

**PROJECT PROPOSAL ON
BIOREMEDIATION OF SEWAGE DISPOSAL IN THE
KHAM RIVER, AT AURANGABAD (MAHARASHTRA)**

**Prepared By
Dr. Dilip B. Boralkar
Sr. Environmental Scientist
Former Member Secretary of Maharashtra Pollution Control Board**

**Submitted to
District Planning & Development Council
Under the aegis of
District Magistrate & Collector
Aurangabad**

**Estimated Project Cost:
Rs. 375 lacs.**

**Proposed Period
2009-2012**

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1. Introduction

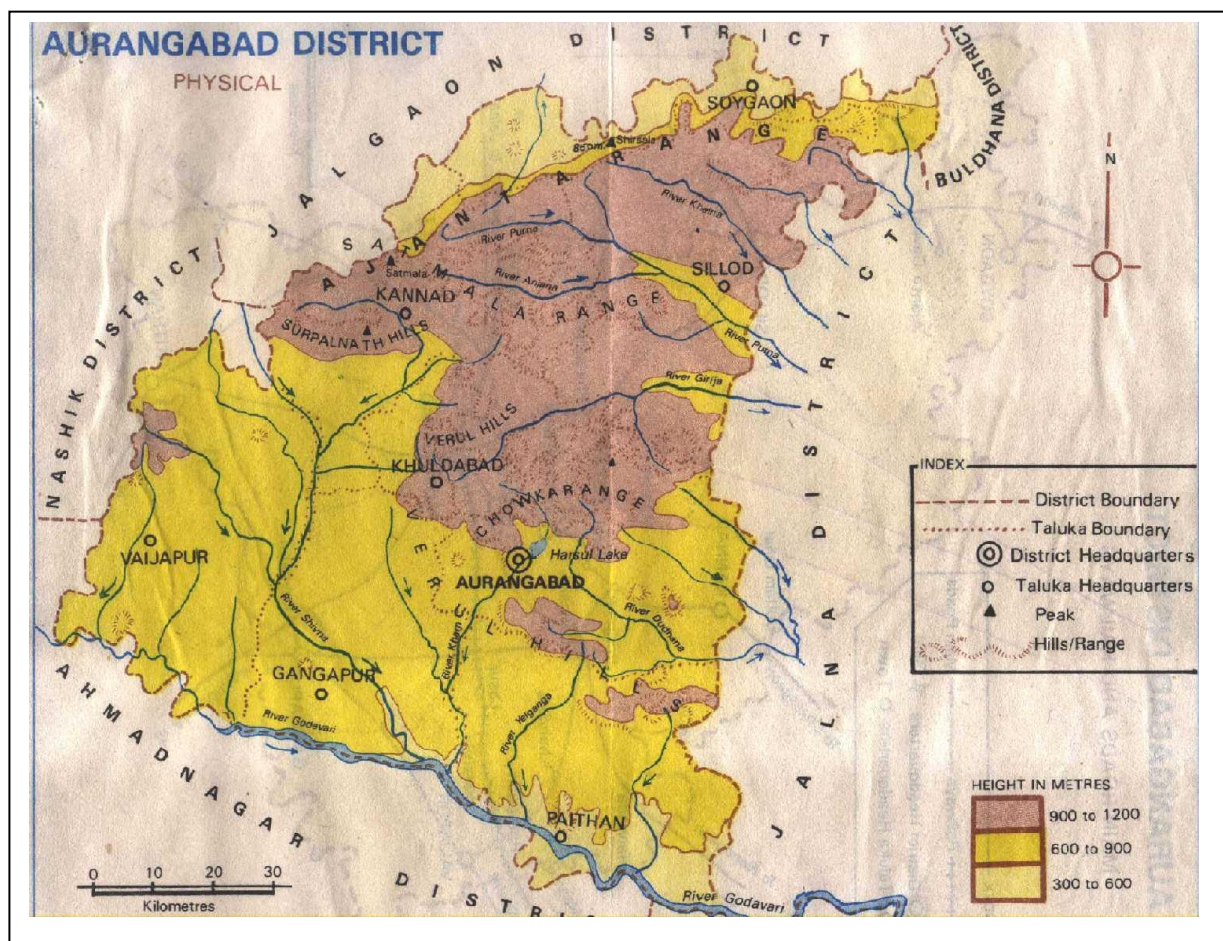
Aurangabad is not blessed with unlimited water resources. The city has crossed population total of one million. There is tremendous pressure on limited drinking water availability and its distribution in the city. The city is generating sewage at about 100 million liters per day (MLD). Untreated sewage disposal is of concern as it is cause of water pollution. Besides drinking, water is in short supply for other legitimate uses in the society. It is therefore most imperative that sewage is not only treated to its maximum but treated waste water should be recycled/ reused for non-potable uses such gardening, construction, industrial cooling, etc. The Kham River in Aurangabad has become nothing but an open drain carrying untreated sewage and other wastes. This river needs revival. *In situ Bioremediation* of Kham River is one important step in that direction. The efforts proposed are less energy-intensive and low-cost options as compared with that of the conventional methods.

Rapidly reducing greenery, cutting of surrounding vegetation, increasing silt and nutrient load, disposal of sewage and other wastes, open defecation, agricultural runoff etc. are causes for the increased quantity of nutrients and organic load input into the Kham river. The deteriorating water quality adversely affects the health and environment of the inhabitants of the area. In general, pollution invariably alters water quality, in turn, influencing biogeochemical cycles, diversity, biomass and overall trophodynamics. Any change in the physico-chemical environment has direct influence on biotic communities due to the fact that different species of flora and fauna exhibit great variations in their responses to the alter environment.

After a careful observation it has been found that the vanishing and extinction of some of the flora and fauna particularly bottom feeding animals and migratory bird fauna from the Kham river bed is due to sudden climatic change, reduced breeding potential, habitat change, commercial and recreational exploitation of river banks, lack of proper legislation and administrative lapses, lack of proper environmental education and training of the people.

2. Study area

Aurangabad is the headquarters of the district as well as the division – Marathwada. It is situated on the Kham River. Its geographical location is latitude $19^{\circ} 53'$ north and longitude $75^{\circ} 20'$ east. The city is situated in the Dudhana valley between the Lakenvara range on the north and the Satara hills on the south. The distance between the hills is about 16 – 20 km. The valley is open towards the east; but on the west side, it gets closed due to deflection and curving of northern range towards the city.



At the base of both the ranges, the soil is shallow and rocky, while towards the centre it deepens and becomes rich and fertile gradually. Thus, the city is placed on very uneven ground. Aurangabad is a historic city. It is well known for its approach to Ellora and Ajanta caves can be easily approached. These caves have put Aurangabad on the tourist map of the world. Aurangabad is linked major cities by air, rail and road.

The Kham River flows through Aurangabad city. The historic engineering marvel - city's water supply was developed by Malik Ambar which had canals and *nahars* running along the Kham River. This river flows with freshwater in monsoon only. Rest of the year it receives wastewater from the city. The Kham River receives sewage from the nallas flowing through densely populated areas. Near the Holy Cross School, the river crosses the city boundary and receives a *nallah* coming from the Railway Station area of MIDC. After Golwadi, it receives industrial wastewaters, the effect of the pollution increases and then it confluences with Godavari River upstream of the intake point for Aurangabad Water Supply Scheme. This was confirmed by the pollution control officers and experts who were present at the time of preliminary survey. Near Golwadi, it is observed that the Kham water is being used for agriculture and vegetable farming.

3 Survey

The survey and preliminary studies were carried out under the encouragement by Dr. Dilip B. Boralkar, former Member Secretary of Maharashtra Pollution Control Board by the volunteers of a Non-Governmental Organization from Pune and Dr. Satish B. Patil of Environment Science Deptt. of Dr. Babasaheb Ambedkar Marathwada University.

Recently, our group comprised of experts and students of environmental science subject visited the entire stretch of the Kham River starting from the Himayat Baug till it leaves Aurangabad city. During the survey, the basic land use pattern and sewage effluent drains, storm water drains leading in to the Kham River were identified.

Himayat Baug is the upstream point on Kham where the city starts. The area is sparsely populated. There are no prominent discharges which pollute the river. The flow was found very less. The pools were formed in the course river due to very thin flow.

Near the Begumpura, it is observed that the water gushes out from the age old water conduit of ancient water management system which runs along the Kham River.



Table no. 1: Characteristics of Kham River water at the Himayat Baug

| Sr. No. | Parameters | Unit | Analysis results at Himayat baug | River Water Quality* A-I | River Water Quality* A-IV | Discharge limit as per MPCB |
|---------|---------------------------------|--------------|----------------------------------|--------------------------|---------------------------|-----------------------------|
| 1. | pH | - | 7.21 | 6.5 – 8.5 | 6.5 – 9.0 | 5.5-9.0 |
| 2. | Suspended Solids | mg/l | 12 | 25 | Not specified | 100 |
| 3. | Total Dissolved Solids | mg/l | 187 | Not specified | Not specified | 2100 |
| 4. | Chlorides | mg/l | 23.34 | 600 | 600 | 600 |
| 5. | Total Hardness | mg/l | 70 | 50 | Not specified | - |
| 6. | Calcium Hardness | mg/l | 22 | Not specified | Not specified | Not specified |
| 7. | Total Alkalinity | mg/l | 114 | Not specified | Not specified | - |
| 8. | Chemical Oxygen Demand (COD) | mg/l | 26 | Not specified | 150 | 250 |
| 9. | Biochemical Oxygen Demand (BOD) | mg/l | 08 | 2 | 30 | 30 |
| 10. | Iron | mg/l | 0.76 | 1 | Not specified | 3 |
| 11. | Oil and Grease | mg/l | nil | Not specified | Not specified | 10 |
| 12. | MPN | No. / 100 ml | 140 | Not specified | Not specified | - |

The water of the Kham River near Begumpura is somewhat blackish because it gets mixed with domestic wastewater from the surrounding settlements having less density of population.



The flow of the river, near Begumpura is comparatively less - in the range of 10 to 12MLD approximately. On the banks of the river, the brick manufacturing is a seasonal activity.



It may be noticed that brick manufacturers have already created one soil bund to retain the water for their activity.

Table no. 2: Characteristics of Kham River water at the Begumpura:

| Sr. No. | Parameters | Unit | Analysis results at Begumpura | River Water Quality* A-I | River Water Quality* A-IV | Discharge limit as per MPCB |
|---------|---------------------------------|--------------|-------------------------------|--------------------------|---------------------------|-----------------------------|
| 1. | pH | - | 7.89 | 6.5 – 8.5 | 6.5 – 9.0 | 5.5-9.0 |
| 2. | Suspended Solids | mg/l | 56 | 25 | Not specified | 100 |
| 3. | Total Dissolved Solids | mg/l | 269 | Not specified | Not specified | 2100 |
| 4. | Chlorides | mg/l | 36.76 | 600 | 600 | 600 |
| 5. | Total Hardness | mg/l | 130 | 50 | Not specified | - |
| 6. | Calcium Hardness | mg/l | 68 | Not specified | Not specified | Not specified |
| 7. | Total Alkalinity | mg/l | 180 | Not specified | Not specified | - |
| 8. | Chemical Oxygen Demand (COD) | mg/l | 64 | Not specified | 150 | 250 |
| 9. | Biochemical Oxygen Demand (BOD) | mg/l | 24 | 2 | 30 | 30 |
| 10. | Iron | mg/l | 0.87 | 1 | Not specified | 3 |
| 11. | Oil and Grease | mg/l | 1.2 | Not specified | Not specified | 10 |
| 12. | MPN | No. / 100 ml | 60 | Not specified | Not specified | - |

The water of Kham River gets fully laden with sewage near the Water Mill. The contamination by raw sewage is evident from its colour.



Near the Water Mill [*Pan Chakki*], the Kham River is flanked by densely populated areas releasing their waste water directly into the river. That's why, the flow of the river was found increased up to 20 MLD at this spot.



Table no. 3: Characteristics of Kham River water near Water Mill [*Paan Chakki*]

| Sr. No. | Parameters | Unit | Analysis results at Water Mill | River Water Quality* A-I | River Water Quality* A-IV | Discharge limit as per MPCB |
|---------|---------------------------------|--------------|--------------------------------|--------------------------|---------------------------|-----------------------------|
| 1. | pH | - | 7.68 | 6.5 – 8.5 | 6.5 – 9.0 | 5.5-9.0 |
| 2. | Suspended Solids | mg/l | 194 | 25 | Not specified | 100 |
| 3. | Total Dissolved Solids | mg/l | 348 | Not specified | Not specified | 2100 |
| 4. | Chlorides | mg/l | 53.65 | 600 | 600 | 600 |
| 5. | Total Hardness | mg/l | 160 | 50 | Not specified | - |
| 6. | Calcium Hardness | mg/l | 76 | Not specified | Not specified | Not specified |
| 7. | Total Alkalinity | mg/l | 160 | Not specified | Not specified | - |
| 8. | Chemical Oxygen Demand (COD) | mg/l | 488 | Not specified | 150 | 250 |
| 9. | Biochemical Oxygen Demand (BOD) | mg/l | 212 | 2 | 30 | 30 |
| 10. | Iron | mg/l | 1.65 | 1 | Not specified | 3 |
| 11. | Oil and Grease | mg/l | 4.6 | Not specified | Not specified | 10 |
| 12. | MPN | No. / 100 ml | >1600 | Not specified | Not specified | - |

The water from the Water Mill gets mixed with the polluted water of the Kham. This freshwater addition is about 1 – 2 MLD. The Kham River widens near Holy Cross School. The flow of the river increases up to 40 MLD.



Table no. 4: Characteristics of Kham River water near Holy Cross School

| Sr. No. | Parameters | Unit | Concentration in sample from Water Mill | River Water Quality* A-I | River Water Quality* A-IV | Discharge limit as per MPCB |
|---------|---------------------------------|--------------|---|--------------------------|---------------------------|-----------------------------|
| 1. | pH | - | 7.14 | 6.5 – 8.5 | 6.5 – 9.0 | 5.5-9.0 |
| 2. | Suspended Solids | mg/l | 108 | 25 | Not specified | 100 |
| 3. | Total Dissolved Solids | mg/l | 365 | Not specified | Not specified | 2100 |
| 4. | Chlorides | mg/l | 56.67 | 600 | 600 | 600 |
| 5. | Total Hardness | mg/l | 170 | 50 | Not specified | - |
| 6. | Calcium Hardness | mg/l | 72 | Not specified | Not specified | Not specified |
| 7. | Total Alkalinity | mg/l | 180 | Not specified | Not specified | - |
| 8. | Chemical Oxygen Demand (COD) | mg/l | 424 | Not specified | 150 | 250 |
| 9. | Biochemical Oxygen Demand (BOD) | mg/l | 144 | 2 | 30 | 30 |
| 10. | Iron | mg/l | 1.23 | 1 | Not specified | 3 |
| 11. | Oil and Grease | mg/l | 5.6 | Not specified | Not specified | 10 |
| 12. | MPN | No. / 100 ml | >1600 | Not specified | Not specified | - |

The river receives a lot of dirt, organic matter from the drains flowing through the densely populated areas of the city. The water has foul smell and stink remains

throughout the day. The total distance of the river stretch through the city is about 8-10 km.

Himayat Baug is well – known for its biodiversity as quoted by the experts. But due to modern civilization and ever growing settlements near the Kham, the quality of the Kham is degraded severely. Though the fish populations and other macro invertebrates populations considerably decreases, most of the areas still show abundances of aquatic plants benthic population even in summer season during low level of water.

4. Project Objectives

- Bio-remediation of the water pollution in the Kham river at Aurangabad.
- Improvement in water quality and maintenance of the river ecosystem.
- Effective use of the treated water for other beneficial uses and recharging of the river with clean water.

5. Action Plan

- 5.1. Dry Inventory and Data Collection in terms of water quality, Survey records of topography of areas, degradation areas, altered areas, pollution, man-made construction and other activities in river bed.
- 5.2. Analysis of sediment and water quality at different locations for physico – chemical and biological monitoring as per the CPCB guidelines.
- 5.3. Determination of enrichment of toxic metals and PoPs in river water, sediment and flora.
- 5.4. Eco-friendly treatment of Kham river water using green bridge and green lake technology and development of model for management of Kham river water for sustainable utilization.
- 5.5. Mass awareness and public participation in the river cleaning programme.

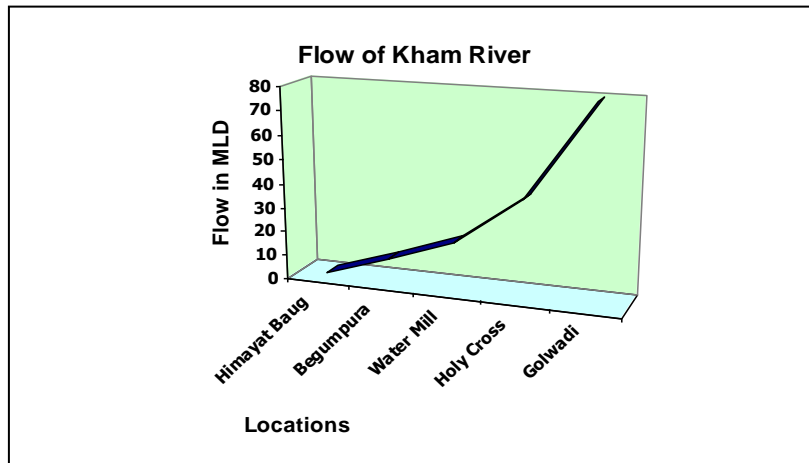
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6. Bioremediation Treatment

6.1 Design Considerations

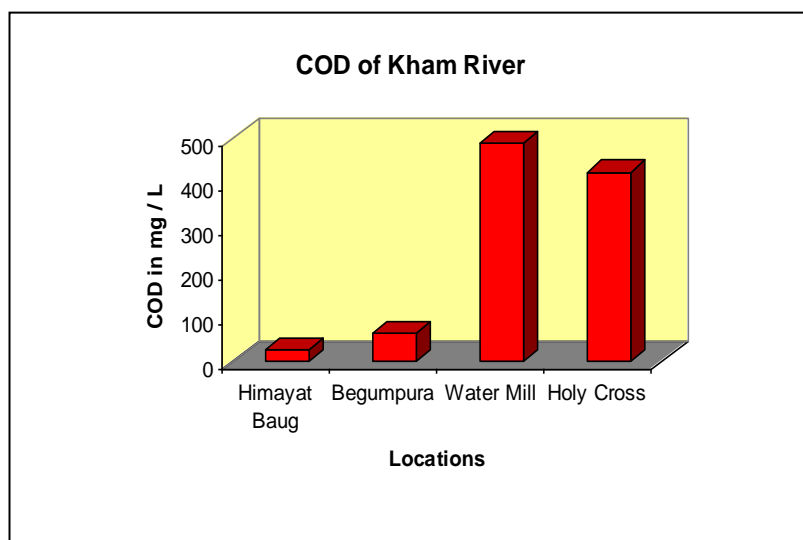
6.1.1. Flow of the River

Though the rainfall is comparatively high, water in the river remains very less after monsoon is over. Due to the Harsul Dam, flow of the river downstream is reduced substantially. The flow in the river is shown in the following figure –



6.1.2 Pollution Load

As the flow of the Kham increases, and river enters the city, gradually the river receives pollution from non-pint sources from the surrounding settlements. The pollution of the river is evident from the abovementioned results of the samples collected in April 2007. The photographs indicate clearly the present situation of the river. The COD values are shown in the following fig.



6.1.3 Variations

There are diurnal and seasonal fluctuations of hydraulic and chemical characteristics because of the rains, discharges from the surrounding settlements, density of settlements, modernization etc. These variations will be studied thoroughly by adopting very scientific monitoring programme.

6.2. Ecotechnologies to Restore Quality of Nallas and Rivers

6.2.1 Green Bridge and Green Lakes systems are nothing but the applications of ecological principles to utilize pollutants as nutrients through eco-transformations, eco-conversions, and bioutilization in a specially developed ecosystem for the treatment. It is the simulation of natural biogeochemical cycles on a small scale. The principle is the matter and energy gets transferred to various trophic levels starting from Detritus Food Chain. This technique is cheaper than the conventional system of sewage treatment.

6.3.2 The scheme involves application of ecological engineering principles and succession of biological communities to remove organic and inorganic pollutants from the water.

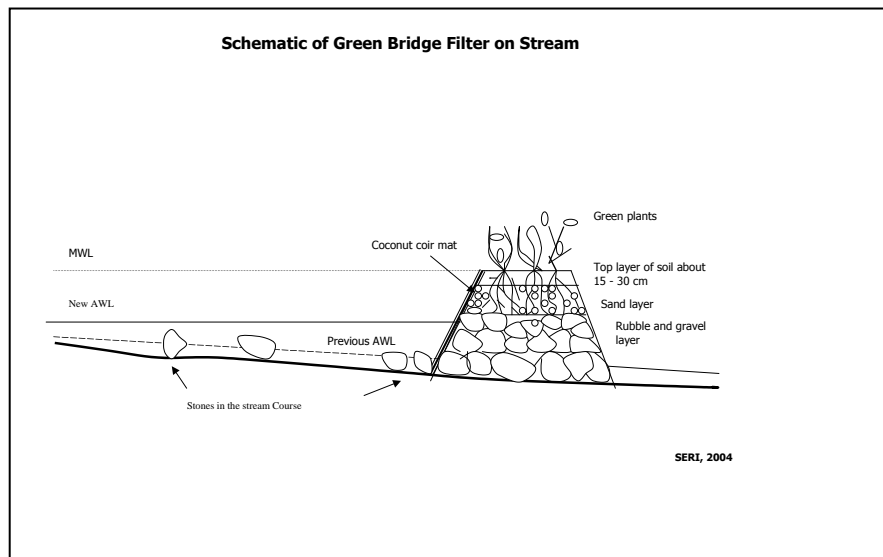
6.3.6 The consortia of organisms at different trophic levels utilize pollutants as nutrients. These eco-transformations, eco-conversions and degradation or bioutilization of pollutants - nutrients are the part of ecological cycles - biogeochemical cycles.

6.3.7 The attempt will be made to apply natural flora and fauna in well-designed manner to develop technologies like Green Bridge, Green Lake Eco-System and Stream Eco-System.

Continued on next page

6. Green Bridge Technology

6.1.1 The Green Bridge technology uses filtration power of biologically originated cellulosic / fibrous material with growth of green plants.



6.1.2 A very good filter is developed when the cellulosic / fibrous material like coconut coir or dried water hyacinth or aquatic grasses are compacted and woven to form a bridge / porous wall like structure strengthened by stones and sand.

6.1.3 All the floatable and suspended solids are trapped in this biological bridge and the turbidity of flowing water is reduced. The green plants growing there help in absorption of soluble substances including heavy metals.

6.1.4 The treatment unit can be designed based on local topographical conditions and water characteristics. The major advantage is that it is self-propagating and self-controlling system depending on the external inputs - varying concentration of the pollutants.

6.1.5 The treatment unit means existing communities of flora and fauna alter their compositions according to the changes in input. This is nothing but the

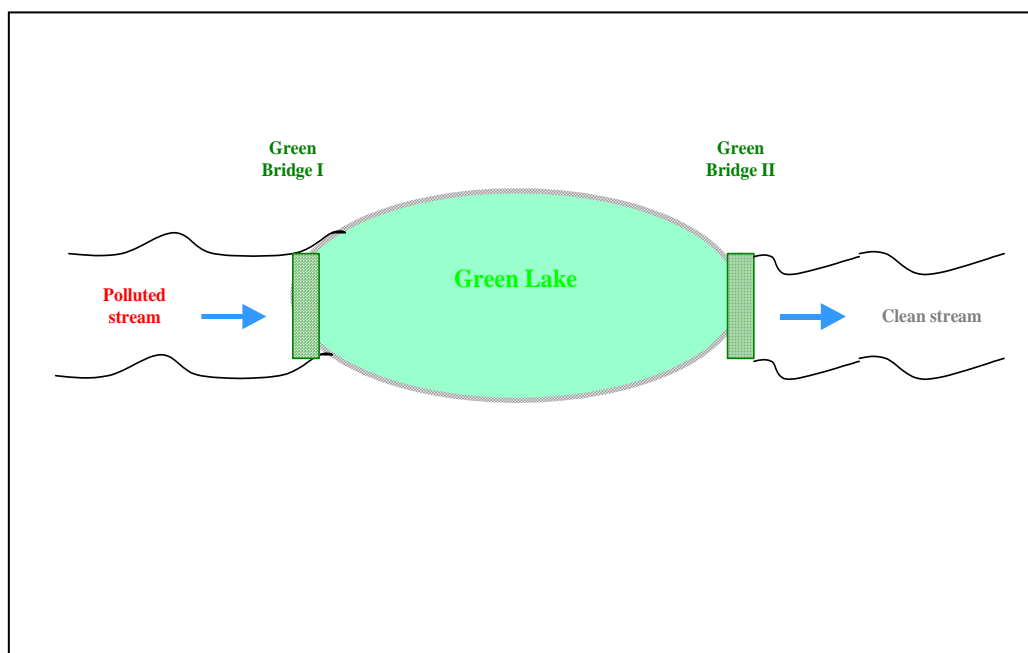
simulation of natural process of ecological succession in a limited space and time.

6.2 Green Lake Technologies

6.2.1 Green Lake system uses floating, submerged or emergent aquatic plant species. These can be termed as *macrophyte* ponds also. Macrophytes are capable to absorb large amounts of inorganic nutrients such as N and P, and heavy metals such as Cd, Cu, Hg and Zn etc and to engineer the growth of microbes to facilitate the degradation of organic matter and toxicants.

6.2.2 There are many references of use of phytoremediation techniques to remove the pollutants to keep the water body free of pollution. This technique can be termed as constructed wetland system. This kind of system has been also evaluated and recognized by USEPA.

6.2.3 The Green Lake System can be illustrated as shown below –



6.3 Stream Eco-System (SES) Technology

6.3.1 Natural streams, rivers and lakes have their own in - built purification system, the winds, natural slopes, stones, sand, biological growth and complex food web help in the purification process. The basis of food web is nothing but utilization of one's waste by another as it's food.

6.3.2 Nature has her own living machinery of detritivorous microbes and other living species to consume wastes. These principles have been harnessed in the Stream Eco-System Technology.

6.4 Expected Efficiency of Natural Technology

| | | |
|------------------------------------|---|------------|
| 1. COD / BOD removal (organic) | : | above 80 % |
| 2. Removal of Suspended solids | : | above 80 % |
| 3. Improvement in Dissolved Oxygen | : | up to 300% |

7. Scheme for Kham River

7.1 Installation of Green Bridges

Three Green Bridges – horizontal filtration systems on Kham – one each at Begumpura, Water Mill [*Paan Chakki*] and Holy Cross School shall be installed to trap the suspended solids and to promote aerobic biodegradation of the organic matter having faecal origin.

Three Green Bridges – horizontal filtration systems on Aurangpura Nallah – one each at Up stream of Subji Mandi, Down Strem of Subji Mandi, upstream of Varad Ganesh Mandir shall be installed to trap the suspended solids and to promote aerobic biodegradation of the organic matter having faecal origin.

The detailed design will be given in the DPR after the complete of the stretch and it's physicochemical and biological characterization.

7.2 Screening of the floating non-biodegradable material

The metal screen - each before every Green Bridge shall be provided to trap the plastic material thrown carelessly by the people in the water body. The accumulation of plastic leads to formation of anaerobic conditions. The on-line screens can be installed in the course of Kham. The design inputs will be obtained by the detailed characterization study.

7.3 Green Lakes

Lakes shall be specially developed in between two Green Bridges to facilitate the phyto-filtration and phyto-remediation of the pollutants in pond ecosystem. Ingestion of useful microbes (aerobic and an-aerobic) will be done to enhance the process of purification and removal of foul smell. The dimensions and HRT of the lakes shall be decided in the DPR.

7.4 Cascades

The gradient of the land shall be used to develop natural aeration systems to facilitate aerobic degradation in the Green Lakes.

7.5 Shoreline Treatment

Three tier plantations will be done to protect the banks from erosion due to flash floods. The design will be based on hydrological and flood studies of the Kham River. The attempt will be made to increase the biodiversity and avifauna of the region so that regional ecological balance can be attained over a period of time.

7.6 Locations

The locations for the Green Bridges are tentatively fixed based on preliminary survey. Total number may vary and the final selection of the locations will be based on DPR.

8.0 Time Period

DPR along with the bid documents will be prepared in three months. Project completion period shall two years. Contractor will be made responsible for operation and maintenance of the entire system at least for the period of 10 years.

9.0 Project Budget

Preparation of Detailed project report consisting of details of locations, bills of quantities, work schedule, estimated capital costs, estimated O&M tariff, Draft Tender Documents, Notice Inviting Bids, Criteria for technical and financial capabilities etc. shall be prepared by the Project Management Consultant who will be an accredited expert having knowledge and working experience related to this field for at least 17 years and possessing degrees of M. Sc. in Environ. Science and Ph.D., preferably in the field of water and waste water engineering. The Person should be reputed at national and international level and having actual experience in application of Green Bridge Technology in India.

Project Management Consultant (PMC) will function under the aegis of the Aurangabad District Collector & District Planning & Development Council and provide technical consultation to conduct the bid process and final selection of the most competent contractor for completion of works as per time schedule. Suggested draft of the Notice Inviting Bids for the PMC is placed as Annexure I.

The cost of preparation of DPR and providing technical consultation shall be paid to PMC @ 5% of the bid value of the most successful contractor or Rs. 20 lacs which ever is more. An amount of Rs. 10 lacs shall be paid to the PMC as an advance along with the Letter of Award (Draft at Annexure II) against the Bank Guarantee of 1 lac as a proof of their intent to take up the assignment as PMC and its completion within the allocated time.

10. Way Forward

1. In order to implement the project systematically over a period of time, the Competent Authority may consider "in principle" sanction for the implementation of the project on bioremediation of Kham River based on the need and justification as illustrated in the preceding pages of this note.
2. Project Implementation period shall be during the period 2009-2012.
3. The Budget Approval may be considered as under:
 - Year 2009-2010 - Rs. 25 lacs (lump sump)
 - Year 2010-2011 - Rs. 300 Lacs Approx.
 - Year 2011-2012 - Rs. 100 lacs approx.
4. Target Dates for various action points are given in the Table below:

| Sl. No. | Action Point | Date |
|---------|--|-------------|
| 01 | Issue of Notice Inviting Bids for appointing PMC | 25.11.2009 |
| 02 | Opening of Bids & Issue of LoA | 14.12.2009 |
| 03 | Preparation of DPR by PMC and its submission to the Authority for approval | 15.03.2010 |
| 04 | Approval of DPR and sanction of Funds | 30.03.2010 |
| 05 | Issue of NIT | 12.04.2010 |
| 06 | Receipt of Bids and Opening | 25.05.2010 |
| 08 | Issue of LoI to the competent bidder | 14.06. 2010 |
| 09 | Agreement between Bidder and Authority | 22.06. 2010 |
| 10 | Launching of the Project | 22.06. 2010 |
| 11 | Preparations by the Bidder to start the work & Completion | 30.06.2011 |
| 12 | Trials | 30.06.2012 |
| 13. | Operation and Maintenance | Till 2022 |

5. Considering the fact that the project implementation activities are science and technology based it will be essential to regularly monitor the progress of the project implementation by the experts. Therefore, an Expert Committee for Monitoring of the project on Bioremediation of Kham River is suggested. Composition of the Committee may be as under:

| | | |
|----|---|--------------------|
| 01 | The Collector, Aurangabad | Chairman |
| 02 | Dr. D.B. Boralkar, Sr. Environ. Scientist and Former Member Secretary of Maharashtra Pollution Control Board, Flat #602, Amar Residency, Sion-Trombay Road, Deonar, Mumbai 400 088. | Expert Member |
| 03 | Prof. Dr. Satish Patil, Deptt. of Environ. Science, BAMU, Aurangabad | Expert Member |
| 04 | Representative of Maharashtra Pollution Control Board | Expert Member |
| 05 | The District Town Planning Officer, Aurangabad | Expert Member |
| 06 | Representative of Aurangabad Municipal Commissioner | Expert Member |
| 07 | Chief Accounts Officer, Collectorate of Aurangabad | Member |
| 08 | District Planning and Development Council Officer Incharge | Member Convener |

Terms of Reference of Expert Committee are suggested as under:

- Monitoring of progress in achieving Physical and Financial Targets as per schedule.
- Consideration of the technical issues as may arise during the project implementation and resolving them.
- Committee will meet generally once in month at Aurangabad or as may deem fit by the Collector, Aurangabad.
- Any other matter as may be referred by the Chairman.
- Non-Official Members of the Committee shall be entitled for TA/DA, and other allowances as per Rules.
- Expenditure on activities of the Expert Committee shall be charged to the Head of Account

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**NOTICE
INVITING TENDERS FOR
PROJECT MANAGEMENT CONSULTANT**

The Aurangabad city's sewage and other wastes flow directly or through storm water drains in the Kham River passing through the city. This river needs revival by treatment of waste water flowing in it. *In situ Bioremediation* of Kham River is one important step proposed to be taken up in that direction. It is therefore most imperative that sewage is not only treated to but treated waste water should be used for recharging of water resources or recycled/ reused for non-potable uses etc.

In order to facilitate the implementation of the Project on *In Situ* Bioremediation of the Kham River at Aurangabad, Bids are invited for engaging services of the Project Management Consultant possessing essentially the following Qualifications and experience:

- The Person shall be well qualified possessing M. Sc. Degree in Environmental Science and Ph.D. degree in water & waste water technologies with experience of at least 15-16 years or more in the related field.
- The Person shall be an accredited/certified expert of ISO or NABL etc.
- The Person should be reputed at national and international level.
- The person must have actual experience in application of Green Bridge Technology in India.

Technical Note giving background of the project proposed may be obtained from this office.

Bids for offering services of the **Project Management Consultant may be submitted to this office on or before 14.12.2009, 13.00 hrs. Bids will be opened on the same day at 15.30 hrs in presence of the Bidders who may wish to attend and Letter of Award will be issued immediately.**

**S/d
District Collector
Aurangabad
(Maharashtra State)**

DISTRICT PLANNING & DEVELOPMENT COUNCIL
OFFICE OF THE DISTRICT MAGISTRATE & COLLECTOR,
AURANGABAD

No.

Dated: 2009

To

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Subject: Letter of Award to function as Project Management Consultant and Preparation of Detailed Project Report regarding implementation of Bioremediation of sewage disposal in the Kham River at Aurangabad.

Reference: Presentation of project proposal and discussion on 18.11.2009 in this office.

Dear

We thank you for responding to our NIT and attending technical discussion in this office regarding implementation of Bioremediation of sewage disposal in the Kham River at Aurangabad. Copy of the presentation prepared by Dr. D.B. Boralkar, Sr. Environmental Scientist & Former member Secretary of Maharashtra Pollution Control Board is enclosed for reference.

2. The Aurangabad city is generating sewage at about 100 million liters per day (MLD). Untreated sewage disposal is of high concern to us as it is also cause of water pollution. Besides drinking, water is in short supply for other legitimate uses in the city. It is therefore most imperative that sewage is not only treated to its maximum but treated waste water should be recycled/ reused for non-potable uses such gardening, construction, industrial cooling, etc. The Kham River in Aurangabad has become nothing but an open drain carrying untreated sewage and other wastes. This river needs revival by treatment of waste water flowing in it. *In situ Bioremediation* of Kham River is one important step in that direction. The efforts proposed are less energy-intensive and low-cost options as compared with that of the conventional methods.

3. We wish to complete the project in two years and contractor shall be responsible for operation and maintenance for 10 years.

4. Considering your special knowledge, experience and pioneering efforts in successful establishment of *in situ* bioremediation using Green Bridge Techniques in India, we decided to engage your services as Project Management Consultant. The suggested Terms of Reference (ToR) are as under:

- Preparation of Detailed project report consisting of details of locations, bills of quantities, work schedule, estimated capital costs, estimated O&M tariff, Draft Tender Documents, Notice Inviting Bids, Criteria for technical and financial capabilities etc.
- You will also function as Project Management Consultant (PMC) under the aegis of the Aurangabad District Collector & District Planning & Development Council and provide technical consultation to conduct the bid process and final selection of the most competent contractor for completion of works as per time schedule.
- The cost of preparation of DPR and providing technical consultation shall be paid to the you @5% of the bid value of the most successful contractor or Rs. 20 lacs which ever is more.
- An amount of Rs. 10 lacs shall be paid to you as an advance after the acceptance of this Letter of Award and against the Bank Guarantee of Rs. 1 lac as a proof of your commitment and intent to take up the job of PMC and its completion within the allocated time.
- You may also suggest draft of the final agreement, if any, for detailed ToR for taking up this assignment of PMC.

This is issued with the approval of the Competent Authority,

Yours faithfully,

(.....)

Dr. Dilip B. Boralkar

M. Sc., Ph.D.

Former Member Secretary, Maharashtra Pollution Control Board, Mumbai
Former Assistant Secretary, Central Pollution Control Board, Delhi

Address: Flat # 602, Amar Residency, Sion-Trombay Road, Deonar, Mumbai 400 088 (Tel. 022-2555 2558)

Mumbai

Date: 12.11.2009

Dear Shri Sanjeev Jaiswal,

The Aurangabad city's untreated sewage and other wastes flow directly or through storm water drains in the Kham River passing through the city. The water pollution is severe and it is adversely affecting the health and environment. This river needs revival by treatment of waste water flowing in it. It is therefore most imperative that sewage is not only treated but treated waste water should be used for recharging of water resources or recycled/reused for non-potable uses etc.

Considering the low costs and high benefits, I proposed *In situ* Bioremediation of the Kham River using Green Bridge Techniques. This would be an important step forward for restoration of ecology and environment protection in the historic city of Aurangabad.

I am enclosing a Technical Note on the Project Proposal on Bioremediation of the Sewage Disposal in the Kham River at Aurangabad for your perusal and consideration. I would be pleased to make a technical presentation on this subject in your office at Aurangabad on November 18th, 2009, 3.30 PM for further clarification.

Looking forward to see you soon. With kind regards,

Yours sincerely,

(D.B. Boralkar)

Encl: as above.

Shri Sanjeev Jaiswal, IAS,
District Magistrate & Collector,
Aurangabad (Maharashtra)

Copy forwarded with best compliments and kind favour of information to:

- (1) Shri Bhaskar Mundhe, IAS, Divisional Commissioner, Aurangabad.
- (2) Dr. Puroshottam Bhapkar, IAS, Municipal Commissioner, Aurangabad