



CENTRAL POLLUTION CONTROL BOARD
Parivesh Bhawan, East Arjun Nagar, Delhi-110 032



BIO-SCIENCE LABORATORY
Field Protocol for Bio-Monitoring

Certificate No.: T-0644

SAMPLING EVENT DETAILS :

Water body	:	
Location	:	
Date of sampling	:	
Starting time of sampling	:	
Ending time of sampling	:	
Sampling team	:	

LOCATION DETAILS :

Avg. Depth (m) or feet	:	1	2	3	4	5	6	7	8	9	10	\bar{d}
(Approx. depth can be measured from height of cattles wading, from bathing activities, length of iron rope of artificial substratum in water body or any other measuring device)												

Approx. width (m or feet)	:	
Approx. main stream flow (m/s)	:	

Description of water	:	Pool	
		Slack	
		Riffle	
		Run	
		Depositing	
		Eroding	
		Turbulent	
		Canalized	

Substrate composition of Natural or Manmade water body/Wetland	:	> 256 mm	Boulders		%
		255 – 64 mm	Cobbles		%
		63 – 16 mm	Pebbles		%
		15 – 2 mm	Gravel		%
			Sand		%
			Silt		%
			Clay		%
			Detritus		%
			Macrophytic vegetation		%
			Artificial substratum		%

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Human influences	:	Melon farming	
		Cattle wading	

Dredging	
Sand recovery	
Other	Bathing, Tourist place

Wet land plants :

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 %

Macrophyte cover/Name :

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 %

Birds/wild life habitation/Name :

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 %

Surrounding land use	Urban	
	Arable	
	Grazing	
	Forest	
	Other	

Sun's Intensity	Nil	
	Moderate	
	Heavy	

Approx altitude (m)	
Discharges	Upstream- Industrial discharge from Mandideep
Confluences	

Make a detailed drawing or photograph of the local situation, and indicate sampling stations and other peculiarities:

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Check List for Bio-Monitoring

1. Sieve with 0.6 mm mesh size
2. Hand net
3. Shovel
4. Scraper
5. Depth measurement device – Folding stick etc.
6. Plastic ball, measuring tape & stop watch for flow measurement
7. Gum boots and hand gloves
8. pH strips, DO bottles & reagents
9. Thermometer
10. White enamel trays
11. Small plastic bucket & rope
12. Wide mouth bottle
13. Forceps, needles & convex hand lens
14. Formalin (4%) or Alcohol (70%)
15. Stickers & marking pen
16. Artificial substratum & its accessories for lined canals etc.
17. First aid box, soap, disinfectant & towel
18. Field protocols
19. Camera for site photograph if required, caps etc.
20. One big box/crate to accommodate artificial substratum for bio-monitoring of benthic macro-invertebrate.
21. Water proof file/bag for placing the field protocols
22. Life Jacket

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Check List for Sample Collection:

SAMPLE TYPE	BOTTLE	VOLUME	PRESERVATION	TICK MARK THE SAMPLE COLLECTED FROM THE SITE
Water Samples for Chemical Analysis				
Physico-chemical composition	PE carboy	5 L	Cooled in ice	
Ammonia	G NM	1 L	2 ml H ₂ SO ₄	
Heavy metals	PE NM	250 ml	1 ml HNO ₃	
Mercury	G NM	250 ml	1 ml HNO ₃ + 5ml K ₂ Cr ₂ O ₇	
Pesticides	G NM (brown)	1 L	-	
PAH + PCB + etc.	G NM (brown)	1 L	-	
Oil and grease	G NM (brown)	1 L	Cooled in ice	
Cyanide	G NM	1 L	Cooled in ice	
Phenol	G NM (brown)	1 L	Cooled in ice	
Chlorophyll	PE NM	1 L	-	
	G NM GS (Sterilized)	300 ml	Cooled in ice	
Water Samples for Bacteriological Analysis				
Total Coliform and Faecal Coliform	Sterilized Glass Bottle	125 ml	Cooled in ice	
Sediment Samples for Chemical Analysis				
Heavy metals	PE WM	1 L	Cooled in ice	
Pesticides + PAH + PCB + etc.	G WM	1 L	Cooled in ice	
Biological Samples for Chemical Analysis (Fish, Mussels, Water Hyacinth, etc.)				
Heavy metals	PE bag		Deep frozen	
Pesticides + PCB + etc.	G WM	1 L	Deep frozen	
Biological Samples for Bio-Assessment				
Benthic Macro-Invertebrates	PE WM	0.1 – 0.5 L	Alcohol 70% or Formalin (4%)	
Others				
Effluent toxicity	PE carboy	25 L	None	
Up-stream dilution water	PE carboy	25 L	None	

G – Glass, GS – Glass stoppered, PE – Polythene, NM – Narrow Mouth, WM – Wide Mouth

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FIELD MEASUREMENTS :

TIME	DATE	Water Temperature (°C)			Air Temperature (°C)			DO-Titration (mg/l)	pH Strip
		Temp. Observed	Correc tion factor	Actual Temp.	Temp. Observed	Corre ction factor	Actual Temp.		

SAMPLING OF BIOLOGICAL ORGANISMS

PROCEDURE :- Different procedures can be employed for sampling of biological parameters. Sampling should be conducted during availability of ample amount or sunlight in the field. Find out the nature of river bed and select the procedure. Always approach the sampling area starting from down stream to upstream. Avoid bio-monitoring at places of acute air quality problems.

I. Stoney River Bed:

- Pick up stones randomly from the fast flowing shallow stream and remove the organisms by brush or soft forceps pins into a white tray.
- Place the sampling net firmly on to the stream bed.
- Brush off the larger stones or rocks lying under water and placed adjacent to the mouth of net for collecting animals.

II. Smaller Stones and Sandy Bed:

Place the net or sieve firmly on to the stream bed against the flow. Stand before the net or sieve and kick up by foot the stream bed and collect the animals into the net or sieve. Wash the animals into white tray.

III. Mud and Silty Bed:

Pick up 5 grab samples of the river bed by the shovel. Wash the sample in the sieve by river water. Pick up the animals by hand or brush or soft forcep pins into white tray.

IV. Water Plants/Floating lands:

Uproot the water plants present near the sampling area. Wash and collect the animals either directly into the net or into white tray.

Collect the benthic macro-invertebrates from floating land by scrubbing the sieve or net under or sides of the floating land.

Identify the indicator animals belonging to various taxa from the given identification chart and the characters. Note down the abundancy of each animals identified. Compare the results from the Water Quality Evaluation system of BWQC and define the water quality class to the investigated water body.

SAPROBIC [BIOLOGICAL MONITORING WORKING PARTY (BMWP)] SCORE:

Ample care should be taken to ensure that all indicator families of Benthic Macro-invertebrates, which are present are actually encountered. This can be accomplished by sub-sampling all different (micro) habitats in a sizeable stretch of the river/water body. The monthly Inventory fieldwork can be restricted to a biologically mature period of the year (October – May), excluding monsoon and post-monsoon periods. Use identification key at page 12, for preliminary identification of Benthic Macro-invertebrates Taxa.

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This method involves a quantitative inventory of the presence of macro-invertebrate benthic fauna upto family level of taxonomic precision. All possible families having saprobic indicator value are classified on a score scale of 1 to 10 according to their preference for saprobic

water quality. The families which are most sensitive to pollution are on the top of the list (Table 1) and are getting a score of 10 while the most pollution tolerant families are getting a score of 1 and 2. The other intermediately sensitive families are placed in between the scoring scale of 10 to 1.

ENTER DIFFERENT SPECIES WITHIN ONE FAMILY SEPARATELY, AND INDICATE ABUNDANCY AS:

Abundance scale: **A** = single (one individual)
 B = scarce (2-10 individuals)
 C = common (10-50 individuals)
 D = abundant (50-100 individuals)
 E = excessive (more than 100 individuals or only one species)

TABLE – 1

TAXONOMICAL GROUP	TAXONOMICAL FAMILIES	MARK ENCOUNTERED FAMILIES AND IF POSSIBLE SPECIES WITHIN FAMILIES ALSO MARK ABUNDANCY AS - 1A, 1B, 1C, 1D, 1E	TOTAL FAMILIES/ SPECIES ENCOUNTERED	BMWP SCORE	MULTI-PLIED SCORE
Ephemeroptera	Siphonuridae				
	Heptageniidae				
	Leptophlebiidae				
	Ephemerellidae	1A			
	Pothamintidae				
	Ephemeridae				
	Prosopistomatidae				
Plecoptera	Taeniopterygidae				
	Leuctridae	1 A			
	Capniidae				
	Perlodidae				
	Perlidae				
Hemiptera	Aphelocheiridae				
Trichoptera	Leptoceridae				
	Goeridae				
	Lepidostomatidae				
	Brachycentridae	1 C			
	Sericostomatidae				
TOTAL FAMILIES ENCOUNTERED & TOTAL MULTIPLIED SCORE			3	X 10	30

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TAXONOMICAL GROUP	TAXONOMICAL FAMILIES	MARK ENCOUNTERED FAMILIES AND IF POSSIBLE SPECIES WITHIN FAMILIES ALSO MARK ABUNDANCY AS - 1A, 1B, 1C, 1D, 1E	TOTAL FAMILIES/ SPECIES ENCOUNTERED	BMWP SCORE	MULTI-PLIED SCORE		
Odonata	Euphaeidae			X 8	16		
	Lestidae						
	Plathycnemididae						
	Gomphidae						
	Cordulegasteridae						
	Aeschnidae						
	Corduliidae						
	Libellulidae						
	Micronectidae	1 A					
Trichoptera	Psychomyiidae						
	Philopotamidae	1 C					
TOTAL FAMILIES ENCOUNTERED & TOTAL MULTIPLIED SCORE			2	X 8	16		
Ephemeroptera	Caenidae			X 7			
Plecoptera	Nemouridae						
Trichoptera	Rhyacophilidae						
	Polycentropodidae						
	Limnephilidae						
TOTAL FAMILIES ENCOUNTERED & TOTAL MULTIPLIED SCORE						X 7	
Mollusca	Neritidae					X 6	12
	Viviparidae	1 B					
	Hydrobiidae						
	Thiaridae						
	Bithynidae						
	Ancylidae						
	Unionidae	1 B					
Trichoptera	Hydroptilidae						
Crustacea	Atydae						
	Gammaridae						
	Palaemonidae						
Polychaeta	Nereidae						
	Nephtyidae						
Odonata	Agriidae						
	Coenagriidae						
TOTAL FAMILIES ENCOUNTERED & TOTAL MULTIPLIED SCORE			2	X 6	12		
TAXONOMICAL	TAXONOMICAL	MARK ENCOUNTERED FAMILIES AND IF POSSIBLE	TOTAL	BMWP	MULTI-		

GROUP	FAMILIES	SPECIES WITHIN FAMILIES ALSO MARK ABUNDANCY AS - 1A, 1B, 1C, 1D, 1E	FAMILIES/ SPECIES ENCOUNTERED	SCORE	PLIED SCORE
Hemiptera	Mesovelidae				
	Hydrometridae				
	Gerridae				
	Nepidae				
	Naucoridae				
	Notonectidae				
	Pleidae				
	Veliidae				
	Hebridae				
	Belastomatidae				
	Corixidae				
Coleoptera	Haliplidae				
	Hygrobidae				
	Dytiscidae				
	Gyrinidae				
	Hydrophilidae				
	Dryopidae				
	Elminthidae				
	Noteridae				
	Psephenidae				
Trichoptera	Hydropsychidae	1 C			
Diptera	Tipulidae				
	Culicidae				
	Blepharoceridae				
	Simuliidae				
Planaria	Planariidae				
	Dendrocoelidae				
TOTAL FAMILIES ENCOUNTERED & TOTAL MULTIPLIED SCORE			1	X 5	5
Ephemeroptera	Baetidae				
Megaloptera	Sialidae				
Hirudinea	Piscicolidae				
TOTAL FAMILIES ENCOUNTERED & TOTAL MULTIPLIED SCORE				X 4	

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TAXONOMICAL GROUP	TAXONOMICAL FAMILIES	MARK ENCOUNTERED FAMILIES AND IF POSSIBLE SPECIES WITHIN FAMILIES ALSO MARK ABUNDANCY AS - 1A, 1B, 1C, 1D, 1E	TOTAL FAMILIES/ SPECIES ENCOUNTERED	BMWP SCORE	MULTI-PLIED SCORE
Mollusca	Lymnaeidae	1 A			
	Physidae				
	Planorbidae				
	Sphaeridae				
Hirudinea	Glossiphonidae				
	Hirudidae				
	Erpobdellidae				
Planaria	Dugesiiidae				
Crustacea	Asellidae				
TOTAL FAMILIES ENCOUNTERED & TOTAL MULTIPLIED SCORE			1	X 3	3
Diptera	Syrphidae				
	Chironomidae	1 B			
	Ephydriidae				
TOTAL FAMILIES ENCOUNTERED & TOTAL MULTIPLIED SCORE			1	X 2	2
Oligochaeta	All families			X 1	
TOTAL FAMILIES ENCOUNTERED & TOTAL MULTIPLIED SCORE					
GRAND TOTAL FAMILIES ENCOUNTERED & GRAND TOTAL MULTIPLIED SCORE				10	68

Saprobic score:

GRAND TOTAL MULTIPLIED SCORE

GRAND TOTAL NUMBER OF FAMILIES ENCOUNTERED

SAPROBIC SCORE:

68/10 = 6.8

REMARKS:

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DIVERSITY SCORE (SEQUENTIAL COMPARISON):

The evaluation of the benthic fauna diversity level can easily be done utilizing the same animals collected for estimating the saprobity score. Take photograph of the living animals in the field for evidence.

Since the method only involves a pair-wise comparison of sequentially encountered individuals, and the differences of two specimen can easily be observed up to the species level, no taxonomic skill is required.

First observed animal is always different and scored as 1 run. When the next observed animal is different from the last, a new run starts. The encounter of an individual which cannot be discerned from the last does not increment the number of runs. Size differences only do NOT change the run.

SAME RUN IS 0 (organism is the same as the previous)

NEXT RUN IS 1 (organism is different from the previous)

When a row is full, continue on next row. Enter the number of runs over all rows (sum of I's).

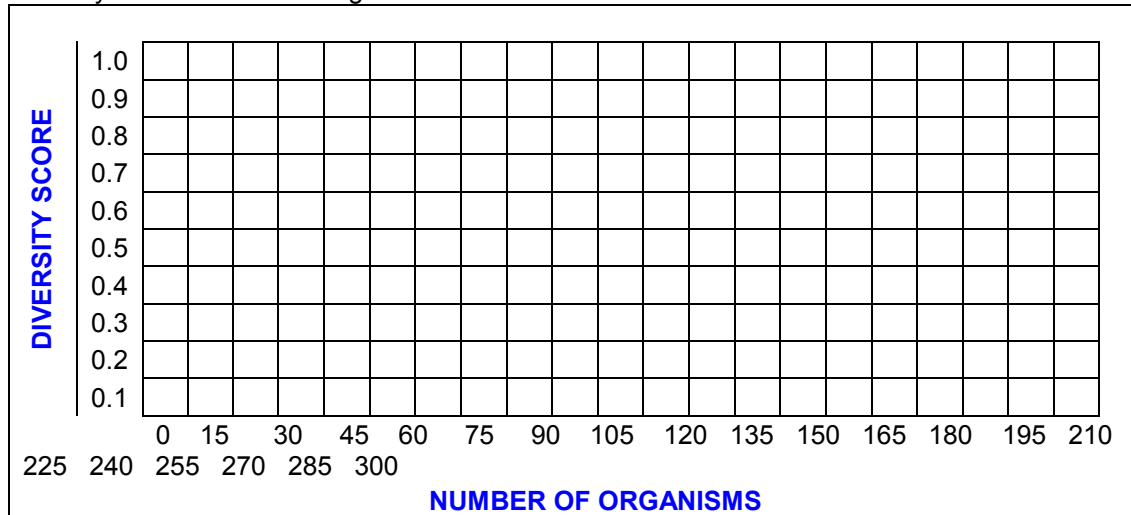
No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total Runs	Total Org.	Diversity Score
1.	1																15	
2.																	30	
3.																	45	
4.																	60	
5.																	75	
6.																	90	
7.																	105	
8.																	120	
9.																	135	
10.																	150	
11.																	165	
12.																	180	
13.																	195	
14.																	210	
15.																	225	
16.																	240	
17.																	255	
18.																	270	
19.																	285	
20.																	300	

DIVERSITY SCORE :
$$\frac{\text{Number of Runs}}{\text{Number of Organisms}}$$

DIVERSITY SCORE :

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Make a graph of Diversity score Vs Number of Organisms for selection of appropriate Diversity score at a linear range.



Note: If, there is no linearity in the graph, then take the average value of Diversity Score.

BIOLOGICAL WATER QUALITY CRITERIA (BWQC)

To assess the actual health of water bodies, CPCB has derived a Biological Water Quality Criteria (BWQC) for water quality evaluation. This system is based on the range of saprobic values and diversity of the benthic macro-invertebrate families with respect to water quality. The system has been developed after extensive field trials and calibration on the saprobity and diversity information of different taxonomic groups of benthic animals collected from artificial substratum and natural substratum of various water bodies. To indicate changes in water quality to different grades of pollution level, the entire taxonomic groups, with their range of saprobic score from 1 to 10, in combination with the range of diversity score from 0 to 1 has been classified into five different classes of water quality (Table 2). The abnormal combination of saprobic score and diversity score indicates sudden change in environmental conditions.

Table - 2

Range of Saprobic Score	Range of Diversity Score	Water Quality	Water Quality Class	Indicator Colour
7 and more	0.2 – 1.0	Clean	A	Blue
6 – 7	0.5 – 1.0	Slight Pollution	B	Light Blue
3 – 6	0.3 – 0.9	Moderate Pollution	C	Green
2 – 5	0.4 – less	Heavy Pollution	D	Orange
0 – 2	0 – 0.2	Severe Pollution	E	Red

CRITERIA FOR BIOLOGICAL WATER QUALITY EVALUATION

The biological water quality evaluation using benthic fauna, can easily be done by combining the observed saprobic score and diversity score and the biological water quality class can be determined through comparing the results with the ranges of Saprobic and Diversity score prescribed in Biological Water Quality Criteria (BWQC).

	Range of Saprobic Score (0 – 10)	Range of Diversity Score (0 – 1.0)	Water Quality	Water Quality Class	Indicator Colour
Results :	6.8		Slight pollution	B	Light Blue

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IDENTIFICATION CHARACTERISTICS OF BENTHIC MACRO INVERTEBRATES TAXA

PLECOPTERA (Stone fly nymph) :- Animals of this group are very sensitive to pollution. They are most abundant in cold, flowing waters with plenty of dissolved oxygen. They are normally found in the bottom of gravel or stones. The body consists of head, thorax and abdomen. Thorax bears three pairs of jointed legs with two claws or hooks at the end. They have two tail-like filaments at the end of abdomen. Their length is up to 2.5 centimeters.

EPHEMEROPTERA (May fly nymph) :- These animals are also sensitive to pollution, but some of the tolerant species are also available. They are very similar to stonefly nymph. Normally, they have three tails (sometimes two) at the end of abdomen. The legs bear one hook or claw at the end. They can be distinguished from stonefly nymph by the presence of gills on either side of abdominal segments. Their length is up to 2.5 centimeters.

TRICHOPTERA (Caddis fly larvae) :- The sensitive forms of caddis fly larvae live in flowing waters and are known for their construction of hollow cases made up of small stones, gravel, leaves, twigs, sand grains etc. Most of them are either attached to the big stone or rocks or they are without cases. The tolerant species are mostly associated with the animals of highly polluted waters. The caddis fly larvae are characterized by a cylindrical body. The terminal end of abdomen bears two small hooks. They grow up to 4.0 centimeters.

ODONATA (Dragon fly and Damselfly nymph) :- The presence of these animals indicates input of little organic pollution in the slow moving or standing clean waters. They are the nymph of adults dragon fly and damselfly which are powerful filters and can fly over several hundred kilometers. They can be observed around water bodies. Nymph of dragons are robust while damselfly are slender with distinct head, thorax and abdomen. They can be identified by a very distinct spoon-shaped food capturing protrudable device underneath and head. The dragons have pointed extremities at the end of abdomen whereas damselfly nymph have three plate-like gill filaments.

CRUSTACEA (Prawn) :- The animals of this group are moderately intolerant of pollution. Body is flattened from either sides. The animal can be distinguished from the insects by the presence of more than three pairs of legs. The head is fused with few or all the thoracic segments to form cephalothorax. The whole body is covered externally by chitinous cuticle. These animals can be observed in variety of standing and flowing waters, hiding in plants of shallow waters under the debris and organic detritus.

COLEOPTERA (Beetles) :- Animals commonly known as water beetles. Beetles belong to the most diverse order of living organisms. Of the more than one million species of insects at least one third are beetles. Body typically consists of head, thorax and abdomen. Head bears the chewing mouth parts, one pair of antennae. Thorax bearing 3 pairs of jointed legs. The wings are modified to form rigid cover or shield on the abdomen. Different types of beetles can be found in both standing and flowing waters. Some of them are surface dwellers whereas others are submerged forms. They fulfill their oxygen requirement mostly from atmosphere. They either store air under their wing covers, or capture air bubbles on the fine hairs that cover their legs and stomach area. Adult beetles are tolerant of a wide variety of pollutants.

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HEMIPTERA (Bug) :- They are commonly known as water bugs. This is a large order. Diversity within the order is high both in terms of structure and habitat. Aquatic bugs live both in running and standing waters. Most of them are surface dwellers. Some of them are sensitive species but most of them prefer moderately polluted waters. They either carry air bubble while swimming or breath through abdominal tail like siphon. They can be distinguished from beetles by structure of head which prolonged into a beaklike structure adopted for piercing and sucking fluids from plants or animals.

MOLLUSCA (Snails and Mussels) :- The animals of this group of Benthic macro invertebrates are characterized by the presence of a hard calcareous shell and lacking extremities. The snails have a coiled shell and a muscular foot whereas mussels also termed as bivalves are having shells consisting of two halves connected by an elastic hinge. Mollusks are found in almost all kinds of waters and sediments. Some types of mollusca are quite intolerant to pollution, while others are tolerant. Snails which are having gills are dependent on the level of oxygen in water and thus are sensitive to oxygen depletion. Those snails which are characterized by the presence of lungs can obtain oxygen directly from atmosphere. Thus, they are able to live in water with a little or no oxygen. The snails with gills are identified by right handed opening shells, whereas the snails with lungs can be both right and left handed opening shells.

HIRUDINEA (Leeches) :- Commonly named as leeches. They look like worms but do not have hairs on their body. The body is segmented which can shrink and extend. They have suckers at both the ends of body. These animals are indicator of highly polluted waters, and can live for several days without oxygen. They are active during night. Usually they can be found under the stones or rocks. Leeches normally prefer shallow waters with lot of vegetation. They are parasite on animals like gastropods, beetles, insect larvae, aquatic birds, fish and crabs.

DIPTERA

Chironomous Larvae or Red Worms :- They are very common indicator of highly polluted waters among the diptera group. They represent the largest family of aquatic insects. These species are tolerant to the organic pollution and found in high abundancy in sedimentation areas. These larvae have thorax without segmented legs mostly with proleg or pseudopodia in one or more segment. Two pairs of tubule or branchiae are present at the end of body segment. They live in running waters making tube-like nests).

Rat tailed maggot :- Rat tailed maggot are typical indicators of severely polluted waters. Rat tailed maggot do not have jointed thoracic legs. Instead of legs, they have many pairs of prolegs. An important feature is the presence of single long or short respiratory tube at the end of abdomen used for breathing at the water's surface. Abdomen is rounded fat body. They are not found in a very high abundance. Their presence indicates very low oxygen content of water.

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EASTERN ZONE

Table: 1.1.0 Showing variation in water temperature at sampling locations

	Narmada Kund	Ramghat	Graveyard	Kapilvan	Jogitikara	Dindori ghat	Mandla raptapul	U/ S Bargi	D/S Bargi	Saraswati ghat	Jhansighat Shahpura	Barman ghat
Nov, 07	18	17					21	25	23			
April, 08	24	23	22	23	21	22	20	24	22	23	24	22
Oct, 08	25	25	25	22.4	32	28.8	28	29	31.5	29	28	29
Jan, 09	19.4	21	19.4	16	21.4	18	22.6	23	21.8	21	21.9	21.9
Nov., 09	19	21	19.2	15			19					
Min	18	17	19.2	15	21	18	19	23	21.8	21	21.9	21.9
Max	25	25	25	23	32	28.8	28	29	31.5	29	28	29

Table: 1.1.1 Showing variation in turbidity at sampling locations

	Narmada Kund	Ramghat	Graveyard	Kapilvan	Jogitikara	Dindori ghat	Mandla raptapul	U/ S Bargi	D/S Bargi	Saraswati ghat	Jhansighat Shahpura	Barman ghat
Nov, 07	3	2					1.6	1.5	1			
April, 08	3	1	2	4	4	2	3	1	1	2	1	2
Oct, 08	0	1	1	1	1	1	1	2	1	1	1	0
Jan, 09	2	2	1	2	1	1	1	2	1	2	1	1
Nov., 09			1	1			2					
Min	0	1	1	1	1	1	1	1	1	1	1	0
Max	3	2	2	4	4	2	3	2	1	2	1	2

Table: 1.1.2 Showing variation in pH at sampling locations

	Narmada Kund	Ramghat	Graveyard	Kapilvan	Jogitikara	Dindori ghat	Mandla raptapul	U/ S Bargi	D/S Bargi	Saraswati ghat	Jhansighat Shahpura	Barman ghat
Nov, 07	5.03	6					7.2	7.76	7			
April, 08	6.1	6.63	7.38	7.49	6.75	7.33	7.24	7.9	6.81	7.23	7.43	7.35
Oct, 08	7	6	6	6.5	9	8	8	9	7	8	7	7
Jan, 09	7.8	9	6	8	8	8	8	6	7	8	7.5	8
Nov., 09	8	9	6	8			9					
Min	5.03	6	6	6.5	6.75	7.33	7.2	6	6.81	7.23	7	7
Max	8	9	7.38	8	9	8	9	9	7	8	7.5	8

Table: 1.1.3 Showing variation in conductivity of sampling sites

	Narmada Kund	Ramghat	Graveyard	Kapilvan	Jogitikaria	Dindori ghat	Mandla raptapul	U/ S Bargi	D/S Bargi	Saraswati ghat	Jhansighat Shahpura	Barman ghat
Nov, 07	290	157					380	194	230			
April, 08	90	130	90	70	160	180	180	120	130	120	140	170
Oct, 08	130	90	90	70	260	280	260	150	150	180	190	260
Jan, 09	270	160	70	60	280	280	280	180	180	210	200	220
Nov., 09	260	140	90	70			260					
Min	90	90	70	60	160	180	180	120	130	120	140	170
Max	290	160	90	70	280	280	380	194	230	210	200	260

Table: 1.1.4 Showing variation in TDS at sampling locations

	Narmada Kund	Ramghat	Graveyard	Kapilvan	Jogitikara	Dindori ghat	Mandla raptapul	U/ S Bargi	D/S Bargi	Saraswati ghat	Jhansighat Shahpura	Barman ghat
Nov, 07	50	38					112	72	60			
April, 08	85	100	86	54	153	146	55	86	175	63	76	122
Oct, 08	123	8	14	8	10	78	65	2	6	8	61	33
Jan, 09	180	100	40	40	180	190	190	120	120	140	130	160
Nov., 09	160	110	60	50			180					
Min	50	8	14	8	10	78	55	2	6	8	61	33
Max	180	110	86	54	180	190	190	120	175	140	130	160

Table: 1.1.5 Showing variation in DO at sampling locations

	Narmada Kund	Ramghat	Graveyard	Kapilvan	Jogitikara	Dindori ghat	Mandla raptapul	U/ S Bargi	D/S Bargi	Saraswati ghat	Jhansighat Shahpura	Barman ghat
Nov, 07	7.2	5.8					8.7	8.8	8.9			
April, 08	6.6	7.8	7.6	5.4	10.2	8.8	6.7	7.5	7.2	8.8	8.4	7.4
Oct, 08	6.5	4.7	6.6	5.7	5.6	7	5.4	11.8	8.1	4.2	5.7	5.9
Jan, 09	7	7.6	8	7.9	8.9	8	8.6	7.9	8	7.2	7.8	8.7
Nov., 09			7	7.4			7.5					
Min	6.5	4.7	6.6	5.4	5.6	7	5.4	7.5	7.2	4.2	5.7	5.9
Max	7.2	7.8	8	7.9	10.2	8.8	8.7	11.8	8.9	8.8	8.4	8.7

Table: 1.1.6 Showing variation in BOD at sampling locations

	Narmada Kund	Ramghat	Graveyard	Kapilvan	Jogitikara	Dindori ghat	Mandla raptapul	U/ S Bargi	D/S Bargi	Saraswati ghat	Jhansighat Shahpura	Barman ghat
Nov, 07	2.3	3.1					2.5	2.6	2.7			
April, 08	3.9	NIL	3.9	4	5.8	NIL	NIL	2.5	3.2	3.7	3.7	3.2
Oct, 08	2.7	1.7	1.9	0.4	1.6	2.8	1.6	7.6	4	1	1.1	1.1
Jan, 09	3.6	2.5	2.6	3.1	3.2	3	2.5	2.9	2.6	2.8	3.2	2.6
Nov., 09			2.3	2.7			2.5					
Min	2.3	1.7	1.9	0.4	1.6	2.8	1.6	2.5	2.6	1	1.1	1.1
Max	3.9	3.1	3.9	4	5.8	3	2.5	7.6	4	3.7	3.7	3.2

Table: 1.1.7 Showing variation in COD at sampling locations

	Narmada Kund	Ramghat	Graveyard	Kapilvan	Jogitikara	Dindori ghat	Mandla raptapul	U/ S Bargi	D/S Bargi	Saraswati ghat	Jhansighat Shahpura	Barman ghat
Nov, 07	30	40					20	20	20			
April, 08	30	60	40	30	10	30	30	10	20	10	40	30
Oct, 08	20	40	50	60	30	40	40	70	110	60	80	30
Jan, 09	40	30	20	40	30	30	20	10	30	20	30	40
Nov., 09			40	40			30					
Min	20	30	20	30	10	30	20	10	20	10	30	30
Max	40	60	50	60	30	40	40	70	110	60	80	40

Table: 1.1.8 Showing variation in MPN at sampling locations

	Narmada Kund	Ramghat	Graveyard	Kapilvan	Jogitikara	Dindori ghat	Mandla raptapul	U/ S Bargi	D/S Bargi	Saraswati ghat	Jhansighat Shahpura	Barman ghat
Nov, 07	160	70					128	4	2			
April, 08	26	70	9	500	23	30	22	4	2	30	900	26
Oct, 08	30	300	90	23	70	1600	200	30	23	40	40	500
Jan, 09	90	300	30	70	23	200	300	30	30	70	23	300
Nov., 09			40	23			90					
Min	26	70	9	23	23	30	22	4	2	30	23	26
Max	160	300	90	500	70	1600	300	30	30	70	900	500

Table: 1.1.9 Showing variation in ammonical nitrogen at sampling locations

	Narmada Kund	Ramghat	Graveyard	Kapilvan	Jogitikara	Dindori ghat	Mandla raptapul	U/ S Bargi	D/S Bargi	Saraswati ghat	Jhansighat Shahpura	Barman ghat
Nov, 07	0.819	0.931					0.901	0.879	1.17			
April, 08	0.254	0.515	0.523	0.338	0.446	1.123	0.392	0.346	0.308	0.308	0.246	0.338
Oct, 08	0.12	0.116	0.152	0.118	0.096	0.086	0.104	0.116	0.104	0.092	0.108	0.108
Jan, 09	0.21	0.01	0.03	0.6	0.214	0.065	0.032	0.069	0.048	0.025	0.034	0.028
Nov., 09			0.023	0.58			0.58					
Min	0.12	0.01	0.023	0.118	0.096	0.065	0.032	0.069	0.048	0.025	0.034	0.028
Max	0.819	0.931	0.523	0.6	0.446	1.123	0.901	0.879	1.17	0.308	0.246	0.338

Table: 1.1.10 Showing variation in nitrite nitrogen at sampling locations

	Narmada Kund	Ramghat	Graveyard	Kapilvan	Jogitikara	Dindori ghat	Mandla raptapul	U/ S Bargi	D/S Bargi	Saraswati ghat	Jhansighat Shahpura	Barman ghat
Nov, 07	0.671	0.495					0.564	0.797	0.944			
April, 08	1.193	1.148	1.17	0.698	0.765	5.336	0.653	0.765	0.833	0.9	0.608	0.563
Oct, 08	0.072	0.09	0.088	0.46	0.086	0.068	0.06	0.054	0.045	0.078	0.062	0.04
Jan, 09	0.078	0.087	0.098	0.01	0.0245	0.12	0.006	0.024	BDL	0.025	0.036	0.014
Nov., 09			0.012	0.018			0.023					
Min	0.072	0.087	0.012	0.01	0.0245	0.068	0.006	0.024	0.045	0.025	0.036	0.014
Max	1.193	1.148	1.17	0.698	0.765	5.336	0.653	0.797	0.944	0.9	0.608	0.563

Table: 1.1.11 Showing variation in nitrate nitrogen at sampling locations

	Narmada Kund	Ramghat	Graveyard	Kapilvan	Jogitikara	Dindori ghat	Mandla raptapul	U/ S Bargi	D/S Bargi	Saraswati ghat	Jhansighat Shahpura	Barman ghat
Nov, 07	0.819	0.677					0.863	0.93	1.079			
April, 08	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Oct, 08	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Jan, 09	0.258	0.125	BDL	BDL	0.058	0.069	BDL	0.369	0.014	0.021	0.087	0.098
Nov., 09			BDL	BDL			BDL					
Min	0.258	0.125	0	0	0.058	0.069	0.863	0.369	0.014	0.021	0.087	0.098
Max	0.819	0.677	0	0	0.058	0.069	0.863	0.93	1.079	0.021	0.087	0.098

Table: 1.1.12 Showing variation in phosphate at sampling locations

	Narmada Kund	Ramghat	Graveyard	Kapilvan	Jogitikara	Dindori ghat	Mandla raptapul	U/ S Bargi	D/S Bargi	Saraswati ghat	Jhansighat Shahpura	Barman ghat
Nov, 07	0.639	0.597					0.846	0.549	0.739			
April, 08	0.278	0.931	1.253	0.966	0.653	1.018	0.896	0.609	BDL	0.722	1.227	1.062
Oct, 08	0.668	0.798	0.458	0.348	0.74	0.834	0.832	0.321	0.222	0.634	0.932	0.038
Jan, 09	1.32	1.25	0.987	0.968	1.025	0.879	1.354	1.458	1.369	1.249	0.964	1.894
Nov., 09			0.045	0.106			0.009					
Min	0.278	0.597	0.045	0.106	0.653	0.834	0.009	0.321	0.222	0.634	0.932	0.038
Max	1.32	1.25	1.253	0.968	1.025	1.018	1.354	1.458	1.369	1.249	1.227	1.894

CENTRAL ZONE

Table : 1.2.0 Showing variation in water temperature at sampling locations

Place	Bandrabhan	Mangalwara	SPM U/S	SPM D/S	Jarrapur	Goalgaon	Tawa river	D/S Tawa confluence
Oct, 07	28	29	29	27				
Jan, 08	20	21	19	20	20	20		
March, 08	19	18	18	19	18	18	19	19
May, 08	29	35	31	30	29	29	28	29
Nov, 08	25.1	25.5	27.7	27.7	26.5	27.5	24.2	24.2
Feb. 09	26.1	24	30	28	26.9	27	25.6	26
Min	19	18	18	19	18	18	19	19
Max	29	35	31	30	29	29	28	29

Table : 1.2.1 Showing variation in turbidity at sampling locations

Place	Bandrabhan	Mangalwara	SPM U/S	SPM D/S	Jarrapur	Goalgaon	Tawa river	D/S Tawa confluence
Oct, 07	1	4	2	2				
Jan, 08	0	2	0	0	1	2		
March, 08	1	4	1	0	2	1	3	4
May, 08	2	4	1	2	2	2	1	2
Nov, 08	4	3	2	2	2	2	5	2
Feb. 09	1	2	3	1	2	3	4	4
Min	0	2	0	0	1	1	1	2
Max	4	4	3	2	2	3	5	4

Table : 1.2.2. Showing variation in pH at sampling locations

Place	Bandrabhan	Mangalwara	SPM U/S	SPM D/S	Jarrapur	Goalgaon	Tawa river	D/S Tawa confluence
Oct, 07	8.78	8.01	8.32	8.5	S			
Jan, 08	8.01	8.14	8.41	7.69	7.81	8.24		
March, 08	8.14	7.9	7.52	8.21	6.71	7.94	8.09	8.07
May, 08	8	7.5	6	7	8	8	9	8
Nov, 08	9	9	8	8	7	8	9	8
Feb, 09	8	8.2	8	8	8	8	8	7
Min	8	7.5	6	7	6.71	7.94	8	7
Max	9	9	8.41	8.5	8	8.24	9	8.07

Table : 1.2.3 Showing variation in conductivity at sampling locations

Place	Bandrabhan	Mangalwara	SPM U/S	SPM D/S	Jarrapur	Goalgaon	Tawa river	D/S Tawa confluence
Oct, 07	140	120	140	130				
Jan, 08	140	140	130	120	120	120		
March, 08	140	170	230	210	150	160	190	180
May, 08	130	180	140	120	130	110	140	150
Nov, 08	240	240	250	240	240	210	330	330
Feb, 09	370	240	280	300	240	240	370	260
Min	130	120	130	120	120	110	140	150
Max	370	240	280	300	240	240	370	330

Table : 1.2.4 Showing variation in TDS at sampling locations

Place	Bandrabhan	Mangalwara	SPM U/S	SPM D/S	Jarrapur	Goalgaon	Tawa river	D/S Tawa confluence
Oct, 07	18	129	193	21				
Jan, 08	78	161	114	65	94	76		
March, 08	143	117	126	108	41	66	78	122
May, 08	180	146	108	111	120	158	122	160
Nov, 08	130	160	160	160	160	190	220	220
Feb, 09	250	160	170	250	160	160	250	150
Min	18	117	108	21	41	66	78	122
Max	250	161	193	250	160	190	250	220

Table : 1.2.5 Showing variation in DO at sampling locations

Place	Bandrabhan	Mangalwara	SPM U/S	SPM D/S	Jarrapur	Goalgaon	Tawa river	D/S Tawa confluence
Oct, 07	8.4	7.6	8.2	8.5				
Jan, 08	8.5	8.3	8.1	7.9	8	8		
March, 08	9.2	7.2	7.8	8	8.4	6.9	8.9	8.6
May, 08	5.5	5.4	8.2	8.1	8.2	8.1	7.8	8
Nov, 08	13.10	9.40	8.70	7.90	8.4	8.70	7.80	6.00
Feb, 09	8.6	8.4	8.1	8	7.9	8.2	8.4	8.2
Min	5.5	5.4	7.8	7.9	7.9	6.9	7.8	6
Max	13.1	9.4	8.7	8.5	8.4	8.7	8.9	8.6

Table : 1.2.6 Showing variation in BOD at sampling locations

Place	Bandrabhan	Mangalwara	SPM U/S	SPM D/S	Jarrapur	Goalgaon	Tawa river	D/S Tawa confluence
Oct., 07	2.4	3	3.2	2.4				
Jan., 08	1.2	0	1.9	1.5	2.6	1.7		
March,08	1.9	4.1	2.6	2.2	2	2.8	1.8	1.8
May,08	2.8	2.6	2.4	2.6	3.2	3.1	3	2.3
Nov,08	2.1	3.6	2.7	2.3	2	3.4	0.4	1.7
Feb, 09	2.3	3.1	2.6	2.4	2.7	3.1	2.4	2.8
Min	1.2	0	1.9	1.5	2	1.7	0.4	1.7
Max	2.8	4.1	3.2	2.6	3.2	3.4	3	2.8

Table : 1.2.7 Showing variation in COD at sampling locations

	Bandrabhan	Mangalwara	SPM U/S	SPM D/S	Jarrapur	Goalgaon	Tawa river	D/S Tawa confluence
Oct, 07	40	40	30	20				
Jan, 08	10	20	50	30	50	10		
March, 08	30	50	30	20	20	40	20	50
May, 08	30	20	40	10	20	30	10	20
Nov, 08	30	100	50	30	20	40	10	20
Feb, 09	40	40	20	30	20	30	20	30
Min	10	20	20	10	20	10	10	20
Max	40	100	50	30	50	40	20	50

Table : 1.2.8 Showing variation in MPN at sampling locations

Place	Bandrabhan	Mangalwara	SPM U/S	SPM D/S	Jarrapur	Goalgaon	Tawa river	D/S Tawa confluence
Oct, 07	500	1600	280	170				
Jan, 08	1600	140	35	1600	1600	1600		
March, 08	13	1500	23	14	8	300	30	23
May, 08	26	280	50	130	30	70	4	23
Nov, 08	1600	1600	34	23	8	34	180	170
Feb, 09	500	280	34	180	14	8	30	23
Min	13	140	23	14	8	8	4	23
Max	1600	1600	280	1600	1600	1600	180	170

Table : 1.2.9 Showing variation in ammonical nitrogen at sampling locations

Place	Bandrabhan	Mangalwara	SPM U/S	SPM D/S	Jarrapur	Goalgaon	Tawa river	D/S Tawa confluence
Oct, 07	0.8	0.977	0.877	0.938				
Jan, 08	0.32	0.54	0.23	0.65	0.26	0.35		
March, 08	0.312	0.591	0.661	0.858	0.678	0.706	0.312	0.214
May, 08	0	0.446	0	0	0	0.038	0	0
Nov, 08	0	0.331	0	0	0	0.038	0	0
Feb, 09	0.18	1.12	0.12	0.11	1.1	0.99	1.8	0.13
Min	0	0.331	0	0	0	0.038	0	0
Max	0.8	1.12	0.877	0.938	1.1	0.99	1.8	0.214

Table : 1.2.10 Showing variation in nitrite nitrogen at sampling locations

Place	Bandrabhan	Mangalwara	SPM U/S	SPM D/S	Jarrapur	Goalgaon	Tawa river	D/S Tawa confluence
Oct, 07	0	12.188	2.011	20.52				
Jan, 08	0.026	0.036	0.034	0.058	0.069	0.3		
March, 08	0.539	0.645	0.489	0.806	0.979	0.163	0.352	0.214
May, 08	0	0	0.417	0	0	0	0	0
Nov, 08	0.009	0	0	0.065	0.215	0	0	0
Feb, 09	0.45	0.4	0.49	0.49	0.47	0.72	0.45	0.49
Min	0	0	0	0	0	0	0	0
Max	0.539	12.188	2.011	20.52	0.979	0.72	0.45	0.49

Table : 1.2.11 Showing variation in nitrate nitrogen at sampling locations

Place	Bandrabhan	Mangalwara	SPM U/S	SPM D/S	Jarrapur	Goalgaon	Tawa river	D/S Tawa confluence
Oct, 07	0	0	0	0				
Jan, 08	0	0	0	0	0	0		
March, 08	0	0	0	0	0	0	0	0
May, 08	0	0.303	0.303	0	0.202	0.506	0.263	0.32
Nov, 08	0	0.295	0.303	0	0.202	0.506	0.031	0.263
Feb, 09	0.064	0.12	0.121	0.085	0.29	0.15	0.134	0.152
Min	0	0	0	0	0	0	0	0
Max	0.064	0.303	0.303	0.085	0.29	0.506	0.263	0.32

Table : 1.2.12 Showing variation in phosphate at sampling locations

Place	Bandrabhan	Mangalwara	SPM U/S	SPM D/S	Jarrapur	Goalgaon	Tawa river	D/S Tawa confluence
Jan, 08	1.5	1.2	1.5	1.4	1.1	0.9		
March, 08	0.312	0.214	0.601	0.524	0.021	0.145	0.047	0.069
May, 08	0.212	0.097	0	0.035	0.265	0.626	0	0.21
Nov, 08	0.124	0.084	0	0.035	0.265	0.626	0.214	0
Feb, 09	2.5	1.2	2.3	1.7	1.5	1.5	1.6	1.7
Min	0.124	0.084	0	0.035	0.021	0.145	0	0
Max	2.5	1.2	2.3	1.7	1.5	1.5	1.6	1.7

WESTERN ZONE

Table : 1.3.0 Showing variation in water temperature at sampling locations

	Maheshwar	Mandleshwar	Omkareshwar	Badwani	Koteshwar	Khedighat	Mamleshwar	Nagarghat
Dec, 07	23	22.5	22.5	21.5				
March, 08	27	25	24	23	24	18	21	18.6
June, 08	29	29	28	29	29	29	28	27
Dec, 08	23.2	25.2	25.4	23.3	24.7	25	23.3	22.1
May, 09	28	25	28.1	29	28	27	26.8	27
Min	23	22.5	22.5	21.5	24	18	21	18.6
Max	29	29	28.1	29	29	29	28	27

Table : 1.3.1 Showing variation in turbidity at sampling locations

	Maheshwar	Mandleshwar	Omkareshwar	Badwani	Koteshwar	Khedighat	Mamleshwar	Nagarghat
Dec, 07	1	4	1	1				
March, 08	3	1	1	1	1.5	4	1	1
June, 08	2	1	2	2	2	4	1	1
Dec, 08	2	3	2	4	2	2	1	1
May, 09	1	2	3	1	4	2	1	3
Min	1	1	1	1	1.5	2	1	1
Max	3	4	3	4	4	4	1	3

Table : 1.3.2 Showing variation in pH at sampling locations

	Maheshwar	Mandleshwar	Omkareshwar	Badwani	Koteshwar	Khedighat	Mamleshwar	Nagarghat
Dec, 07	7.5	7.5	7.5	7.5				
March, 08	7.84	7.72	8.03	7.97	8.04	7.99	7.35	7.64
June, 08	7	7	7	6	8	7	7	8
Dec, 08	8	9	6	7.5	8	9	8	8
May, 09	7	8	7	8	9	7	8	7
Min	7	7	6	6	8	7	7	7
Max	8	9	8.03	8	9	9	8	8

Table : 1.3.3 Showing variation in conductivity at sampling locations

	Maheshwar	Mandleshwar	Omkareshwar	Badwani	Koteshwar	Khedighat	Mamleshwar	Nagarghat
Dec, 07	355	276	310	283				
March, 08	170	180	160	170	170	180	160	180
June, 08	150	170	150	160	180	170	140	140
Dec, 08	300	260	260	260	260	260	260	250
May, 09	270	290	250	440	550	230	280	250
Min	150	170	150	160	170	170	140	140
Max	355	290	310	440	550	260	280	250

Table : 1.3.4 Showing variation in TDS at sampling locations

	Maheshwar	Mandleshwar	Omkareshwar	Badwani	Koteshwar	Khedighat	Mamleshwar	Nagarghat
Dec, 07	182	159	150	185				
March, 08	82	107	134	93	57	103	69	98
June, 08	106	123	140	138	108	91	93	120
Dec, 08	200	140	150	140	140	160	170	140
May, 09	180	200	170	290	300	170	190	170
Min	82	107	134	93	57	91	69	98
Max	200	200	170	290	300	170	190	170

Table : 1.3.5 Showing variation in DO at sampling locations

	Maheshwar	Mandleshwar	Omkareshwar	Badwani	Koteshwar	Khedighat	Mamleshwar	Nagarghat
Dec, 07	7.9	8	7.8	7.7				
March, 08	8.6	7.7	6.4	7.3	8	10	9	6.7
June, 08	8.9	9.5	11.3	8	7.5	11.4	9.6	5.6
Dec, 08	8.3	8.2	7.7	7.9	8	8.8	7.9	8.5
May, 09	8	8.5	8.1	7.9	7.8	8.1	8	8.1
Min	7.9	7.7	6.4	7.3	7.5	8.1	7.9	5.6
Max	8.9	9.5	11.3	8	8	11.4	9.6	8.5

Table : 1.3.6 Showing variation in BOD at sampling locations

	Maheshwar	Mandleshwar	Omkareshwar	Badwani	Koteshwar	Khedighat	Mamleshwar	Nagarghat
Dec, 07	1.4	1.4	1.2	1.7				
March, 08	2.8	3.2	3.1	2.3	2.8	3.4	3.1	4.1
June, 08	2.3	3.1	2.8	2.1	3.1	3.1	2.9	3.2
Dec, 08	2.9	2.7	2.2	2.2	2.8	2.6	2.3	2.5
May, 09	2.1	2.4	2.6	2.9	2.8	2.7	2.5	2
Min	1.4	1.4	1.2	1.7	2.8	2.6	2.3	2
Max	2.9	3.2	3.1	2.9	3.1	3.4	3.1	4.1

Table : 1.3.7 Showing variation in COD at sampling locations

	Maheshwar	Mandleshwar	Omkareshwar	Badwani	Koteshwar	Khedighat	Mamleshwar	Nagarghat
Dec, 07	20	20	20	20				
March, 08	20	30	40	30	50	10	10	20
June, 08	20	30	30	20	40	30	20	30
Dec, 08	60	30	20	40	30	10	50	50
May, 09	30	20	40	20	30	20	40	20
Min	20	20	20	20	30	10	10	20
Max	60	30	40	40	50	30	50	50

Table : 1.3.8 Showing variation in MPN at sampling locations

	Maheshwar	Mandleshwar	Omkareshwar	Badwani	Koteshwar	Khedighat	Mamleshwar	Nagarghat
Dec, 07	210	170	170	80				
March, 08	23	13	140	2	13	140	13	8
June, 08	280	130	300	70	4	70	6	350
Dec, 08	50	22	80	80	240	80	50	27
May, 09	22	8	140	2	13	140	13	23
Min	22	8	80	2	4	70	6	8
Max	280	170	300	80	240	140	50	350

Table : 1.3.9 Showing variation in ammonical nitrogen at sampling locations

	Maheshwar	Mandleshwar	Omkareshwar	Badwani	Koteshwar	Khedighat	Mamleshwar	Nagarghat
Dec, 07	1.2	1.6	1.8	1.4				
March, 08	0.9	1.1	1.6	1.3	1.2	1	0.8	0.5
June, 08	0.008	BDL	BDL	0.761	0.215	BDL	0.038	0.038
Dec, 08	1.11	0.99	5.18	1.8	0.13	1.1	1.12	1.12
May, 09	0.181	0.098	0.106	0.093	0.108	0.09	0.108	0.094
Min	0.008	0.098	0.106	0.093	0.108	0.09	0.038	0.038
Max	1.2	1.6	5.18	1.8	1.2	1.1	1.12	1.12

Table : 1.3.10 Showing variation in nitrite nitrogen at sampling locations

	Maheshwar	Mandleshwar	Omkareshwar	Badwani	Koteshwar	Khedighat	Mamleshwar	Nagarghat
Dec, 07	0.006	0.003	0.02	0.02				
March, 08	0.68	0.54	0.36	0.25	0.46	0.35	0.59	0.36
June, 08	0	0	0	0.564	0	0	0	0
Dec, 08	0.49	0.46	0.45	0.46	0.49	0.47	0.49	0.4
May, 09	0.11	0.107	0.13	0.1	0.109	0.103	0.111	0.118
Min	0	0	0	0.02	0	0	0	0
Max	0.68	0.54	0.45	0.564	0.49	0.47	0.59	0.4

Table : 1.3.11 Showing variation in nitrate nitrogen at sampling locations

	Maheshwar	Mandleshwar	Omkareshwar	Badwani	Koteshwar	Khedighat	Mamleshwar	Nagarghat
Dec, 07	0.4	0.6	0.4	0.2				
March, 08	0	0	0	0	0	0	0	0
June, 08	0.809	0.364	0.121	0.445	0.101	0.263	0.303	0.303
Dec, 08	0.085	0.15	0.64	0.134	0.152	0.29	0.141	0.12
May, 09	0.012	0.21	0.17	0.35	0.41	0.21	0.25	0.24
Min	0	0	0	0	0	0	0	0
Max	0.809	0.6	0.64	0.445	0.41	0.29	0.303	0.303

Table : 1.3.12 Showing variation in phosphate at sampling locations

	Maheshwar	Mandleshwar	Omkareshwar	Badwani	Koteshwar	Khedighat	Mamleshwar	Nagarghat
Dec, 07	1.6	1.4	1.2	2				
March, 08	0.06	0.069	0.34	0.68	0.23	0.4	0.036	0.247
June, 08	0.461	0.409	0.244	0.235	0	0.27	0.305	0.461
Dec, 08	1.7	1.5	2.5	1.6	1.7	1.5	2.3	1.2
May, 09	1.438	1.807	1.904	1.618	1.627	1.528	0.823	1.665
Min	0.06	0.069	0.244	0.235	0	0.27	0.036	0.247
Max	1.7	1.807	2.5	2	1.7	1.528	2.3	1.665

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Table: 1.4.0 Water quality status of Narmada Kund

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Class
Nov. 2007	7.2	2.3	160	5.03	
Apr. 2008	6.6	3.9	26	6.1	
Oct. 2008	6.5	2.7	300	7	B
Jan. 2009	7	3.6	90	7.8	
Avg. value	6.8	3.1	76.5	6.48	
Class	A	B	B	A	

Table: 1.4.1 Water quality status of Ramghat

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Class
Nov. 2007	5.8	3.1	70	6	
Apr. 2008	7.8	Nil	70	6.83	
Oct. 2008	4.7	1.7	300	6	B
Jan. 2009	7.6	2.5	300	9	
Avg. value	6.4	2.4	185	6.9	
Class	A	B	B	A	

Table: 1.4.2 Water quality status of Graveyard

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Class
Nov. 2007					
Apr. 2008	7.6	3.9	9	7.38	
Oct. 2008	6.6	1.9	90	6	B
Jan. 2009	8	2.6	30	6	
Avg. value	7.4	2.8	63	6.46	
Class	A	B	B	A	

Table: 1.4.3 Water quality status of Kapilvan

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Class
Nov. 2007					
Apr. 2008	5.4	4	500	7.49	
Oct. 2008	5.7	0.4	23	6.5	B
Jan. 2009	7.9	3.1	70	8	
Avg. value	6.3	2.5	197	7.33	
Class	A	B	B	A	

Table: 1.4.4 Water quality status of Mandla Raptapul

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Class
Nov. 2007	8.7	2.5	128	7.2	
Apr. 2008	6.7	Nil	22	7.2	
Oct. 2008	5.4	1.6	200	8	B
Jan. 2009	8.6	2.5	300	8	
Avg. value	7.4	2.2	162.5	7.61	
Class	A	B	B	B	

Table: 1.4.5 Water quality status of Bargi dam U/S

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Class
Nov. 2007	8.8	2.6	4	7.76	
Apr. 2008	7.5	2.5	4	7.9	
Oct. 2008	11.8	7.6	30	9	A
Jan. 2009	7.9	2.9	30	6	
Avg. value	9	3.9	17	7.67	
Class	A	C	A	B	

Table: 1.4.6 Water quality status of Jogitikaria

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Class
Nov. 2007	—	—	—	—	
Apr. 2008	10.2	5.8	23	6.75	
Oct. 2008	5.6	1.6	70	9	A
Jan. 2009	8.9	3.2	23	8	
Avg. value	8.2	3.5	38.6	7.92	
Class	A	B	A	B	

Table: 1.4.7 Water quality status of Dindorighat

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Class
Nov. 2007	—	—	—	—	
Apr. 2008	8.8	—	30	7.33	
Oct. 2008	7	2.8	1600	8	C
Jan. 2009	8	3	200	8	
Avg. value	7.9	2.9	610	7.73	
Class	A	B	C	B	

Table: 1.4.8 Water quality status of Bergi D/S

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Class
Nov. 2007	8.9	2.7	2	7	
Apr. 2008	7.2	3.2	2	6.81	
Oct. 2008	8.1	4	23	7	A

Jan. 2009	8	2.6	30	7	
Avg. value	8.1	3.1	14.25	6.95	
Class	A	B	A	A	

Table: 1.4.9 Water quality status of Saraswati ghat

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Class
Nov. 2007					
Apr. 2008	8.8	2.5	46.6	7.74	
Oct. 2008	4.2	1	40	8	A
Jan. 2009	7.2	2.8	70	8	
Avg. value	6.7	2.5	46.6	7.74	
Class	A	B	A	B	

Table: 1.4.10 Water quality status of Jhanshi ghat

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Class
Nov. 2007					
Apr. 2008	8.4	3.7	900	7.43	
Oct. 2008	5.7	1.1	40	7	B
Jan. 2009	7.8	3.2	23	7.5	
Avg. value	7.3	2.7	321	7.31	
Class	A	B	B	A	

Table: 1.4.11 Water quality status of Barman ghat

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Class
Nov. 2007					
Apr. 2008	7.4	3.2	26	7.35	
Oct. 2008	5.9	1.1	500	7	B
Jan. 2009	8.7	2.6	300	8	
Avg. value	7.3	2.3	275.3	7.45	
Class	A	B	B	A	

CENTRAL ZONE

Table: 1.5.0 Water quality status of Bandrabhan

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Class
Oct.2007	8.4	2.4	500	8.78	
Jan-08	8.5	1.2	1600	8.01	
Mar-08	9.2	1.9	13	8.14	A
May-08	5.5	2.8	26	8	
Nov.2008	13.1	2.1	1600	9	

Average Value	8.9	2	747	8.3	
Class	A	A	C	B	

Table: 1.5.1 Water quality status of Magalwaraghat

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Class
Oct.2007	7.6	3	1600	8.01	
Jan-08	8.3	0	140	8.14	
Mar-08	7.2	4.1	1500	7.9	C
May-08	5.4	2.6	280	7.5	
Nov.2008	9.4	3.6	1600	9	
Average Value	7.5	3.3	1024	8.1	
Class	A	C	C	B	

Table: 1.5.2 Water quality status of SPM U/S

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Class
Oct.2007	8.2	3.2	280	8.32	
Jan-08	8.1	1.9	35	8.41	
Mar-08	7.8	2.6	23	7.52	B
May-08	8.2	2.4	50	6	
Nov.2008	8.7	2.7	34	8	
Average Value	8.2	2.5	84.4	7.6	
Class	A	B	B	B	

Table: 1.5.3 Water quality status of SPM D/S

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Class
Oct.2007	8.5	2.4	170	8.5	
Jan-08	7.9	1.5	1600	7.69	
Mar-08	8	2.2	14	8.21	B
May-08	8.1	2.6	130	7	
Nov.2008	7.9	2.3	23	8	
Average Value	8	2.2	387	7.8	
Class	A	B	B	B	

Table: 1.5.4 Water quality status of Jarrapur

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Class
Oct.2007	—	—	—	—	
Jan-08	8	2.6	1600	7.81	
Mar-08	8.4	2	8	6.71	
May-08	8.2	3.2	30	8	B
Nov.2008	8.4	2	8	7	
Average Value	8.25	2.4	411	7.3	
Class	A	B	B	A	

Table: 1.5.5 Water quality status of Goalgaon

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Class
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Oct.2007	—	—	—	—	
Jan-08	8	1.7	1600	8.24	
Mar-08	6.9	2.8	300	7.94	
May-08	8.1	3.1	70	8	C
Nov.2008	8.7	3.4	34	8	
Average Value	7.9	2.7	501	8	
Class	A	B	C	B	

Table: 1.5.6 Water quality status of Tawa River

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Class
Oct.2007	—	—	—	—	
Jan-08	—	—	—	—	
Mar-08	8.9	1.8	30	8.09	
May-08	7.8	3	4	9	A
Nov.2008	7.8	0.4	180	9	
Average Value	8.1	1.7	71	8.5	
Class	A	A	B	B	

Table: 1.5.7 Water quality status of D/S Tawa River

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Final Class
Oct.2007	—	—	—	—	
Jan-08	—	—	—	—	
Mar-08	8.6	1.8	23	8.07	
May-08	8	2.3	23	8	A
Nov.2008	6	1.7	170	8	
Average Value	7.5	1.9	72	8	
Class	A	A	B	B	

WESTERN ZONE

Table: 1.6.0 Water quality status of Maheshwar

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Class
Dec.2007	7.9	1.4	210	7.5	
Mar-08	8.6	2.8	23	7.84	
Jun-08	8.9	—	280	7	B
Dec-08	8.3	2.9	50	8	
Average Value	8.4	2.3	140	7.5	
Class	A	B	B	A	

Table: 1.6.1 Water quality status of Mandleshwar

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Class
Dec.2007	8	1.4	170	7.5	
Mar-08	7.7	3.2	13	7.72	
Jun-08	9.5	—	130	7	B
Dec-08	8.2	2.7	22	9	
Average Value	8.3	2.4	84	7.8	
Class	A	B	B	B	

Table: 1.6.2 Water quality status of Omkareshwar

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Class
Dec.2007	7.8	1.2	170	7.5	
Mar-08	6.4	3.1	140	7.9	
Jun-08	11.3	—	300	6	B
Dec-08	7.7	2.1	80	7	
Average Value	8.3	2.1	173	7.1	
Class	A	B	B	A	

Table: 1.6.3 Water quality status of Badwani

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Class
Dec.2007	7.7	1.7	80	7.5	
Mar-08	7.3	2.3	2	7.9	
Jun-08	8	—	70	6	A
Dec-08	7.9	2.2	80	7.5	
Average Value	7.7	2	58	7.2	
Class	A	A	B	A	

Table: 1.6.4 Water quality status of Koteswar

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Class
Dec.2007	7.7	—	80	7.5	

Mar-08	7.3	2.8	2	7.9	
Jun-08	8	—	70	6	B
Dec-08	7.9	2.8	80	7.5	
Average Value	7.7	2.8	58	7.2	
Class	A	B	B	A	

Table: 1.6.5 Water quality status of Khedighat

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Class
Dec.2007	—	—	140	—	
Mar-08	10	3.4	70	7.9	
Jun-08	11.4	—	80	7	B
Dec-08	8.8	2.6	140	9	
Average Value	10	3	108	7.9	
Class	A	B	B	B	

Table: 1.6.6 Water quality status of Mamleshwar

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Class
Dec.2007	—	—	—	—	
Mar-08	9	3.1	13	7.35	
Jun-08	9.6	—	6	7	A
Dec-08	7.9	2.3	50	8	
Average Value	8.8	2.7	23	7.45	
Class	A	B	A	A	

Table: 1.6.7 Water quality status of Nagar ghat

Month of sampling	D.O. mg/l	BOD mg/l	MPN/100ml	pH	Class
Dec.2007	—	—	—	—	
Mar-08	6.7	4.1	8	7.6	
Jun-08	5.6	—	350	8	B
Dec-08	8.5	2.5	27	8	
Average Value	6.9	3.3	128	7.8	
Class	A	B	B	B	

1.7.1 Statistical data of water quality parameters of Eastern zone

		Narmada kund	Ramghat	Graveyard	Kapil Van	Jogitikara	Dindori	Raptapul	U/S Bargi	D/S Bargi	Saraswati Ghat	Jhansighat	Bermanghat
Temperature	Max	25	25	25	23	32	28.8	28	29	31.5	29	28	29
	Min	18	17	19.4	16	21	18	20	23	21.8	21	21.9	21.9
Turbidity	Max	3	2	2	4	4	2	3	2	1	2	1	2
	Min	Clear	1	1	1	1	1	1	1	1	1	1	Clear
pH	Max	7.8	9	7.38	8	9	8	8	9	7	8	7.5	8
	Min	5.03	6	6	6.5	6.75	7.33	7.2	6	6.81	7.23	7	7
Conductivity	Max	290	160	90	70	280	280	380	194	230	210	200	260
	Min	90	90	70	60	160	180	180	120	130	120	140	170
TDS	Max	180	100	86	54	180	190	190	120	175	140	130	160
	Min	50	8	14	8	10	78	55	2	6	8	61	33
DO	Max	7.2	7.8	8	7.9	10.2	8.8	8.7	11.8	8.9	8.8	8.4	8.7
	Min	6.5	4.7	6.6	5.4	5.6	7	5.4	7.5	7.2	4.2	5.7	5.9
BOD	Max	3.9	3.1	3.9	4	5.8	3	2.5	7.6	4	3.7	3.7	3.2
	Min	2.3	1.7	1.9	0.4	1.6	2.8	1.6	2.5	2.6	1	1.1	1.1
COD	Max	40	60	50	60	30	40	40	70	110	60	80	40
	Min	20	30	20	30	10	30	20	10	20	10	30	30
Ammonical nitrogen	Max	0.819	0.931	0.523	0.6	0.446	1.123	0.901	0.879	1.17	0.308	0.246	0.338
	Min	0.12	0.01	0.03	0.118	0.096	0.065	0.032	0.069	0.048	0.025	0.034	0.028
Nitrate	Max	0.819	0.677	BDL	BDL	0.058	0.069	0.863	0.93	1.079	0.021	0.087	0.098
	Min	0.258	0.125	BDL	BDL	0.058	0.069	0.863	0.369	0.014	0.021	0.087	0.098
Nitrite	Max	1.193	1.148	1.17	0.698	0.765	5.336	0.653	0.797	0.944	0.9	0.608	0.563
	Min	0.072	0.087	0.088	0.01	0.0245	0.068	0.006	0.024	0.045	0.025	0.036	0.014
Phosphate	Max	1.32	1.25	1.253	0.968	1.025	1.018	1.354	1.458	1.369	1.249	1.227	1.894
	Min	0.278	0.597	0.458	0.348	0.653	0.834	0.832	0.321	0.222	0.634	0.932	0.038
MPN	Max	160	300	90	500	70	1600	300	30	30	70	900	500
	Min	26	70	9	23	23	30	22	4	2	30	23	26

1.7.2 Statistical data of water quality parameters of Central zone

		Bandrabhan	Mangalwara	SPM U/S	SPM D/S	Jarrapur	Goalgaon	Tawa river	D/S Tawa confluence
Temperature	Max	29	35	31	30	29	29	28	29
	Min	19	18	18	19	18	18	19	19
Turbidity	Max	4	4	2	2	2	2	5	4
	Min	Clear	2	Clear	Clear	1	1	1	2
pH	Max	9	9	8.41	8.5	8	8.24	9	8.07
	Min	8	7.5	6	7	6.71	7.94	8.09	8
Conductivity	Max	240	240	250	240	240	210	330	330
	Min	130	120	130	120	120	110	140	150
TDS	Max	180	161	193	160	160	190	220	220
	Min	18	117	108	21	41	66	78	122
DO	Max	13.1	9.4	8.7	8.5	8.4	8.7	8.9	8.6
	Min	5.5	5.4	7.8	7.9	8	6.9	7.8	6
BOD	Max	2.8	4.1	3.2	2.6	3.2	3.4	3	2.3
	Min	1.2	Fail	1.9	1.5	2	1.7	0.4	1.7
COD	Max	40	100	50	30	50	40	20	50
	Min	10	20	30	10	20	10	10	20
Ammonical nitrogen	Max	0.8	0.977	0.877	0.938	0.678	0.706	0.312	0.214
	Min	0.312	0.331	0.23	0.65	0.26	0.038	0.312	0.214
Nitrate	Max	BDL	0.303	0.303	BDL	0.202	0.506	0.263	0.32
	Min	BDL	0.295	0.303	BDL	0.202	0.506	0.031	0.263
Nitrite	Max	0.539	12.188	2.011	20.52	0.979	0.3	0.352	0.214
	Min	0.009	0.036	0.034	0.058	0.069	0.163	0.352	0.214
Phosphate	Max	1.5	1.2	1.5	1.4	1.1	0.9	0.214	0.21
	Min	0.124	0.084	0.601	0.035	0.021	0.145	0.047	0.069
MPN	Max	1600	1600	280	1600	1600	1600	180	170
	Min	13	140	23	14	8	34	4	23

1.7.3 Statistical data of water quality parameters of Western zone

		Maheshwar	Mandleshwar	Omkareshwar	Badwani	Koteshwar	Khedighat	Mamleshwar	Nagarghat
Temperature	Max	29	29	28	29	29	29	28	27
	Min	23	22.5	22.5	21.5	24	18	21	18.6
Turbidity	Max	3	4	2	4	2	4	1	1
	Min	1	1	1	1	1.5	2	1	1
pH	Max	8	9	8.03	7.97	8.04	9	8	8
	Min	7	7	6	6	8	7	7	7.64
Conductivity	Max	355	276	310	283	260	260	260	250
	Min	150	170	150	160	170	170	140	140
TDS	Max	200	159	150	185	140	160	170	140
	Min	82	107	134	93	57	91	69	98
DO	Max	8.9	9.5	11.3	8	8	11.4	9.6	8.5
	Min	7.9	7.7	6.4	7.3	7.5	8.8	7.9	5.6
BOD	Max	2.9	3.2	3.1	2.3	2.8	3.4	3.1	4.1
	Min	1.4	1.4	1.2	1.7	2.8	2.6	2.3	2.5
COD	Max	60	30	40	40	50	30	50	50
	Min	20	20	20	20	30	10	10	20
Ammonical nitrogen	Max	1.2	1.6	5.18	1.8	1.2	1.1	1.12	1.12
	Min	0.008	0.99	1.6	0.761	0.13	1	0.038	0.038
Nitrate	Max	0.809	0.6	0.64	0.445	0.152	0.29	0.303	0.303
	Min	0.085	0.15	0.121	0.134	0.101	0.263	0.141	0.12
Nitrite	Max	0.68	0.54	0.45	0.564	0.49	0.47	0.59	0.4
	Min	0.006	0.003	0.02	0.02	0.46	0.35	0.49	0.36
Phosphate	Max	1.7	1.5	2.5	2	1.7	1.5	2.3	1.2
	Min	0.06	0.069	0.244	0.235	0.23	0.27	0.036	0.247
MPN	Max	280	170	300	80	240	140	50	350
	Min	23	13	80	2	4	70	6	8

1.7.4 Statistical data of water quality parameters of river Narmada –At a Glance

Parameters		Eastern Zone	Central Zone	Western Zone
Temperature	Max	32	35	29
	Min	16	18	18
Turbidity	Max	4	5	4
	Min	Clear	Clear	1
pH	Max	9	9	9
	Min	5.03	6	6
Conductivity	Max	380	330	355
	Min	5.03	110	140
TDS	Max	190	220	200
	Min	2	18	57
DO	Max	11.8	13.1	11.4
	Min	4.2	5.4	5.6
BOD	Max	7.6	4.1	4.1
	Min	0.4	Fail	1.2
COD	Max	110	100	60
	Min	10	10	10
Ammonical nitrogen	Max	1.17	0.977	5.18
	Min	0.01	0.038	0.008
Nitrate	Max	1.079	0.506	0.809
	Min	BDL	BDL	0.085
Nitrite	Max	5.336	20.52	0.68
	Min	0.006	0.009	0.003
Phosphate	Max	1.894	1.5	2.5
	Min	0.038	0.021	0.036
MPN	Max	1600	1600	350
	Min	2	4	2

Table: 2.1.a EASTERN ZONE

Sampling Locations	NOVEMBER,07			APRIL, 08			OCTOBER, 08			NOVEMBER, 09		
	Saprobic Score	Diversity Score	BWQC	Saprobic Score	Diversity Score	BWQC	Saprobic Score	Diversity Score	BWQC	Saprobic Score	Diversity Score	BWQC
Ramghat, Amarkantak	5.18	0.78	C	5	0.8	C	4.66	0.81	C			
Graveyard, Amarkantak	7	0.88	A	5.7	0.63	C	5.18	0.95	C	5.33	0.69	C
Kapilvan, Amarkanatak	6.33	0.57	B	6.5	0.65	B	6.25	0.61	B			
Kapildhara, Amarkantak	-	-	-	4.8	0.5	C	6.2	0.7	B	5.5	0.75	C
Jogi Tikaria, Dindori	-	-	-	6.33	0.56	C	6.11	0.65	B			
Dindori Ghat, Dindori	-	-	-	5.33	0.65	C	6.54	0.73	B			
Raptapul Ghat, Mandla	8.8	0.29	A	6	0.6	B	7.11	0.77	A			
Chiri, Mandla	-	-	-	5.75	0.57	C	-	-	-			
Bargi Dam U/S (Maikal Resort)	5.4	0.33	C	5.78	0.52	C	5.75	0.55	C			
Bargi Dam D/S	4.28	0.2	D	6.33	0.48	B	5.28	0.88	C			
Saraswati Ghat, Jabalpur	3.4	0.15	D	7.75	0.59	A	7	0.53	B			
Jhansi Ghat, Shahpura	-	-	-	6.54	0.62	B	6	0.76	C			
Barmanghat, Narsinghpur	-	-	-	7.11	0.63	A	4.83	0.27	D			

Table No: 2.1.b List of benthic macroinvertebrates in Eastern Zone

Trichoptera:	Hydropsychidae, Philopotamidae, Policentropodidae, Goeridae, Leptoceridae
Plecoptera:	Perlidae
Ephemeroptera:	Baetidae, Heptageniidae, Leptophlebiae, Caenidae, Ephemeridae
Odonata:	Protoneuridae, Gomphidae, Libellulidae, Coenagriidae
Hemiptera:	Nepidae, Notonectidae, Belastomatidae, Aphelocheiridae, Gerridae, Corixidae, Nepidae, Ranatridae, Mesovalidae, Pleidae, Hydrometridae, Naucoridae
Coleoptera:	Hygrobiidae, Gyrinidae, Hydrophilidae, Ecnomidae, Dytiscidae, Psephenidae
Mollusca:	Viviparidae, Planorbidae, Lymnaeidae, Thiaridae, Bithynidae, Spheridae, Assimineidae, Corbiculidae, Unionidae, Amblemidae
Diptera:	Chironomidae, Ceratopogonidae
Crustacea:	Palaemonidae, Atyidae, Potamidae
Megaloptera:	Sialidae, Corydalidae
Lepidoptera:	Pyralidae
Oligochaeta:	Nereidae
Annelid:	Salifidae

Total families identified - 54

Table: 2.2.a CENTRAL ZONE

Sampling Locations	OCTOBER, 2007			JANUARY, 2008			FEBRUARY, 2008			MAY, 2008			NOV. 2008			FEB., 2009		
	SS	DS	BWQC	SS	DS	BWQC	SS	DS	BWQC	SS	DS	BWQC	SS	DS	BWQC	SS	DS	BWQC
Ramnagar, Bandrabhan	5.46	0.6	C	5.82	0.636	C	6.71	0.57	B	5	0.76	C	6.08	0.84	B	5	0.362	C
Jarrapur, Budni	-	-	-	4.77	0.393	C	5.58	0.5	C	5.29	0.69	C	-	-	-	5.41	0.81	C
Goalgaon, Budni	-	-	-	5.46	0.362	C	5.75	0.38	C	5.3	0.89	C	5.14	0.79	C	5.68	0.82	C
Tawa, Bandrabhan	-	-	-	-	-	-	5.8	0.37	C	6.2	0.73	B	5.14	0.79	C	4.69	0.393	C
Bandrabhan, A/C of Tawa river	-	-	-	-	-	-	6.2	0.4	C	7.22	0.52	B	5.83	0.73	C	5.5	0.63	C
Mangalwara Ghat, Hoshangabad	5.75	0.56	C	6.2	0.47	B	5.9	0.63	C	6	0.8	C	5.8	0.88	C	5.72	0.51	C
U/S SPM Nallah, Hoshangabad	5.52	0.475	C	5.57	0.4	C	6	0.42	C	5.45	0.86	C	5.4	0.8	C	5.81	0.37	C
D/S SPM Nallah, Hoshangabad	6	0.57	B	5.52	0.79	C	6.22	0.43	C	5.7	0.81	C	5.23	0.84	C	5.18	0.58	C

Saprobic Score SS
Diversity Score DS

Table No: 2.2.b List of benthic macroinvertebrates in Central Zone

Trichoptera:	Leptoceridae, Hydropsychidae, Hydroptilidae
Plecoptera:	Perlidae
Ephemeroptera:	Leptophlebiidae, Caenidae, Baetidae, Heptageniidae, Ephemeridae
Odonata:	Gomphidae, Macromiidae, Protoneuridae, Aeshnidae, Libellulidae, Coenagriidae,
Hemiptera:	Corixidae, Belastomatidae, Nepidae, Pleidae, Gerridae, Aphelocheridae, Ranatridae, Mesovelidae
Coleoptera:	Dytiscidae, Elminthidae, Hygrobidae, Hydrophilidae, Gyrinidae Ecnomidae, Lepidoptera, Psephenidae, Dryopidae
Mollusca:	Corbiculidae, Amblemidae, Thiaridae, Unionidae, Viviparidae, Bithyniidae, Assimineidae, Lymnaeidae, Planorbidae, Spheridae, Piscicolidae,
Diptera:	Tabanidae, Chironomidae, Culicidae, Simuliidae
Crustacea:	Atydae, Palaemonidae, Potamidae, Cirolanidae
Lepidoptera:	Pyrulidae
Annelida:	Glossiphonidae
Platyhelminthys:	Planariidae

Total families identified - 53

Table: 2.3.a WESTERN ZONE

S. No	Sampling Locations	DECEMBER, 2007			MARCH, 2008			JUNE, 2008			DECEMBER, 2008			MAY, 09		
		SS	DS	BWQC	SS	DS	BWQC	SS	DS	BWQC	SS	DS	BWQC	SS	DS	BWQC
1	Omkareshwar U/S	4.66	0.63	C	4.75	0.69	C	6	0.81	B	5.58	0.8	C	5.33	0.65	C
2	Nagar Ghat, Omkareshwar	-	-	-	7	0.44	A	5.5	0.74	C	7.6	0.59	A	5.8	0.506	C
3	Mamleshwar Ghat, Omkareshwar	-	-	-	-	0.16	-	5.25	0.49	C	5.5	0.61	C	5.8	0.76	C
4	Khedi Ghat, Mortakka	-	-	-	7.01	0.52	A	6.22	0.82	B	5.5	0.78	C	4.85	0.62	C
5	Mandleshwar D/S	4.77	0.6	C	6.36	0.54	B	6.25	0.88	B	6.4	0.86	B	5.31	0.62	C
6	Maheshwar (MPT Hotel)	5.5	0.86	C	5.12	0.54	C	5.7	0.82	C	4.78	0.79	C	5	0.73	C
7	Rajghat, Barwani	5.2	0.39	C	6.181	0.69	B	6.3	0.79	B	5.53	0.83	C	5.33	0.64	C
8	Koteshwar Ghat, Nisarpur	-	-	-	5.625	0.64	C	5.5	0.81	C	6.37	0.87	B	5.44	0.74	C

Table No: 2.3.b List of benthic macroinvertebrates in Western Zone

Trichoptera:	Leptoceridae, Hydropsychidae, Goeridae, Philopotamidae, Psychomyiidae
Plecoptera:	Perlidae
Ephemeroptera:	Baetidae, Heptageniidae, Caenidae
Odonata:	Protoneuridae, Libellulidae, Coenagriidae, Macromiidae, Gomphidae
Hemiptera:	Naucoridae, Belastomatidae, Corixidae, Nepidae, Ranatridae, Gerridae, Pleidae
Coleoptera:	Hydrophilidae, Dytiscidae, Psephenidae, Ecnomidae, Haliplidae, Gyrinidae, Noteridae, Dryopidae
Mollusca:	Planorbidae, Lymnaeidae, Bithynidae, Viviparidae, Thiaridae, Amblemidae, Unioidea, Sphaeridae, Pyrulidae, Physidae
Diptera:	Culicidae, Chironomidae, Tabanidae
Crustacea:	Atyidae, Cirolanidae, Palaemonidae
Annelida:	Hirudinidae

Total families identified: 46

2.4 Statistical data of biological parameters of Eastern zone

Sampling stations	Saprobic Score			Diversity Score		
	Max	Min	Avg.	Max	Min	Avg.
Ramghat, Amarkantak	5.27	4.66	4.965	0.81	0.78	0.795
Graveyard, Amarkantak	7	5.14	6.07	0.95	0.63	0.79
Kapilvan, Amarkanatak	6.5	5.44	5.97	0.74	0.57	0.655
Kapildhara, Amarkantak	6.2	4.8	5.5	0.88	0.5	0.69
Jogi Tikaria, Dindori	6.33	5.14	5.735	0.67	0.56	0.615
Dindori Ghat, Dindori	6.54	5.33	5.935	0.83	0.65	0.74
Raptapul Ghat, Mandla	8.8	6	7.4	0.77	0.29	0.53
Chiri, Mandla	5.75	5.25	5.5	0.62	0.57	0.595
Bargi Dam U/S (Maikal Resort)	5.78	4.55	5.165	0.58	0.33	0.455
Bargi Dam D/S	6.33	4.28	5.305	0.88	0.2	0.54
Saraswati Ghat, Jabalpur	7.75	3.4	5.575	0.7	0.15	0.425
Jhansi Ghat, Shahpura	6.8	6	6.4	0.76	0.46	0.61
Barmanghat, Narsinghpur	7.11	4.83	5.97	0.8	0.27	0.535

2.5 Statistical data of biological parameters of Central zone

Sampling stations	Saprobic Score			Diversity Score		
	Max	Min	Avg.	Max	Min	Avg.
Ramnagar, Bandrabhan	6.71	5	5.855	0.84	0.57	0.705
Jarrapur, Budni	5.58	4.77	5.175	0.69	0.393	0.54
Goalgaon, Budni	5.75	5.14	5.445	0.89	0.362	0.626
Tawa, Bandrabhan	6.2	5.14	5.67	0.79	0.37	0.58
Bandrabhan, A/C of Tawa river	7.22	5.83	6.525	0.73	0.4	0.565
Mangalwara Ghat	6.2	5.75	5.975	0.88	0.47	0.675
U/S SPM Nallah,	6	5.4	5.7	0.86	0.4	0.63
SPM Nallah	5.3	2.5	3.9	0.77	0.4	0.585
D/S SPM Nallah	6.22	5.23	5.725	0.84	0.43	0.635

2.6 Statistical data of biological parameters of Western zone

Sampling stations	Saprobic Score			Diversity Score		
	Max	Min	Avg.	Max	Min	Avg.
Omkareshwar U/S	6	4.66	5.33	0.81	0.63	0.72
Nagar Ghat, Omkareshwar	7.6	5.5	6.55	0.74	0.44	0.59
Mamleshwar Ghat, Omkareshwar	5.5	5.25	5.375	0.61	0.16	0.385
Khedi Ghat, Mortakka	7.01	5.5	6.255	0.82	0.52	0.67
Mandleshwar D/S	6.4	4.77	5.585	0.88	0.54	0.71
Maheshwar (MPT Hotel)	5.7	4.78	5.24	0.86	0.54	0.7
Rajghat, Barwani	6.3	5.2	5.75	0.83	0.39	0.61
Koteshwar Ghat, Nisarpur	6.37	5.5	5.935	0.87	0.64	0.755

2.7 Statistical data of Biological quality parameters of river Narmada- At a Glance

Sampling Zones	Saprobic Score			Diversity Score			Avg. BWQC
	Max	Min	Avg.	Max	Min	Avg.	
Eastern Zone	8.8	3.4	6.1	0.95	0.15	0.55	C
Central Zone	7.22	2.5	4.86	0.89	0.362	0.62	C
Western Zone	7.6	4.66	6.13	0.88	0.16	0.52	C

2.8 BWQC OF EASTERN ZONE

Sampling Stations	Nov., 07	April, 08	Oct., 08	Jan., 09	Average
Ramghat, Amarkantak	C	C	C	C	C
Graveyard, Amarkantak	A	C	C	C	B
Kapilvan, Amarkanatak	B	B	B	C	C
Kapildhara, Amarkantak	-	C	B	C	C
Jogi Tikaria, Dindori	-	C	B	C	C
Dindori Ghat, Dindori	-	C	B	B	C
Raptapul Ghat, Mandla	A	B	A	B	B
Chiri, Mandla	-	C	-	C	C
Bargi Dam U/S (Maikal Resort)	C	C	C	C	C
Bargi Dam D/S	D	B	C	C	C
Saraswati Ghat, Jabalpur	D	A	B	C	C
Jhansi Ghat, Shahpura	-	B	C	B	B
Barmanghat, Narsinghpur	-	A	D	C	C

2.9 BWQC OF CENTRAL ZONE

Sampling Stations	Oct., 07	Jan., 08	Feb., 08	May, 08	Nov., 09	Average
Ramnagar, Bandrabhan	C	C	B	C	B	C
Jarrapur, Budni	-	C	C	C	-	C
Goalgaon, Budni	-	C	C	C	C	C
Tawa, Bandrabhan	-	-	C	B	C	C
Bandrabhan, A/C of Tawa river	-	-	C	B	C	B
Mangalwara Ghat, Hoshanga-bad	C	B	C	C	C	C
U/S SPM Nallah, Hoshanga-bad	C	C	C	C	C	C
D/S SPM Nallah, Hoshanga-bad	B	C	C	C	C	C

2.10 BWQC OF WESTERN ZONE

Sampling Stations	Dec., 07	March, 08	June, 08	Dec., 08	Average
Omkareshwar U/S	C	C	B	C	C
Nagar Ghat, Omkareshwar	-	A	C	A	B
Mamleshwar Ghat, Omkareshwar	-	-	C	C	C
Khedi Ghat, Mortakka	-	A	B	C	B
Mandleshwar D/S	C	B	B	B	C
Maheshwar (MPT Hotel)	C	C	C	C	C
Rajghat, Barwani	C	B	B	C	C
Koteshwar Ghat, Nisarpur	-	C	C	B	C

2.11 Water resources and their uses

SL. NO.	ZONE/ REGION	SAMPLING LOCATION	WATER USE STATUS
1.	Eastern Zone	Origin (Kund)	Bathing, Washing, Ritual activities
2.		Ramghat	Cattle wading, Boating, Bathing, Solid waste, floor washing, Open defecation
3.		Graveyard	Cattle wading, Bathing, Cremation, Open defecation, Cattle wading
4.		Kapil Van	Cattle wading, Bathing, Washing, Open defecation
5.		Kapil Dhara	Bathing
6.		Jogi Tikaria	Bathing, Fishing, Vehicle washing
7.		Dindori Ghat	Bathing, Washing, Ritual activities, Farming, Cattle wading and Domestic discharge
8.		Raptapul Ghat (Mandla)	Cattle wading, Bathing, Cremation, Fishing, Open defecation
9.		Chiri Ghat	Bathing, washing, Fishing, Open defecation
10.		Bargi Upstream (Jabalpur)	Cattle wading, Sand recovery, Boating, Bathing, Fishing, Hydal power generation, Open defecation
11.		Bargi Down stream (Jabalpur)	Bathing, Cattle wading, Open Defecation and cremation
12.		Saraswati Ghat (Jabalpur)	Cattle wading, Bathing, Sand recovery, Vehicle washing and Ritual activities
13.		Jhansi Ghat (Shahpura)	Cattle wading, Sand recovery, Cremation, Bathing & Vehicle washing

14.		Berman Ghat (Narsingpur)	Bathing, Cattle wading, Cremation, Ritual activities and Fishing
15.	Central Zone	Bandrabhan (Ramnagar)	Cattle wading, Melon farming, Bathing, Boating and Religious activities
16.		Jarrapur	Cattle wading, Bathing, Washing and boating
17.		Goalgaon (Budni Ghat)	Farming, Cattle wading, Bathing, Ritual activities, Washing, Fishing, Boating & Cremation
18.		Mangalwara Ghat (Hoshangabad)	Cattle wading, Bathing, Ritual activities, Washing, Boating, Idol immersion, Open defecation & Cremation
19.		Before confluence of Tawa River	Sand recovery and Cremation
20.	Central Zone	After confluence of Tawa River	Ritual activity , Bathing and Open defecation
21.		SPM Nallah Upstream	Cattle wading, Sand recovery, Bathing and Fishing
22.		SPM Nallah Down stream	Sand recovery, Bathing, Cremation, Cattle wading and Fishing
23.		Western Zone	Omkareshwar Upstream
24.	Nagar Ghat (Omkareshwar)		Religious activities and Bathing
25.	Mamleshwar Ghat (Omkareshwar)		Cattle wading, Bathing, Washing and Open defecation
26.	Khedi Ghat (Mortakka)		Cattle wading, Bathing, Ritual activities and Washing
27.	Kasrawat (Downstream of mandleshwar dam)		Cattle wading, Bathing, Washing and Hydral power generation
28.	Maheshwar (MPT Hotel)		Cattle wading, Bathing and Washing
29.	Rajghat (Badwani)		Bathing and Ritual activities
30.	Koteswar (Nisarapur)		Bathing and Religious activities

2.12 HYDROLOGICAL STATUS OF EASTERN ZONE

Sl. No.	Sampling Location	Period of Sampling	Aprox. Depth (m.)	Aprox. Width (m.)	Aprox. Velocity of flow (m/ sec.)	Substratum Composition	
						Substrate type	Percentage
1.	Ramghat	Nov., 07	2.1	50	NIL	Silt Clay Detritous Artificial Substratum	1 7 2 90
		April, 08	-	24	NIL	Silt Clay Detritous Artificial Substratum	10 20 10 60
		Oct., 08	6.09	100	NIL	Silt Clay Detritous Artificial Substratum	10 10 10 70
		Jan., 09	1.52	9.14	NIL	Silt Clay Detritous Artificial Substratum	10 20 20 50
2.	Graveyard	Nov., 07	0.5	2.1	0.41	Boulders Cobbles Pebbles Gravels Sand Silt Clay	2 5 5 10 10 10 50
		April, 08	1.75	0.91	0.16	Boulders Gravels Sand Silt Clay	5 5 10 70 10
		Oct., 08	0.91	3	0.83	Pebbles Gravels Sand Clay	10 20 50 20

		Jan., 09	1.52	1.5	0.30	Boulders Cobbles Pebbles Gravels Sand Silt Clay Detritus	5 5 3 2 5 70 5 5
3.	Kapil Van	Nov., 07	-	-	NIL	Pebbles Gravels Sand Silt Clay	40 20 15 15 10
		April, 08	-	-	0.12	Gravels Sand Silt Clay Detritus	10 60 20 5 5
		Oct., 08	0.47	10	0.45	Pebbles Gravels Sand Silt	10 10 70 10
		Jan., 09	0.91	15	3	Boulders Cobbles Pebbles Gravels Sand	5 5 10 10 70
4.	Kapil Dhara	April, 08	1.5-2.0	30	NIL	Boulders Cobbles Pebbles Sand	70 10 5 5
		Oct., 08	0.60	15	0.66	Boulders Cobbles Pebbles Gravels	60 20 10 10
		Jan., 09	0.91	18	10	Boulders Cobbles Gravels Sand	80 10 5 5
5.	Jogi Tikaria	April, 08	1.5-2.0	100	0.6	Boulders Cobbles Pebbles Silt Clay Detritus	70 5 5 10 5 5

		Oct., 08	0.60	180	0.28	Cobbles Pebbles Gravels	80 10 10
		Jan., 09	0.91	100	2	Boulders Cobbles Pebbles Gravels Sand	60 10 10 10 10
6.	Dindori Ghat	April, 08	0.45	-	0.27	Boulders Cobbles Pebbles Silt Clay Detritus	70 10 5 5 5 5
		Oct., 08	7.61	200	1	Boulders Cobbles Pebbles Gravels Sand	10 20 50 10 10
		Jan., 09	0.91	250	1.8	Boulders Cobbles Pebbles Sand Silt Clay	70 10 5 5 5 5
7.	Raptapul Ghat (Mandla)	Nov., 07	-	-	0.83	Boulders Cobbles Pebbles Clay Detritus	40 10 10 39 1
		April, 08	0.76	200	0.83	Boulders Cobbles Silt Clay	60 30 5 5
		Oct., 08	6.09	800	1	Boulders Cobbles Pebbles Gravels Sand Silt Detritus	20 20 10 10 10 10 20
		Jan., 09	1.52	150	2	Silt Clay Detritus	10 80 10

8.	Chiri Ghat	April, 08	12.1	1000	NIL	Boulders Silt Clay Detritus	10 10 70 10
		Jan., 09	1.82	850	NIL	Boulders Cobbles Gravels Sand	10 5 5 80
9.	Bargi Upstream (Jabalpur)	Nov., 07	1	-	NIL	Cobbles Pebbles Gravels Sand Silt	2 2 1 80 15
		April, 08	100	1000	NIL	Gravels Sand Silt Clay	10 80 5 5
		Oct., 08	9.41	914.3	NIL	Pebbles Gravels Sand Silt Clay	10 10 60 10 10
		Jan., 09	12.1	1000	NIL	Gravels Sand Silt Clay	10 80 5 5
10.	Bargi Down stream (Jabalpur)	Nov., 07	2.5	200	0.83	Boulder Cobbles Pebbles Gravels Silt	65 15 10 5 5
		April, 08	1.5	121.9	7.1	Boulder Cobbles Pebbles Gravels	90 5 3 2
		Oct., 08	41.21	200	0.83	Boulder Cobbles Pebbles Gravels Sand	80 5 5 7 3
		Jan., 09	0.91	150	1.5	Boulder Cobbles Pebbles Gravels	90 5 3 2

11.	Saraswati Ghat (Jabalpur)	Nov., 07	3	100	0.47	Boulder Cobbles Pebbles Gravels Sand Silt	50 20 18 5 5 2
		April, 08	2-3.5	600	NIL	Boulder Cobbles Pebbles	80 10 10
		Oct., 08	3.04	91	0.55	Boulder Cobbles Pebbles	80 10 10
		Jan., 09	1.82	600	6	Boulder Cobbles Pebbles Gravels Sand Silt Clay	60 10 5 5 10 5 5
12.	Jhansi Ghat (Shahpura)	April, 08	4.5	200	0.52	Boulder Cobbles Sand	80 10 10
		Oct., 08	4.57	300	0.35	Boulder Cobbles Sand	80 10 10
		Jan., 09	4.57	200	1.8	Pebbles Gravels Sand	70 20 10
13.	Berman Ghat (Narsingpur)	April, 08	7	200	0.22	Boulder Cobbles Clay Detritus	10 10 70 10
		Oct., 08	21	300	0.55	Boulder Cobbles Pebble Sand	70 10 10 10
		Jan., 09	4.87	225	1.33	Boulder Cobbles Sand Silt Clay	70 10 10 5 5

2.13 HYDROLOGICAL STATUS OF CENTRAL ZONE

Sl. No.	Sampling Location	Period of Sampling	Aprox. Depth (m.)	Aprox. Width (m.)	Aprox. Velocity of flow (m/ sec.)	Substratum Composition	
						Substrate type	Percentage
1.	Bandrabhan (Ramnagar)	Oct., 07	1.82	150	0.133	Boulders Cobbles Silt Clay	80 10 5 5
		Jan., 08	4.5	220	0.13	Boulders Cobbles Silt Clay	80 10 5 5
		Feb., 08	1-1.5	150	1.25	Boulders Silt Clay	80 10 10
		May, 08	4.5	-	2	Boulders Cobbles Pebbles Gravels Sand	80 10 5 2 3
		Nov., 08	-	-	1	Boulders Cobbles Gravels Sand	50 20 10 10
2.	Jarrapur	Jan., 08	9.14	195	0.71	Sand Silt Clay Detritus	10 80 5 5
		Feb., 08	12.1	250	0.71	Sand Silt Clay Detritus	10 10 70 10
		May, 08	12.1	250	0.71	Sand Clay Detritus	10 80 10
3.	Goalgaon (Budni Ghat)	Jan., 08	7.61	250	NIL	Sand Silt Clay Detritus	10 40 40 10
		Feb., 08	7.61	53.3	0.08	Silt Clay Detritus	5 85 10

		May, 08	7.61	-	NIL	Sand Clay Detritus	20 70 10
		Nov., 08	10.66	-	NIL	Silt Clay Detritus	10 80 10
4.	Mangalwara Ghat (Hoshangabad)	Oct., 07	-	-	0.057	Cobbles Sand Silt Clay Detritus	5 40 10 40 5
		Jan., 08	3.04	200	0.62	Cobbles Sand Silt Clay Detritus	5 40 10 30 15
		Feb., 08	13.71	100	0.62	Silt Clay Detritus	10 80 10
		May, 08	3.04	150	0.55	Silt Clay Detritus	10 70 20
		Nov., 08	-	170	-	Silt Clay Detritus	10 80 10
		Feb., 08	-	-	0.43	Boulder Cobbles Sand Silt Clay	10 10 70 5 5
5.	Before Tawa Confluence	May, 08	-	-	1.5	Gravel Sand	10 90
		Feb., 08	15.2	200	NIL	Sand Silt Clay	70 25 5
6.	After tawa Confluence	May, 08	15.2	200	0.83	Gravel Sand Silt	10 80 10
		Nov., 08	19.8	200	0.31	Sand Silt Clay Detritus	50 20 20 10

7.	SPM Nallah Upstream	Oct., 07	2.28	1000	0.067	Pebbles Gravels Sand Silt Clay	5 5 70 10 10
		Jan., 08	9.1	1000	0.90	Cobbles Gravels Sand Silt	10 10 60 30
		March, 08	9.14	1000	0.90	Sand Silt Detritus	80 10 10
		May, 08	9.14	750	0.5	Sand Silt Detritus	40 10 40
		Nov., 08	9.2	785	0.4	Gravels Sand Silt Clay Detritus	10 10 10 60 10
8.	SPM Nallah Down stream	Oct., 07	-	-	0.052	Cobbles Pebbles Sand Silt Clay	5 10 40 10 35
		Jan., 08	10.6	-	0.90	Cobbles Pebbles Sand Silt Clay	3 7 60 10 20
		March, 08	10.6	1000	0.90	Cobbles Pebbles Sand Silt Clay	3 7 60 10 20
		May, 08	6.09	800	1.47	Boulders Cobbles Pebbles Sand	5 5 70 10
		Nov., 08	-	-	1.47	Cobbles Pebbles Gravels Sand	10 50 10 30

2.14 HYDROLOGICAL STATUS OF WESTERN ZONE

Sl. No.	Sampling Location	Period of Sampling	Aprox. Depth (m.)	Aprox. Width (m.)	Aprox. Velocity of flow (m/ sec.)	Substratum Composition	
						Substrate type	Percentage
1.	Omkareshwar Upstream	Dec., 07	25	1800	NIL	Cobbles Pebbles Silt Clay	8 2 80 10
		March, 08	-	1500	NIL	Boulders Cobbles Pebbles Gravels Sand Silt Clay	1 30 20 5 5 10 29
		June, 08	30.4	1500	NIL	Cobbles Gravels Sand Clay	70 10 5 15
		Dec., 08	21.35	1000	NIL	Cobbles Gravels Sand Silt Clay	8 10 10 2 70
		March, 08	2	150	0.5	Boulder Cobbles Pebble Gravels	90 5 3 2
2.	Nagar Ghat (Omkareshwar)	June, 08	0.91	100	0.16	Boulder Cobbles Clay Detritus	80 10 5 5
		Dec., 08	15.2	200	0.66	Boulder Cobbles Pebble Gravels	90 5 3 2

3.	Mamleshwar Ghat (Omkareshwar)	March, 08	1.5-2	150	0.34	Boulders Cobbles Pebbles Gravels Sand	70 10 10 5 5
		June, 08	1.5	100	0.16	Boulders Cobbles Gravels Clay	70 10 10 10
		Dec., 08	2.38	200	0.66	Boulders Cobbles Gravels Clay	70 10 10 10
4.	Khedighat (Mortakka)	March, 08	-	250	-	Boulders Cobbles Pebbles Gravels Sand Silt	80 10 5 3 1 1
		June, 08	6.09	-	-	Boulders Cobbles Gravels Silt Detritus	80 5 3 5 7
		Dec., 08	6.09	600	0.5	Boulders Cobbles Gravels Silt Detritus	60 10 10 10 10
5.	Kasrawat (Mandleshwar)	March, 08	0.4	200	0.4	Boulders Cobbles Pebbles Gravels Sand Clay	1 5 20 50 10 10
		June, 08	6.09	600	0.16	Boulders Gravels Sand Silt	70 10 10 10
		Dec., 08	22.05	800	0.18	Boulders Gravels Sand Silt	70 20 10 10

6.	Maheshwar MPT ghat	Dec., 07	4.26	130	-	Boulders Cobbles Sand Silt Clay	2 20 10 60 8
		March, 08	12.1	250	-	Sand Silt Clay Detritus	10 15 70 5
		June, 08	15	1000	-	Gravels Sand Clay Detritus	5 5 80 10
		Dec., 08	16.95	800	-	Gravels Sand Clay Detritus	5 5 80 10
7.	Rajghat (badwani)	March, 08	53.3	700	0.6	Clay	100
		June, 08	15	400	16	Boulders Sand Clay Detritus	5 5 80 10
		Dec., 08	15	800	0.8	Silt Clay Detritus	10 80 10
8.	Koteshwar ghat (Nisarpur)	March, 08	9.14	400	-	Clay	100
		June, 08	15.1	1000	-	Gravels Clay Detritus	5 85 10
		Dec., 08	7.5	900	-	Gravels Clay Detritus	5 85 10