

In exercise of the powers conferred by sub-section (1) of section 418 of the City of Nagpur Corporation Act, 1948 (C. P. and Berar II of 1950) the Government of Maharashtra hereby confirms the following bye-laws made by the Commissioner, Nagpur Municipal Corporation under Sub-section (2) of section 201 of the said Act for amending the City of Nagpur Municipal Corporation Assessment and Collection of Water Rate bye-laws, as confirmed, are now published in the Maharashtra *Government Gazette* as required by section 419 of the said Act :-

1. These bye-laws may be called the City of Nagpur Corporation Assessment and Collection of Water Rate (Amendment) Bye-laws, 2000.
2. In the City of Nagpur Corporation Assessment and Collection of Water Rate Bye-laws, 1966. (hereinafter referred to as "the principle Bye-laws"), in bye-law 6, for clauses (b) and (c), the following clauses shall be *substituted* namely :-
 - (b) A consumer having an authorized connection but having no meter fixed to his water supply pipe, shall be charged according to the following rates, namely :-

Size of Connection	Rates	
	Residential	Non Residential
15 mm dia	Rupees 75	Rupees 300
20 mm dia	Rupees 150	Rupees 600
25 mm dia	Rupees 350	Rupees 2000

The rates shall be per month per house or unit (Tenement) :

Provided that in notified slum water rate for 15 mm dia connection shall be charged according to the following rates namely :-

Type of House	Rates
Roof without slab	Rupees 25
Roof with slab	Rupees 50

The rates shall be per month per unit (Tenement) :

Provided further that the consumer shall fix the water meter before 31st December, 2002. After expiry of the said date, the un-metered connection shall be charged 3 times the above rates.

- (c) The building or land which does not receive water by meter or without a meter from the Corporation water pipe line shall be liable to pay general water rate based on the annual letting value of the building or land according to the following rates, namely :-

Annual Letting Value (In Rupees)	Rate per Annum
From 1 to 199	30%
From 200 to 1000	35%, but subject to minimum of rupees 600 per unit (Tenement)
From 1001 and above	40% subject to minimum of rupees 12 per unit (Tenement)

3. For bye-law 9 of the principle Buy-laws the following bye-law shall be *substituted*, namely :-

9(a) (i) Water supplied by meter to the residential buildings and land, and the consumers in the non-residential buildings and structures i.e. *Gathai Kamgar*, Cycle Repairing Shops, General Stores, *Kirana Shops*, Tailoring Shops, Telephone Booths, Flour Mills, Medical Shops, Daily Needs, Furniture Shops, Fabrication, Vegetable Shops, True Copy Centres, Consulting Chambers, Laundries, Timber Marts excluding colonies shall be charged according to the following rates namely :-

1 st 10,000 liters	at	Rupees 3.00 per 1000 liters
Next 30,000 liters	at	Rupees 3.50 per 1000 liters
And above	at	Rupees 4.00 per 1000 liters

Minimum charges for 30 days or per month shall be according to the following rates, namely :-

Dia of Connection	Rates
15 mm	Rupees 50
20 mm	Rupees 200
25 mm	Rupees 500
40 mm	Rupees 1000
50 mm	Rupees 2500
80 mm	Rupees 8000
100 mm	Rupees 9000
150 mm	Rupees 15000
200 mm	Rupees 30000
250 mm	Rupees 50000
300 mm	Rupees 60000

Minimum rates for Flat Scheme shall be rupees 50 per Flat or actual consumption, whichever is more : and in addition to the said charges, meter rent shall be charged extra.

(ii) Water supplied by meter for Hospital attached with Educational Institutions, Sports Organisation, colonies attached to Institutions, Air Force Maintenance Command, Military Engineering Services, Government Railway, Railway Electrification, Swimming pools, Public Sector Undertaking Colonies and Hostels and Hospitals without bed facility and excluding the categories under bye-law 9(a) (i) and 9(b) for 30 days or per month or part thereof shall be charged at the rate of rupees 12 per 1000 liters.

Minimum charges for 30 days or per month shall be according to the following rates, namely :-

Dia of Connection	Rates
15 mm	Rupees 500
20 mm	Rupees 800
25 mm	Rupees 3500
40 mm	Rupees 4500
50 mm	Rupees 9000
80 mm	Rupees 11000
100 mm	Rupees 19000
150 mm	Rupees 23000
200 mm	Rupees 45000
250 mm	Rupees 70000
300 mm	Rupees 90000

In addition to the said charges, meter rent shall be charged extra.

Annexure 3

Schedule of Financial Contribution and Sources Table (in Rs. Lakhs)

Sr. No.	Sorces	Total Cost	FY 07-08					FY 07-08					FY 09-10
			Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total	Scheduled Amount
			Schedule Month and Amount					Schedule Month and Amount					
1	GoI (50%)	4180.5	1045		1045	1045	3135		1045			1045	
			25%		25%	25%	75%		25%			25%	
2	State (20%)	1672.2	418		418	418	1254		418			418	
			25%		25%	25%	75%		25%			25%	
3	ULB (30%)												
a	Bank Loan	1254.15	125	125	125	125	500	125	125	125	125	500	251
			10%	10%	10%	10%	40%	10%	10%	10%	10%	40%	20%
b	PPP	1254.15	125	125	125	125	500	125	125	125	125	500	251
			10%	10%	10%	10%	40%	10%	10%	10%	10%	40%	20%
Total		8361.00	1713	250	1713	1713	5389	250	1713	250	250	2463	502.4

Total cost of Project Rs. 8361 lakhs

Annexure 4 : Project Cash Flow
Annexure 4A

PROJECT CASH FLOW FOR JNNURM																					
Particulars	Block 1 - JNNURM Duration						Block 2 - Beyond JNNURM Duration														
	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2016-19	2016-20	2016-21	2016-22	2016-23	2016-24	2016-25	2016-26	2016-27
1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Cash Flow during Construction phase																					
Inflows		Construction Period 2.5 Years																			
Central Government Grant - JNNURM (50%)		3135	1045																		
State Government Grant (20%)		1254	418																		
ULB's own contribution (30%)																					
Loans from banks/ FIs (15%)		500	500	251																	
Others (PPP) (15%)		500	500	251																	
Debentures/ Bonds																					
Beneficiary contribution																					
Sub Total (A)		5389	2463	502																	
Outflows																					
Capital expenditure (Note 1)		4470	3601	290																	
Interest during construction																					
Project related Establishment charges																					
Others (Consultancy Charges)																					
Sub Total (B)	8361	4470	3601	290																	
Net cash flow during Construction phase (A-B)(C)	2502	919	-1138	212	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cash flow during O&M phase																					
Inflows																					
User charges (Revenue from Water bill)		2047.14	2047.14	2169.968	2300.167	2438.176	2584.467	2739.535	2903.907	3078.142	3262.83	3458.6	3666.116	3886.083	4119.248	4366.403	4628.387	4906.09	5200.456	5512.483	5843.232
Revenue grant from State Government																					
Other income (Please specify)																					
Income earmarked for the Project etc. (Note 2)																					
Others (Please specify)																					
Sub Total (D)		2047.14	2047.14	2169.968	2300.167	2438.176	2584.467	2739.535	2903.907	3078.142	3262.83	3458.6	3666.116	3886.083	4119.248	4366.403	4628.387	4906.09	5200.456	5512.483	5843.232
Outflows																					
O&M charges																					
Energy Charges		610.71	647.35	1006.19	1066.56	1130.55	1198.38	1270.28	1346.5	1427.29	1512.93	1603.71	1699.93	1801.93	1910.05	2024.65	2146.13	2274.9	2411.39	2556.07	2709.43
Chemical & Consumables		55.376	58.70	109.31	115.87	122.82	130.19	138.00	146.28	155.06	164.36	174.22	184.67	195.75	207.50	219.95	233.15	247.14	261.97	277.69	294.35
Establishment charges		113.26	120.06	173.12	183.51	194.52	206.19	218.56	231.67	245.57	260.3	275.92	292.48	310.03	328.63	348.35	369.25	391.41	414.89	439.78	466.17
Communication		0	0	12	12.72	13.48	14.29	15.15	16.06	17.02	18.04	19.12	20.27	21.49	22.78	24.15	25.6	27.14	28.77	30.5	32.33
Repairs & Maintenance		212.3865	225.13	287.87	305.14	323.45	342.86	363.43	385.24	408.35	432.85	458.82	486.35	515.53	546.46	579.25	614.01	650.85	689.9	731.29	775.17
Raw water charges		63.7679	67.59	105.81	112.16	118.89	126.02	133.58	141.59	150.09	159.1	168.65	178.77	189.5	200.87	212.92	225.7	239.24	253.59	268.81	284.94
Loan repayments (Principal)																					
Interest		40	83.2		222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8
Others (Please specify)																					
Sub Total (E)		1095.6004	1202.03	1917.1	2018.76	2126.51	2240.73	2361.8	2490.14	2626.18	2770.38	2923.24	3085.27	3257.03	3439.09	3632.07	3836.64	4053.48	4283.31	4526.94	4785.19
Net cash flow during O&M phase (D-E) (F) (Note 4)	12.75	-40	-83.2	252.8684	281.4065	311.6665	343.7371	377.7351	413.7672	451.9616	492.4501	535.36	580.846	629.0529	680.1579	734.3328	791.7469	852.6101	917.1455	985.5429	1058.042
NPV and IRR (O&M)	2,502.61	(35.48)	(65.45)	176.42	174.13	171.04	167.31	163.07	158.42	153.48	148.32	143.01	137.61	132.18	126.76	121.38	116.07	110.86	105.76	100.80	95.98
IRR (O & M)	17.60			475.67	504.21	534.47	566.54	600.54	636.57	674.76	715.25	758.16	803.65	851.85	902.96	957.13	1,014.55	1,075.41	1,139.95	1,208.34	1,280.84
	2,507.76			292.47	263.62	237.62	214.18	193.06	174.01	156.85	141.38	127.43	114.86	103.53	93.32	84.11	75.81	68.34	61.60	55.52	50.04
Net cash flow during Construction and O&M phase (C+F) (G)	1.956	-5429	-2546.2	-249.132	281.4065	311.6665	343.7371	377.7351	413.7672	451.9616	492.4501	535.36	580.846	629.0529	680.1579	734.3328	791.7469	852.6101	917.1455	985.5429	1058.042
NPV and Project IRR (overall)	0.89	(5,324.85)	(2,449.44)	(235.07)	260.43	282.90	306.02	329.84	354.37	379.65	405.73	432.62	460.37	489.01	518.60	549.16	580.74	613.38	647.15	682.08	718.20

Annexure 4b :

Details of Capital Expenditure (Rs lakhs)												
Sr. No.	Particulars	Total	FY 07-08				FY 08-09				FY 09-010	
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
1	Land Acquisition	0.00										
2	Civil Works	7219	277	450	1450	1700	1157	1136	700	350	0	0
3	Rehabilitation & resettlement	1142	450	0	50	93	43	0	121	100	160	135
4	Administrative buildings											
5	Plant & Machinery											
6	Technical/ supervision/ other consultancy											
Total		8361	727	450	1500	1793	1200	1136	821	450	160	135

Annexure 4C

Details of Operation & Maintenance Charges (Existing + Augmentation)																				
Particulars	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Electricity charges	610.710	647.35	1006.19	1066.56	1130.55	1198.38	1270.28	1346.50	1427.29	1512.93	1603.71	1699.93	1801.93	1910.05	2024.65	2146.13	2274.90	2411.39	2556.07	2709.43
Chemical ,Petrol, Oil and Lubricants	55.376	58.70	109.31	115.87	122.82	130.19	138.00	146.28	155.06	164.36	174.22	184.67	195.75	207.50	219.95	233.15	247.14	261.97	277.69	294.35
Rent, Rates and Taxes																				
Consultancy / Professional charges																				
Office Eshtabishment	113.260	120.06	173.12	183.51	194.52	206.19	218.56	231.67	245.57	260.3	275.92	292.48	310.03	328.63	348.35	369.25	391.41	414.89	439.78	466.17
Billing and Collection																				
Communication Expenses			12.00	12.72	13.48	14.29	15.15	16.06	17.02	18.04	19.12	20.27	21.49	22.78	24.15	25.6	27.14	28.77	30.5	32.33
Printing and Stationery																				
Insurance																				
Consumption of Stores																				
Repairs and Maintenance	49.268	52.22	104.58	110.85	117.50	124.55	132.02	139.94	148.34	157.24	166.67	176.67	187.27	198.51	210.42	223.05	236.43	250.62	265.66	281.60
Annual maintenance charges																				
Patents and Royalties																				
Raw water charges	63.768	67.59	105.81	112.16	118.89	126.02	133.58	141.59	150.09	159.10	168.65	178.77	189.50	200.87	212.92	225.70	239.24	253.59	268.81	284.94
Bank charges (Loan Repayment)	40.00	83.20	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8	222.8
Total	932.38	1029.12	1733.81	1824.47	1920.56	2022.42	2130.39	2244.84	2366.17	2494.77	2631.09	2775.59	2928.77	3091.14	3263.24	3445.68	3639.06	3844.03	4061.31	4291.62

Assumptions 1) Rate of Inflation considered as 6%

2) O & M Cost against Augmentation work is added in third year

3) In Loan repayment, only intrest during 2 year construction period is considered @ 8%

ANNEXURE-5

- **Financial profile of Nagpur Municipal Corporation**

The finances of NMC have been reviewed for the five-year period 2001-2005. The items of both receipts and expenditure are classified under revenue and capital accounts as per their sources and uses. In 2004-05, the revenue income of NMC has grown to Rs.324 crores from Rs.232 crores in 2000-01. During this period, revenues have registered a compounded annual growth rate (CAGR) of 6.9%, while revenue expenditure has increased at a CAGR of 9.0%.

In absolute terms, the revenue expenditure in 2004-05 was Rs.254 crores. The revenue account surplus in 2004-05 was Rs.78 crores.

Table 10. Financial status at a glance In Rs lakhs						
	2000-01	2001-02	2002-03	2003-04	2004-05	CAGR
Revenue Account						
Income	23,279	27,041	27,155	31,768	32,489	6.9
Expenditure	16,533	18,270	22,462	22,519	25,430	9
Surplus /(Deficit)	6,746	8,771	4,693	9,249	7,059	0.9
Capital Account						
Income	3,470	165	6,610	0	0	
Expenditure	4,686	8,794	9,595	8,032	7,798	
Surplus /(Deficit)	-1,216	-8,629	-2,985	-8,032	-7,798	
Overall surplus/(deficit)	2,766	-947	4,448	-1,146	1,898	64.5

Source: NMC Annual Accounts

The capital income of NMC mainly comprises loans. In the last two years, NMC has not availed of any loans for its capital expenditure. The capital expenditure in the last four years has averaged around Rs.80 crores annually. In 2004-05, NMC had an overall surplus position of Rs.18.98 crores. The following sections provide a review of the revenue account in order to assess the municipal fiscal status.

- **Revenue account**

The revenue account comprises two components -revenue income and revenue expenditure. Revenue income comprises internal resources in the form of octroi, tax and non-tax items. External resources are in the form of shared taxes/transfers and revenue grants from the State and Central Government. Revenue expenditure comprises expenditure incurred on salaries, operation & maintenance cost, and debt servicing.

- **Revenue Income- General Account**

The revenue sources of NMC can be broadly categorized as own sources, grants, and contributions. The source-wise income generated during the review period is presented in Table 11.

Table 11. Source-wise revenue income In Rs lakhs	200001	200102	200203	200304	200405	CAGR %
Octroi	10,186	11,753	12,498	13,387	15,296	8.5
Change y-o-y %		15.4	6.3	7.1	14.3	
As % of Revenue Income	43.8	43.5	46	42.1	47.1	
Property Tax	4,433	5,913	6,058	5,522	5,796	5.5
Change y-o-y %		33.4	2.5	-8.9	5	
As % of Revenue Income	19	21.9	22.3	17.4	17.8	
Other Taxes	1,312	1,403	1,992	4,827	2,071	9.6
Change y-o-y %		6.9	42	142.3	-57.1	
As % of Revenue Income	5.6	5.2	7.3	15.2	6.4	

In Rs lakhs	200001	200102	200203	200304	200405	CAGR %
Total Revenue Income	15,931	19,069	20,548	23,735	23,163	7.8
Change y-o-y %		19.7	7.8	15.5	-2.4	
Non-tax Revenues						
Water Charges	3,123	4,384	4,507	4,891	5,146	10.5
Change y-o-y %		40.4	2.8	8.5	5.2	
As % of Revenue Income	13.4	16.2	16.6	15.4	15.8	
Other charges	1,724	756	77	142	108	42.5
Change y-o-y %		-56.1	-89.8	84.4	-23.9	
As % of Revenue Income	7.4	2.8	0.3	0.4	0.3	
Total Non-Tax Revenues	4,847	5,140	4,584	5,033	5,254	1.6
Change y-o-y %		6	-10.8	9.8	4.4	
Capital Grants	2,501	2,832	2,023	3,000	4,072	10.2
Total Revenue Income	23,279	27,041	27,155	31,768	32,489	6.9

- **Own Sources**

Own source income includes income from octroi, property tax, other taxes and non-tax income in the form of income from municipal properties and other miscellaneous income. Income from own sources accounted for over almost 88% of total revenue income (2004-05), indicating low dependence of NMC on external sources for its operations. The own sources have grown at a CAGR of over 6.4% during the 2001-2005 period. Grants, which contribute about 12.5% of total revenue income, have been growing at a higher pace than own sources in the period under review.

- **Octroi**

Octroi is a local tax charged on all goods entering the city; it is levied based on the category of goods (weight, numbers, etc.). It is the single largest source of NMC's income accounting for about 47.1% of municipal revenue income in 2004-05; during the review period, it has registered a CAGR of 8.5%. In 2004-05, octroi revenues reported a year-on-year (y-o-y) growth of 14.3%.

- **Property Tax**

The tax collected on property includes various other taxes levied as part of property tax. It consists of general tax on properties, sewerage tax, water tax, light tax, education cess and EGS cess. It is charged based as a percentage of Annual Rental Value (ARV). The education cess and EGS cess are collected on behalf of the State Government.

In NMC, the property tax accounted for about 18% of municipal revenue income (2004-05) and registered a CAGR of 5.5%. The overall collection performance stands at about 52% of the total demand (2004-05), indicating scope for further improvement of collection efficiency.

Table 12. Property tax details and DCB statement					
	2000-01	2001-02	2002-03	2003-04	2004-05
Collection - Rs. Lakh					
Arrears	1,848	2,601	2,455	1,959	2,041
Current	1,931	2,422	2,687	2,697	2,844
Total Collection	3,779	5,023	5,142	4,655	4,885
Balance - Rs. Lakh	3,917	5,650	5,074	3,333	2,682
Collection Performance - %	52.7	49.9	55.9	54.2	51.8

According to NMC, there are about 50,000 properties, which are currently outside the property tax net. Also, for around 50,000 properties the property description is not as per the status in the asset register.

- **Non-tax Revenues**

Non-tax sources include all non-tax revenues such as fees and charges levied as per the Municipal Act and services provided by the NMC. These sources include water and sewerage charges, income from building license fees, development charges, income from municipal properties and other fees. The non-tax income of NMC accounted for about 16.2% of the municipal revenue income (2004-05) and registered a CAGR of 1.6% in the five-year period ending in 2004-05.

- **External Sources**

External sources mainly include grants from State and Central Government. All the external sources together account for about 12.5% of revenue income. These sources indicated a growth of 10% over the past five years.

- **Revenue Expenditure**

Revenue expenditure of NMC has been analysed based on expenditure heads which are broadly classified under the following departments/sections of NMC –General Administration & Tax Collection, Public Works, Public Health (General & Medical), Education, and Miscellaneous.

Revenue expenditure is further classified into establishment, operations and maintenance and debt servicing.

Table 13. Application of funds by head of account Revenue Expenditure	2000-01	2001-02	2002-03	2003-04	2004-05	CAGR %
Establishment	10,268	11,083	11,763	12,232	13,326	5.4
As % of Revenue Expenditure	62.1	60.7	52.4	54.3	52.4	
As % of Revenue Income	44.1	41	43.3	38.5	41	
O&M	5530	5921	5556	7078	8094	
As % of Revenue Expenditure	33.4	32.4	24.7	31.4	31.8	
As % of Revenue Income	23.8	21.9	20.5	22.3	24.9	
Debt Servicing	735	1,266	5,143	3,209	4,010	40.4
As % of Revenue Expenditure	4.4	10.5	7.4	9.4	12.5	
As % of Revenue Income	3.2	6.9	22.9	14.3	15.8	
Total Revenue Expenditure	16,533	18,270	22,462	22,519	25,430	

As % of Revenue Income	71	67.6	82.7	70.9	78.3	
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Establishment Expenditure

A large portion of the establishment expenditure includes salaries paid to municipal employees and contract workers. The expenditure on establishment accounted for about 45% of revenue income and 66% of revenue expenditure in 2004-05. This expenditure has been growing at a rate higher than that of revenue income.

O&M Expenditure

The expenditure on O&M has been volatile in the period under review. Its share of revenue expenditure has varied from a high of 42.2% in 2000-01 to a low of 15.8% in 2002-03.

Table 14. O&M expenditure In Rs lakhs	2000-01	2001-02	2002-03	2003-04	2004-05
O&M on old assets	7410	7694	3174	6012	7672
As % of revenue expenditure	42.2	38.4	15.8	28.1	34.1

- **Capital account**

In general, the capital income of NMC comprises loans, grants and contributions. NMC has not availed of any loans in the past two years.

Table 15. Capital receipts Capital Receipts	2000-01	2001-02	2002-03	2003-04	2004-05
Total Receipts	3,470	165	6,610	0	0
Loans	3,240	0	6,000	0	0
Debentures	230	165	610	0	0

- **Capital Expenditure**

In 2004-05, the total capital expenditure of NMC was Rs.79 crores. The bulk of the capital expenditure has been on water supply, public works and roads.

Table 16. Capital expenditure Sector	2000-01	2001-02	2002-03	2003-04	2004-05
Water Works	1053	2274	4156	1853	528
Public Works	1301	2276	1632	1837	2378
Roads	1579	3234	2794	2500	3233
Lighting Department	350	437	564	872	629
Gardens	48	130	80	131	117
Others	353	444	369	838	1031
Total Capital Expenditure	4685	8794	9595	8032	7915

- **Cost recovery on services**

Water supply

In the case of water supply, NMC's revenue expenditure exceeds revenue income in each of the years of operation being reviewed. For sustainability of operations, it is important that NMC is able to realise 85% recovery of revenue expenditure.

Table 17. Water supply income and expenditure	2001-02	2002-03	2003-04	2004-05
Revenue Income	4767	4824	5224	5403
Revenue Expenditure	5156	7586	7746	5961
Surplus /(Deficit)	(389)	(2762)	(2522)	(558)
Capital Expenditure	2274	4156	1853	528

Sewerage

NMC collects sewerage charges as part of property tax collection. The sewerage network is estimated to cover only 70% of the population. But the sewerage tax is levied on all properties irrespective of the existence or non-existence of a sewerage network. The sewerage tax collected is higher than the cost incurred on operating and maintaining the sewerage system. The sewerage system is inadequate at present. Also, the sewage treatment plant has a capacity of 100 MLD while the daily sewage generation is to the extent of 285 MLD. The untreated sewage is the cause of ground water pollution in several places in the city. The current revenues will prove to be insufficient to meet the operation and maintenance expenditure of a sewerage system built to provide 100% geographical coverage and adequate sewage treatment capacity.

Table 18. Sewerage income and expenditure In Rs lakhs	2000-01	2001-02	2002-03	2003-04	2004-05
Revenue Income	1056	1334	1493	1507	1609
Revenue Expenditure	57	171	194	320	281
Surplus /(Deficit)	998	1163	1299	1187	1328
Capital Expenditure	170	113	78	294	432

Solid Waste Management

NMC currently incurs a revenue expenditure of about Rs.35 crores (2004-05) on solid waste management while there is no direct revenue generated under this head. NMC incurs an expenditure of Rs.5.5 per household for door-to-door collection of solid waste. NMC plans to gradually recover this from every household. The revenues realised will be less than Rs.3 crores. This is insufficient to cover the expenses incurred by the Solid Waste Department.

Table 19. Solid waste management expenditure In Rs lakhs	2000-01	2001-02	2002-03	2003-04	2004-05
Revenue Expenditure	2623	2732	2967	3426	3516