

Evaluation of Water and Sewerage Facilities

4.1 Performance of the Water Treatment Plants

Since the raw water source is impounded water from the dam, the efficiency of all the water treatment plants is quite good and no major problems about product water quality are faced in non monsoon months. The maximum raw water turbidity recorded during 2012 -2013 was 110 NTU with a range of 40 to 60 NTU for maximum monsoon days. Water from Darna reservoir is more turbid than Gangapur. Filtered water turbidity was always less than the stipulated acceptable value of 5.0 NTU and less than 1.0 on about 80% of the samples.

a) Evaluation of Water Supply Facility

The current water supply scheme is adequate to provide water to all residents of Nashik and also meets institutional needs (**Table 4.1**).

- Raw Water quality is good as the source is settled water from the dams.
- The Turbidity of raw water is low during non monsoon season and hence no major problems are faced during treatment
- The dose of coagulant is marginal.
- Since the dams are well protected, there is no contamination due to human pollution.
- Water quality surveillance programme indicates that more than 95% of the samples analyzed for microbial indicators.

Table 4.1 : Summary Results of Water Quality Surveillance for Nashik City for 2013

Parameters	Nashik (E)	Nashik (W)	Panchavati	Satpur	CIDCO	Nashik Rd.	Total
Sample Collected	2211	1905	3286	3612	2861	2157	16032
Fit Sample	2151	1874	3251	3601	2833	2128	15839
Unfit samples	60	31	35	11	28	29	193
% Unfit samples	2.71	1.63	1.07	0.30	0.98	1.34	1.20

Zone wise information on unfit samples are presented in **Figure 4.1**.

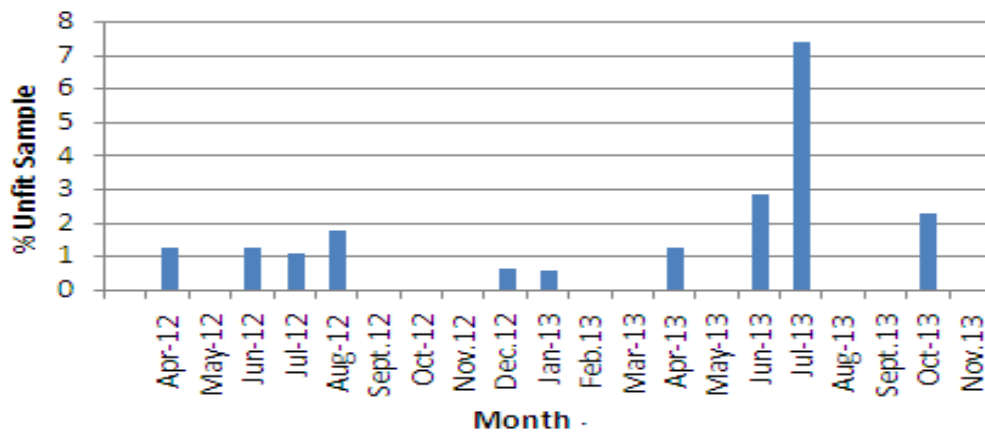
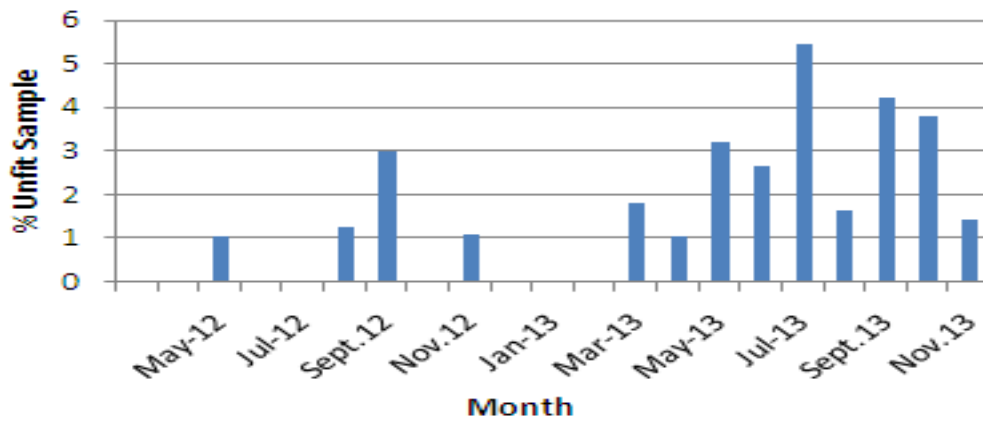
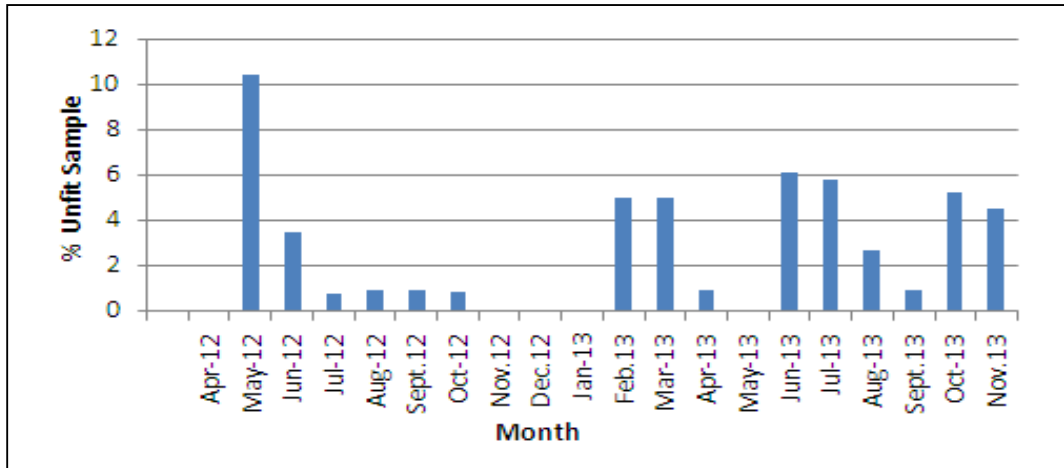


Figure 4.1 : Zone wise Status of Unfit Samples

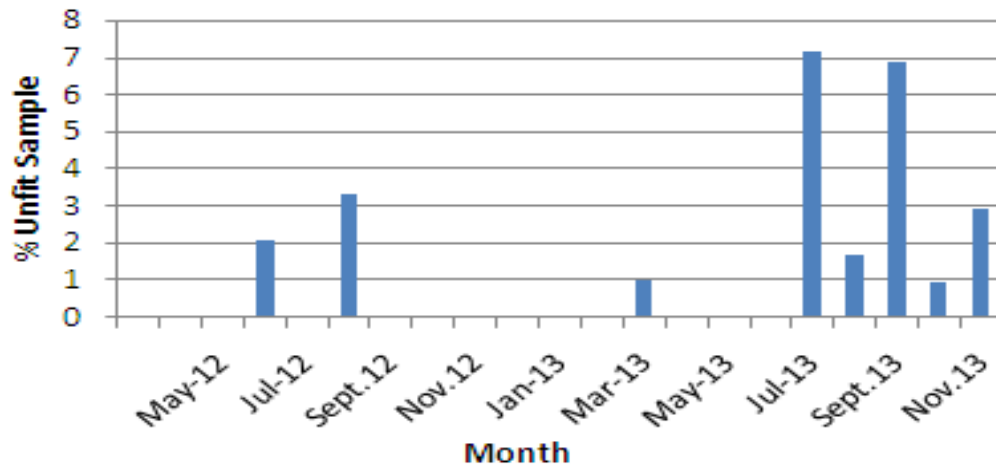
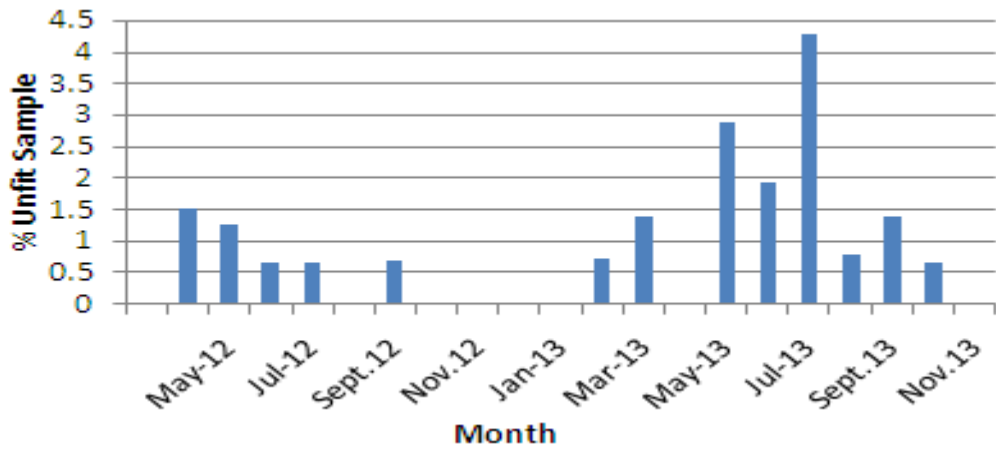
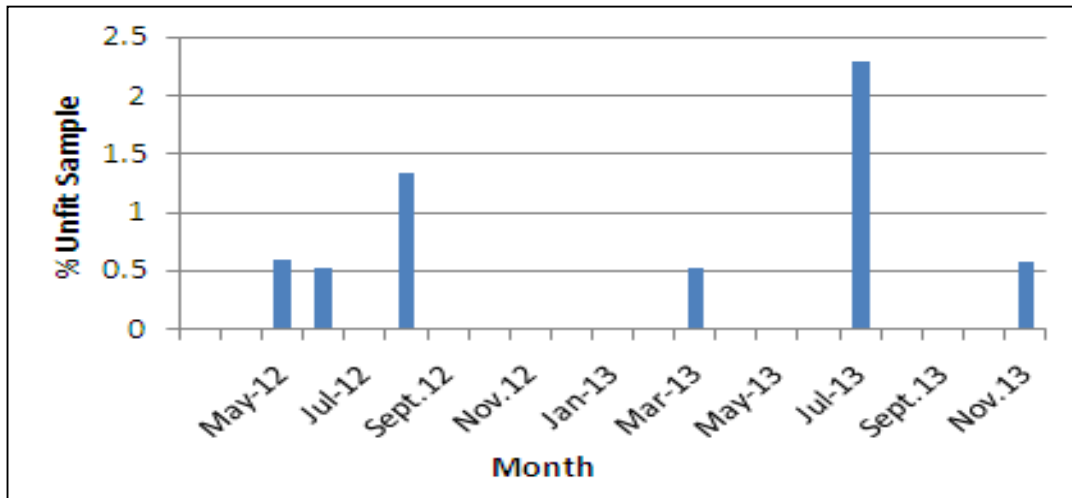


Figure 4.1 (Contd..) : Zone wise Status of Unfit Samples

b) Observations on Water Quality Surveillance

- For Nashik East, the maximum percentage of unfit samples was observed in month of May.
- For Nashik West, Panchavati, Satpur, CIDCO zones, the maximum percentage of unfit sample were observed in month of July.
- For Nashik Road, the maximum percentage of unfit sample was observed to in month of July and September.

Maximum unfit sample were observed in month of July is mainly due to rainy season. It is recommended that NMC should have its own Environmental Laboratory with the facility of microbial analysis.

The water quality surveillance programme should follow CPHEEO norms for frequency and number of samples to be considered per day. It is also recommended to carry out Water Audit.

c) Provision of future Augmentation of Water Supply:

For further improvement in the Water Supply System, NMC prepared DPR Package -2. The design year taken in this DPR is 2041. In the DPR following works were proposed by NMC:

- Intake works and head works at Mukne Dam (for 207 MLD capacity)
- Raw water pumping for 207 MLD water
- Transmission mains from Mukne Dam to Pathardi site
- Water Treatment Plant at Pathardi with MBR and clear water sump
- ESR at Gharkul Yojana
- Clear water transmission mains till ESR

Nashik Municipal Corporation submitted DPR for Package-2 for the approval of GoI, however it was not approved by the Government. It required modifications.

d) Water Supply Master Plan

The Water Supply Master Plan was prepared to meet the water demand of Nashik till 2031. The agenda of the Master Plan was development of new water source for Nashik city. After sanctioning of Kashyapi dam by irrigation department in 2009, Nashik has multiple sources of water. Master Plan analyzed options for sources and recommended –

- Immediate stage (Till 2026) –Lifting of water from Mukane dam and rehabilitation of old head works
- Ultimate stage (upto 2041) – To draw water from Kashyapi dam and additional water from Gangapur, and Mukane dam.

The Master Plan for water supply was revised and the following projects were proposed

- DPR for intake works, head works, raw water pumping at Mukane head works and raw water main from Mukane to Pathardi WTP
- DPR for Pathardi WTP with a capacity of 207 MLD
- Again the project was divided in two phases viz –

Phase I (Design year 2026)

- Intake works in Mukane for 414 MLD of water
- Raw water pumping for 207 MLD and WTP
- Rehabilitation work of Gangapur intake and Chehedi head works

Phase II (Design year 2041)

- New intake and head work at Kashyapi dam
- Raw water pumping at Kashyapi dam

Thus, as per recommendation of Master Plan the total water sources for Nashik has become six and two additional water supply zones were added viz, Pathardi and Kashayapi to existing five numbers.

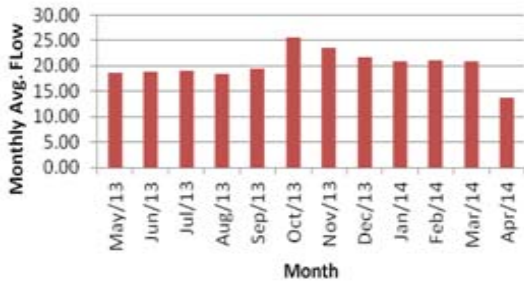
Source: Draft Revised City Development Plan 2012 pp36

4.2 Evaluation of Sewerage System

The information on the monthly average flow for the year 2013-2014, at various pumping stations and for four STPs was provided by Sewerage Department of NMC (**Annexure 17**). is depicted in **Figure 4.2**. A summary of comparison of pumping details at the STPs is presented in **Table 4.2 and 4.3**. **Figure 4.3** presents the graphic information on volumetric load of STP.

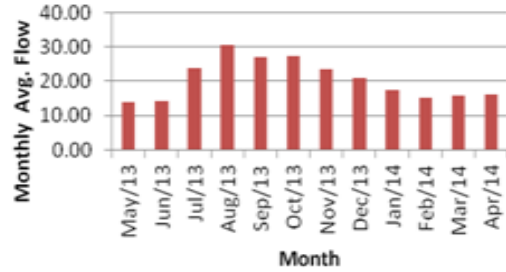
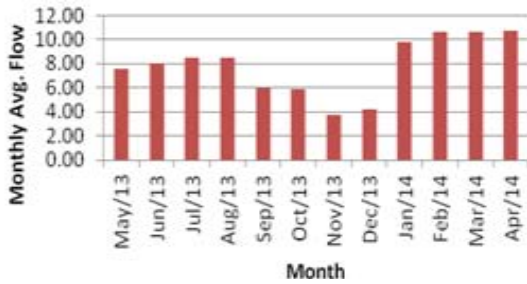
As indicated in **Figure 4.3** representing comparison of wastewater flows receive at respective sewage treatment plants indicate a steady rise in flow at Tapovan. Most of the time a flow equivalent to its design capacity of 130 mld was observed in recent past, particularly when activities of diversion of nallas to the pumping station has been completed. Panchak STP has received maximum flow during august to October, 2013. However, the quantity has reduced in fair season starting from January to April, 2014. Chehadi STP receives about 70% of flow as compared to design capacity of 42 mld, so there is a scope of diverting additional flows to Chehadi and Panchak STPs. However, the limitations of gradient and slope of intercepting sewers and trunk sewers needs to be evaluated before above implementation.

A) Tapovan STP



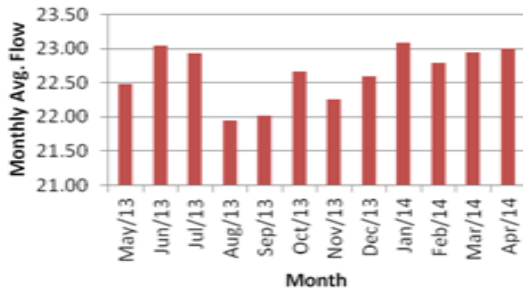
Old Ganeshwadi PS (25 MLD)

New Ganeshwadi PS (45 MLD)



Kaplia SPS (7.5 MLD)

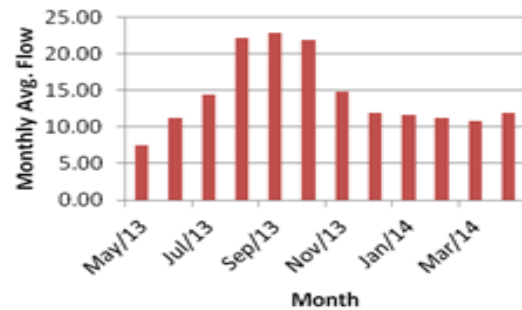
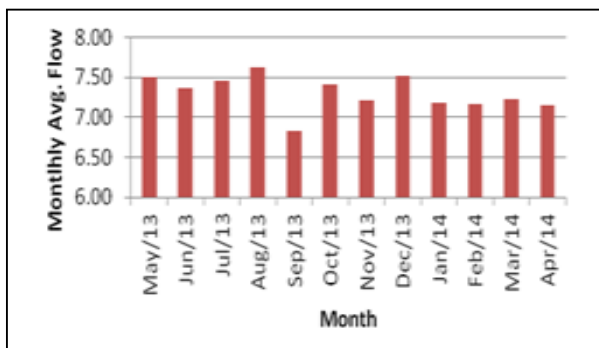
New Kaplia SPS (52 MLD)



Takali SPS (21 MLD)

Tapovan STP (130 MLD)

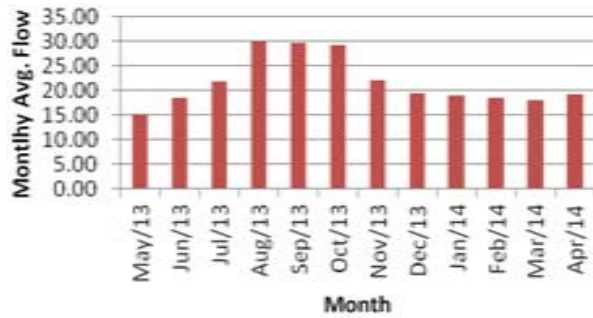
B) Panchak STP



Panchak PS (7.5 MLD)

New Panchak PS (21 MLD)

Figure 4.2 : Average Flows Observed at Various Pumping Stations

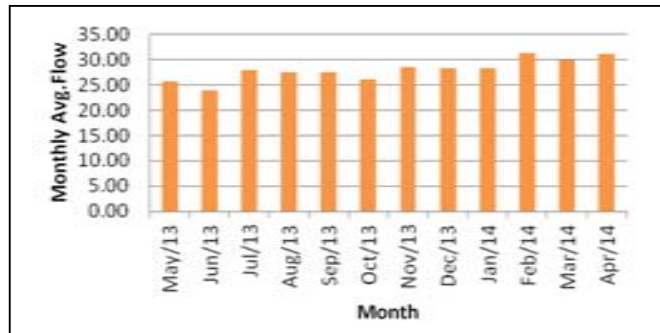


C) Chehedi STP Panchak STP (28.5 = 7.5 + 21 MLD)



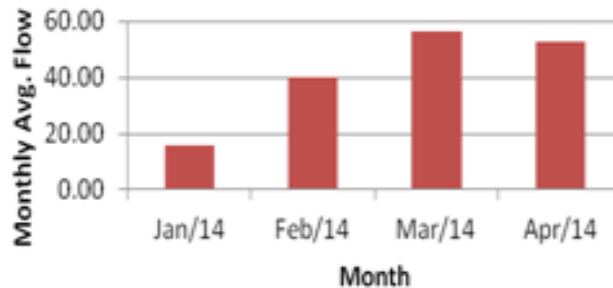
New Chehedi Sewage PS (22 MLD)

Chehedi Pumping Station (20 MLD)



D) Agartakali STP

Chehedi STP (42 MLD)



Agartakali SPS to STP (70 MLD)

Figure 4.2 (Contd..) : Average Flows Observed at Various Pumping Stations

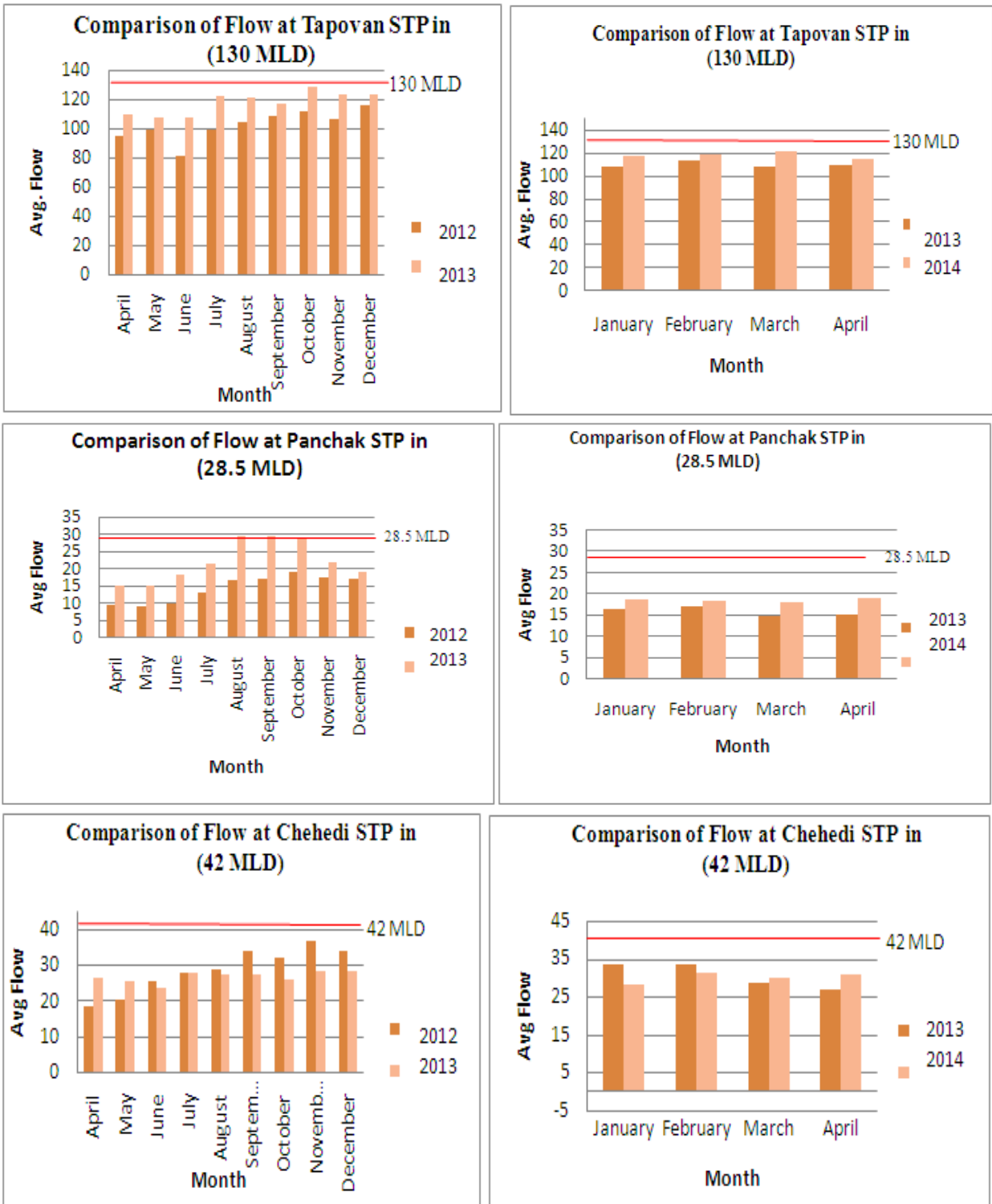


Figure 4.3 : Flow Comparison at STPs

Table 4.2: Comparison of Monthly Average of Pumping Details (2012-13) for Nashik City

Month	Tapovan STP (130MLD)		Chehadi STP (42 MLD)		Panchak STP (28.5 MLD)	
	2012	2013	2012	2013	2012	2013
April	95.17	109.16	18.63	26.72	9.64	15.32
May	99.03	107.44	20.50	25.75	9.33	15.10
June	81.44	107.02	25.42	23.80	10.09	18.50
July	99.30	121.73	27.82	27.83	13.33	21.90
August	104.35	121.36	28.72	27.57	17.01	29.80
September	108.54	117.12	34.28	27.60	17.31	29.70
October	111.68	128.60	32.18	26.06	19.28	29.20
November	106.33	123.65	36.66	28.56	17.64	22.10
December	115.97	122.94	34.17	28.27	17.17	19.50

Table 4.3: Comparison of Monthly Average of Pumping Details (2013-14) for Nashik City

Month	Tapovan STP (130MLD)		Chehadi STP (42 MLD)		Panchak STP (28.5 MLD)		Agar Takli STP (70 MLD)
	2013	2014	2013	2014	2013	2014	2014
January	107.86	116.75	33.44	28.38	16.43	18.9	15.93
February	113.07	118.42	33.32	31.28	17.08	18.4	40.15
March	108.10	121.69	28.86	29.94	14.97	18.0	56.39
April	109.16	114.50	26.72	31.03	15.32	19.1	52.88
May	107.43	90.35	26.50	23.92	15.05	18.31	18.31
June	103.56	108.23	23.80	26.55	18.54	17.24	54.44

4.2.1 Observation on Exiting Sewerage System

a) Contribution of Sewage from Wards to Specified Zone

From the information obtained from Master Plane, 2009 viz. Section 3.2, Sewer Zone it is observed that:

1. Ward No. 79 and 91 does not contribute to sewerage system in any of the zones i.e. total percentage area of sewer in these wards in 0%.
2. The total area of sewer for Ward No. 4, 12,13,14, 32, 33, 34, 68 was observed to be below 100%
3. The total area of sewer for Ward No. 37, 38, 39, 51, 52, 69,108 was observed to be above 100%

Ward-wise Issues

From the Sewerage zone map received by NEERI, It is observed that:

- a. As observed in the map the land area under ward 79 and ward 91 is very less. Accordingly smaller area of sewer comes under these wards.
- b. Ward No. 4 contributes approximately 95% of Sewer system and rest 5% is under Military area which again is under Panchak Zone.

- c. Ward No. 5 contributes its sewerage in Tapovan and Agartakali Zone Although area covered in Agartakali is not mentioned
- d. Ward No. 12 contributes sewerage area to Tapovan, Panchak Zone and very small portion of Agartakali Zone, however according to the information provided in Master Plane 2009 viz. Section 3.2 Sewer Zone; if 40% area contributes to Tapovan then remaining 60% contributes from the remaining 2 zones which is not mentioned. Similar observations are made in case of Ward No. 14, 32, and 68.
- e. Ward No. 33 contributes 100% area to Panchak. However according to the information provided in above table only 65% of its area is said to be under Panchak, hence no traces of remaining 35% area in mentioned.
- f. Ward No. 37 contributes to major part of sewer system to Panchak and lesser part of sewer system to Agartakali. Similar observations are made in case of Ward no. 38.
- g. Ward No. 52 contributes to part of area to Kamathwada and part of area to Gangapur Sewerage zone. However this area contributes only to Kamathwada according to the information provided in report.
- h. Ward No. 69 contributes to part of area to Chehadi and part of area to Panchak Sewerage zone, total of which is obtained to be 132%.
- i. Ward 108 contributes Ambad MIDC and Kamathwada. However area contributed by this ward is 100% to Agartakali and 85% to Kamathwada.
- j. Ward No. 39 contributes 100% Sewer system to Agartakali Zone. According to the information provided in above table this ward contributes 56% sewer area in Panchak as well, thus total area contributed by Ward No. 39 is 156 which is contradictory to Map.
- k. Ward No. 51 contributes 100% Sewer system to Gangapur Zone; although as per the above table 100% area is contributed by ward no 51 to Tapovan.

b) Observations on Pumping Stations

Sr. No.	Name of Pumping Station	Observations
1	Old Ganeshwadi (25 MLD)	The average flow is less than its loading capacity; except in month of October 2013 when slightly more flow above 25 MLD was observed
2	New Ganeshwadi (45 MLD)	Mostly overloaded. The average flow exceeds in month of January 2014 by 0.43 ML. In October 2013 and February 2014, it exceeded by 2 and 4 MLD where as in November December March and April the Pumping Station is highly over loaded.
3	Kapila (7.5 MLD)	Slightly over loaded in monsoon months of June, July, August, and also winter months of January, March, April.
4	New Kapila (52 MLD)	Under loaded

Observations on Pumping Stations (Contd..)

Sr. No.	Name of Pumping Station	Observations
5	Takali (21 MLD)	Remarkable over loaded throughout the month
6	Panchak (7.5 MLD)	Panchak Pumping Station is slightly over loaded in month of August. That may be because of rainfall and inclusion of Storm water into Nallas conveying water to Panchak STP through this pumping Station.
7	New Panchak (21MLD)	Overloaded in month of August September and October, which may be because of storm water conveyed through Nallas
8	Chahde gaon (2 MLD)	Data from September 2013 indicates under loading
9	New Chehedhi (20 MLD)	Under loaded.
10	Chehedhi (22 MLD)	Under loaded
11	Agartakali (210 MLD)	Recently installed in March 2014. Highly under loaded

c) Recommendations based on the Observations on Pumping Stations

- The Nallas that contributes to sewage flow in New Ganeshwadi Pumping Station should be diverted to Old Ganeshwadi Pumping Station.
- As Takali Pumping Station is observed fully loaded throughout the year, 21 MLD of sewage should be diverted to Agartakali Pumping Station from where it will be carried to Agartakali STP.
- The Sewage that is carried to Kapila Pumping Station should be diverted to New Kapila Pumping Station which is comparatively under loaded.
- Drop Structure Collection system must be used wherein storm water flows from shallow sewer towards a vertical shaft from where it falls by gravity into a common deep tunnel which should be further conveyed to river.
- Flow from nallas which carry sewage to overloaded Pumping Station should be diverted to New Chehedhi Pumping Station.
- Flow from nallas which carry sewage to overloaded Pumping Station should be diverted to Chehedhi Pumping Station.

4.3 Observations on Sanitation and Recommendations

- It is observed that the Toilet to person ratio in Nashik is fairly high in the range of 1:65. This results in increase in prevalence of open defecation in slum area.
- Maintenance of the toilet is poor, as toilets are deprived of proper maintenance.
- Availability of electricity and water supply is inadequate. Around 15% toilets do not have electricity either for lighting or pumping of water and 26 toilets suffer shortage of water supply

- Frequent water clogging is observed due to overflowing of gutters as this is mainly due to inadequate gradient.

To make the city “slum free”, NMC has to adopt different schemes like RAY (Rajiv Awas Yojana) guidelines and others which are disclosed by state government. Such schemes include identification of groups who will get benefit of the scheme, GIS mapping of slums, implementation of pilot scale scheme on PPP basis at selected places and then covering remaining areas. If properly implemented, NMC expects the city to be almost slum free by 2026. NMC has to perform stringent controlling and monitoring efforts to prevent flourishing of new slums and rehabilitate the existing slums by 2031.

4.4 Secondary Water Quality Data of River Godavari by MPCB

MPCB routinely monitors river water quality at specified locations under the programme of GEMS, MWMPs, SWMPs, IDW and IWIN. The secondary data provided by MPCB for the year 2012 is along with observations is presented in **Table 4.4**.

BOD of river water in the Nashik area mainly including places like Gangapur Dam, Ramkund, Godavari D/S Nashik, Someshwar temple, Chikhali nalla meeting point, Hanuman ghat, Godavari D/s Tapovan broadly ranges from 2 to 40 mg/L. The higher BOD values can be due to the activities carried out on the banks of river including washing of clothes, vehicles, performing Pujas at Ramkund etc. Lesser BOD values are observed at Godavari River at Gangapur Dam, BOD values at Kapila Godavari Confluence point and Chikhli Nalla Godavari Confluence point typically ranged between 4 to 40 mg/L.

BOD values of Godavari River at Someshwar Temple, and downstream of Nashik city is quite low and meets and A-II river water quality standards in most of the samples. Though BOD values of Water samples from Nashik Downstream ranges from 2 to 9 mg/L, the values rarely exceeds the value of 5mg/L.

Ammonical Nitrogen concentration varies greatly from stations to stations. Higher ammonical nitrogen values are observed in the river where Chikhali nalla meets river Godavari. It ranges from 3 to 30 mg/L indicating the inflow of wastewater through nalla. Kapila Godavari confluence point also show higher ammonia cal nitrogen concentration in the range of 0.12 to 17 mg/L.

According to the A-II water quality standards prescribed by MPCB, the total coliforms should not exceed the value of 5000 MPN per 100 ml sample. All the water samples of Godavari River do not exceed the prescribed limit of A-II river water quality standards.

Table 4.4: Secondary data of River Water Quality – 2012

a) Godavari River at Gangapur Dam

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
pH	7.7	7.5	8.3	7.5	7.2	7.5	7.5	7.1	7.6	7.6
Conductivity	189.0	271.0	200.0	151.0	211.0	165.0	197.5	142.5	166.9	160.0
DO	6.4	6.5	6.5	6.4	6.5	6.6	6.1	6.5	6.9	6.8
BOD	3.0	3.0	3.0	4.0	3.0	3.0	3.5	3.0	3.0	3.0
Nitrate	0.7	0.6	0.0	0.2	0.2	0.1	0.6	4.5	6.0	4.0
Ammonia	0.2	0.0	0.0	0.0	0.1	BDL	0.0	0.1	0,,04	0,,12
Total Coliform	17.0	27.0	27.0	11.0	40.0	22.0	22.0	26.0	30.0	40.0
Fecal Coliform	8.0	9.0	9.0	9.0	13.0	11.0	11.0	11.0	11.0	11.0

* All values expressed as mg/l except pH, TC & FC expressed in (MPN)/100 ml

b) Godavari River at Chikhali Nalla

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
pH	7.7	7.3	8.1	7.2	7.0	7.3	7.6	7.5	7.8	7.7
Conductivity	260.0	181.0	851.0	232.0	404.0	298.0	241.0	441.0	502.7	1360.0
DO	5.1	5.6	5.2	6.1	5.6	6.1	7.0	6.2	5.3	6.7
BOD	6.0	6.0	6.0	5.5	5.5	5.5	3.0	4.0	5.0	6.0
Nitrate	1.8	0.6	0.9	4.6	0.1	0.5	0.4	25.0	21.1	9.9
Ammonia	0.0	0.2	0.0	0.2	0.0	0.1	0.1	0.1	0.0	0.1
Total Coliform	50.0	60.0	27.0	110.0	60.0	40.0	60.0	40.0	50.0	60.0
Fecal Coliform	23.0	21.0	11.0	50.0	22.0	13.0	21.0	13.0	17.0	17.0

* All values expressed as mg/l except pH, TC & FC expressed in (MPN)/100 ml

Table 4.4 (Contd.): Secondary data of River Water Quality – 2012

c) Chikhali Nalla meeting Godavari River

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
pH	7.4	7.1	7.1	7.2	6.9	Dry	7.1	6.9	8.0	7.1
Conductivity	1100.0	938.0	950.0	950.0	908.0		1081.0	1186.0	2113.0	331.0
DO	1.5	5.1	Nil	6.1	3.2		2.9	4.5	4.2	3.2
BOD	40.0	8.0	27.0	5.0	14.0		20.0	12.0	8.0	7.0
Nitrate	BDL	0.1	0.2	11.4	BDL		6.1	24.7	10.4	41.2
Ammonia	21.2	4.9	29.7	14.4	26.4		11.9	3.4	4.4	4.3
Total Coliform	900.0	240.0	180.0	500.0	240.0		240.0	280.0	301.0	280.0
Fecal Coliform	240.0	50.0	60.0	1600.0	50.0		60.0	70.0	80.0	80.0

* All values expressed as mg/l except pH, TC & FC expressed in (MPN)/100 ml

e) Godavari River at Hanuman Ghat

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
pH	7.2	7.1	7.5	7.1	7.1	6.5	7.4	7.0	7.8	7.8
Conductivity	419.0	191.0	262.0	690.0	381.0	441.0	351.8	394.0	480.6	443.9
DO	2.4	5.5	6.2	6.2	5.9	6.2	5.9	3.0	4.8	6.4
BOD	18.0	6.0	4.0	4.5	6.2	5.0	4.0	12.0	6.0	6.0
Nitrate	0.5	3.4	1.1	3.5	0.2	0.0	0.1	9.3	18.3	14.3
Ammonia	0.0	1.4	BDL	0.2	1.2	1.5	0.1	1.0	0.5	0.2
Total Coliform	240.0	120.0	70.0	500.0	60.0	180.0	60.0	110.0	90.0	110.0
Fecal Coliform	60.0	27.0	22.0	170.0	22.0	60.0	21.0	40.0	30.0	33.0

* All values expressed as mg/l except pH, TC & FC expressed in (MPN)/100 ml

Table 4.4 (Contd.): Secondary data of River Water Quality – 2012

e) Godavari River at Ramkund

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
pH	7.3	7.5	8.1	7.1	7.0	7.4	7.3	6.8	7.5	7.4
Conductivity	320.0	250.0	248.0	394.0	421.0	231.0	368.5	307.2	492.1	757.5
DO	4.1	5.2	5.6	6.2	5.6	6.3	3.2	5.4	5.2	5.0
BOD	10.0	8.0	5.0	5.0	6.0	4.5	10.0	5.0	4.0	5.0
Nitrate	1.1	3.7	4.0	7.7	0.1	BDL	0.1	10.7	13.5	16.4
Ammonia	0.0	3.2	0.1	1.7	0.1	0.1	0.2	0.8	0.5	BDL
Total Coliform	280.0	70.0	70.0	350.0	60.0	40.0	60.0	90.0	110.0	170.0
Fecal Coliform	60.0	24.0	22.0	110.0	22.0	22.0	21.0	26.0	30.0	40.0

* All values expressed as mg/l except pH, TC & FC expressed in (MPN)/100 ml

f) Godavari River at Nashik D/S

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
pH	7.2	7.3	7.6	7.1	7.0	7.6	7.2	6.9	7.6	7.6
Conductivity	311.0	201.0	248.0	399.0	410.0	275.0	398.1	331.0	519.0	495.1
DO	4.4	5.6	6.2	6.3	6.1	6.4	5.4	5.0	4.7	4.5
BOD	9.0	5.0	4.0	4.5	4.5	4.5	2.0	6.0	8.0	6.0
Nitrate	0.1	2.9	0.2	0.0	0.1	0.3	0,549	1.0	0.9	0.1
Ammonia	BDL	2.9	0.2	0.0	0.1	0.2	0.6	1.0	0.9	0.1
Total Coliform	350.0	50.0	60.0	500.0	27.0	70.0	50.0	50.0	60.0	50.0
Fecal Coliform	70.0	21.0	20.0	140.0	13.0	21.0	22.0	21.0	22.0	17.0

* All values expressed as mg/l except pH, TC & FC expressed in (MPN)/100 ml

Table 4.4 (Contd.): Secondary data of River Water Quality – 2012

g) Godavari River at Kapila Godavari Confluence point

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
pH	7.1	7.4	7.1	7.1	7.0	7.6	7.1	7.1	7.7	7.6
Conductivity	357.0	288.0	421.0	440.0	532.0	243.0	465.6	786.4	566.7	698.2
DO	1.1	6.1	6.1	6.2	6.1	6.3	2.6	1.6	4.2	3.8
BOD	40.0	4.0	4.5	4.5	5.0	5.0	24.0	12.0	8.0	9.0
Nitrate	0.6	18.2	0.2	29.0	0.4	0.2	0.1	2.8	31.5	35.8
Ammonia	10.0	0.8	5.7	1.7	0.1	0.1	5.7	16.6	5.6	5.8
Total Coliform	140.0	60.0	70.0	500.0	50.0	140.0	140.0	180.0	170.0	170.0
Fecal Coliform	70.0	11.0	22.0	220.0	21.0	70.0	60.0	70.0	60.0	50.0

* All values expressed as mg/l except pH, TC & FC expressed in (MPN)/100 ml

h) Godavari River at Tapovan

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
pH	7.2	7.5	7.4	7.7	7.0	7.7	7.2	6.9	7.8	7.7
Conductivity	356.0	243.0	392.0	503.0	589.0	240.0	461.8	115.4	508.3	502.9
DO	2.3	6.1	6.2	6.1	5.4	6.1	3.0	4.1	4.0	6.8
BOD	16.0	4.0	4.0	4.5	6.5	5.5	28.0	9.0	6.0	6.0
Nitrate	0.1	3.7	0.1	21.7	0.3	0.2	0.1	19.2	14.4	13.8
Ammonia	BDL	2.1	6.9	BDL	0.1	0.2	5.5	3.6	1.1	0.1
Total Coliform	240.0	170.0	100.0	900.0	100.0	100.0	110.0	110.0	110.0	140.0
Fecal Coliform	60.0	50.0	34.0	350.0	22.0	34.0	33.0	34.0	40.0	50.0

* All values expressed as mg/l except pH, TC & FC expressed in (MPN)/100 ml