Meghalaya State Pollution Control Board
Forests & Environment Department, Government of Meghalaya
'ARDEN' Lumpyngngad, Shillong-793014
Website: http://megspcb.gov.in

No. MSPCB/LEGAL-182/2019/2020-'21/49 Dt. Shill. The 28th May, 2020

To,

The Consultant Judicial,
National Green Tribunal
Faridkot House, Copernicus Marg,
New Delhi - 110 001

Subject: NGT Order Dt. 10.05.2019 & Dt. 25.02.2020 in M.A. No 26/2019 of O.A. No. 325/2015 Lt. Col. Sarvadaman Singh Oberoi –Vrs- Union of India & Ors.

Ref: Email: sanjeev joglekar <sanjucat@yahoo.com> on Sat, May 2020.

Sir,

With reference to the above, I am to inform that the Central Pollution Control Board (CPCB) has identified Ward's Lake and Umiam Lake as Polluted Water bodies (Lakes ponds) based on the Water Quality Monitored under National Water Monitoring Program (NWMP) of the Central Pollution Control Board (CPCB). As per the NGT order mentioned above, the State has to prepare Action Plan for Restoration of the above Polluted Water Bodies and submit the same to the Central Pollution Control Board (CPCB).

Enclosed please find herewith Action Plan of Umaim Lake & Ward's Lake for Restoration of polluted water bodies which has been submitted to the Central Pollution Control Board (CPCB), Delhi.

Enclosed: As stated

Yours faithfully

MEMBER SECRETARY
Meghalaya State Pollution Control Board
Shillong

Contact details: Email:megspcb@rediffmail.com; Telephone Numbers : Chairman-0364-2521217; Member Secretary-2522802; Scientific-2521514; Engineering-2521533; Laboratory-2521726; Administration-2520073; Telefax-2521764

(43)

Meghalaya State Pollution Control Board
Forests & Environment Department, Government of Meghalaya
'ARDEN' Lumpyngngad, Shillong-793014
Website: http://megspcb.gov.in

mspcb

No. MPCB/GEN-298/2019/43 Dated Shillong the 22nd May 2020

To

Shri. A. Sudhakar
Division Head, WQM-I Div
Central Pollution Control Board,
Ministry of Environment, Forest, & Climate Change Govt. of India,
Parivesh Bhavan, East Arjun Nagar
Delhi -110030.

Email: asudhakar.cpcb@nic.in/jcb.cpcb@nic.in

Sub: **Hon,ble NGT Order Dated 10.05.2019 in M.A.No 26/2019 in OA .No 325 /2015 in the matter of Lt.Col. Sarvadaman Singh Oberoi Vs UOI & Ors**

Ref: **1. No. F-A-14011/1/325/2020-WQM-I/13378 Dated 06.03.2020**
2. No. MPCB/GEN-298/2019/37 Dated Shillong the 18th May 2020

Sir,

In continuation of subject cited above, enclosed please find herewith the filled in format where the required information were incorporated alongwith the enclosures. This is for favour of your information & necessary action.

Yours faithfully

Enclo: As stated

MEMBER SECRETARY
MSPCB, SHILLONG

Memo No. MPCB/GEN-298/2019/43 A **Dated Shillong the 18th May 2020**

Copy to:

1. Shri MBK Reddy, Addl. Principal Chief Conservator of Forests, Planning, Development and Legal Matters, Meghalaya, Shillong for information and necessary action.

MEMBER SECRETARY
MSPCB, SHILLONG

O/C

FORMAT FOR SUBMISSION OF INFORMATION ON PROPOSED ACTION PLANS FOR RESTORATION OF POLLUTED WATER BODIES (LAKES AND PONDS) IN COMPLIANCE TO HON'BLE NGT ORDERS DATED 10.05.2019 & 25.02.2020 IN O.A. NO. 325/2015

Sl. No.	Content					
1	Name of State/UT	Meghalaya				
	Contact Details (Department-wise)	Name of the State/UT Department	Name of the Nodal Officer	Contact Tel. No.	Mobile No.	Email
		Power Department, Government of Meghalaya	Shri. M. Shangpliang Director (Generation) MePGCL	0364-2591406		1. pce-mecl@yahoo.co.in 2. dg.mepgcl@mecl.co.in
2	Information on water bodies such as Lakes & Ponds	Type of Water Body	Total No. of Water Bodies Identified	Ownership of Identified Water Bodies (Indicate No. of water bodies)		Status On-going Restoration of water bodies with financial support from NRCD/MoJS/with own resources of the State/UT
				Government	Private /Individual	Total No. of water bodies selected for restoration / Total No. of Water bodies restored so far / Total No. of water bodies presently under restoration
		Lakes	1	Public Sector Undertaking		1 / / 1
		Ponds				
3	Whether water bodies are geo-tagged/ provided with Unique Identification Number (UIN)	No				
4	Major causes of pollution in identified water bodies	Improper disposal of sewage√/ Industrial Effluent√/ Wastes like Municipal Solid Waste√/ Hazardous Waste√/ Plastic waste√/ Construction & Demolition Waste√ Pl. put√ whichever is correct				
5	Other problems associated with the Identified Water Bodies	Silting√/ Weeding/ Encroachments/ No Provision of inflow or outflow control measures/ Poor Embankment√/ Poor Watershed Management in Catchment√/ No adequate Buffer Zone√/ Any other Pl. put √whichever is correct				
6	Water Quality Compliance status of Identified Lakes and ponds in the State/UT	Type of Water body	No. of Identified water bodies	No. of Water Quality Monitoring Stations	No. of Water Bodies complying to	
					Primary Water Quality Criteria for bathing / Drinking Water Quality Criteria after Conventional Treatment	Water Quality Criteria for Agriculture/Fishing/Any other criteria
		Lakes	1	4		1
		Ponds				
7	Proposed Water Body-wise Action Plans for restoration of prioritized water bodies with timelines and implementing agencies	*Umiam Reservoir will be notified shortly as a Wetland by the State Wetland Authority as per Wetland (Conservation and Management) Rues, 2017. A Management Plan for Umiam Reservoir aimed at "securing the ecological integrity of the wetland ecosystem while providing ecological, economic and cultural benefits to the society on a sustainable basis and to put in place adequate institutional and governance arrangements for stakeholders led management of the Umiam reservoir", was submitted to the State Wetland Authority for necessary action.* Annexed				
8	Any other relevant information					

Date: 18.05.20

Signature of the Designated Officer with name and seal.
Director (Generation)
MePGCL, Shillong- 793001

Annexure

(PL Provide Following Details Water Body-Wise)

1.	Location details of water body (Address with GPS location)	:	Umiam Lake, Umiam, Ri –Bhoi District latitude 25°37"30'N- 25°40"30'N longitude 91°51"0'E-91°54"30'E
2.	Details of Area and Dimensions of the Water body	:	.1,015.8 hectare
3.	Water depth (in m) (During monsoon and non-monsoon period)	:	Avg 970.79 m. Maximum-981.46
4.	Ownership of the Water Body	:	Government of Meghalaya
5.	Allocation Unique Identification Number (UIN)	:	
6.	Details of Habitat (Surrounding Areas/towns with population and no. of industries in the surrounding area/ industrial estates in the establishments of pond or lake)	:	
7.	Details of inflow/outflow, evaporation, flooding frequency, magnitude of flow into the water body	:	None
8.	Major Plant and Animal communities present in the water body	:	
9.	Designated Use of Pond or Lake (Drinking/ Irrigation/Aqua Culture/ Tourism/Protected Bio-diversity	:	Domestic, Fisheries, Tourism (Boating), Recreational activities.
10.	Major Drains outfall into Water Body	:	Umkhrah & Umshyrpi river
11.	Physical condition of the Water Body	:	-
12.	Water Quality of Water Body	:	Enclosed

11. Proposed Action Plans with action-wise implementing agency, estimated cost and timelines for completion

12. Status of Sewage Management in the Catchment area

Total sewage inflow into the water body (in MLD)	Existing sewage Treatment Capacity (in MLD)	Gap in Sewage treatment (in MLD)	Proposed No. of Treatment Facilities	Proposed Sewage Treatment Capacity (in MLD)	Implementing Agency, Estimated Cost and Timelines for Completion
47.9	Nil	47.9		4.05 (STPs including Septage Management	Urban Affair Department, Shillong 99.25 crore April 2021

13. Status of Industrial Effluent Management in the Catchment area

Total Industrial Effluent Inflow into the waterbody (in MLD)	Existing Industrial Effluent Treatment Capacity (both captive and CETPs) (in MLD)	Gap in Industrial Effluent Treatment (in MLD)	Proposed No. of Treatment Facilities	Proposed Treatment Capacity (in MLD)	Implementing Agency, Estimated Cost and Time lines for completion
NIL	1.7585	Nil	-	-	-

14. Waste Management in the Catchment area of water body

Type of waste	Quantity of Waste Generation in the catchment area (TPD)	No. of Treatment and disposal Facilities and Capacity in the catchment area (inTPD)	Gap in Treatment and Disposal of Waste in the catchment area (in TPD)	Proposed No. of Facilities and their (in TPD)	Implementing Agency, Estimated Cost and Time lines for completion
MSW	164.81	8.72	156.09	170.0	Shillong municipal Board, 80 Crore, completed, to be commissioned.
HW	No information				
BMW	1.059728	1.059728	Nil	-	-
C&D	No information				
Plastic	0.230	Nil	0.230		

15. Additional Measures (Pl indicate action-wise implementing agency estimated cost and the timelines for completion)

Interception & Diversion of sewage /industrial effluent from drains to the nearby treatment or upcoming facilities, Restoration of natural drains, Silt control measures in natural drains contributing to inflow. Inflow and outflow flood control provisions(with sluice gates as well as constructed wetlands on u/s),Strengthening of Earthen embarkment surrounding the pond or lake with stone revetment or pitching),In situ measures (like desilting, deweeding, surface aeration ,floating adoption of biological treatment poptions0,buffer Zone and development of bio-diversity park, Recreational provision, training and Awareness Programme, Public Participation For Cleaning of surroundings ,any other actions.

WATER QUALITY DATA OF UMIAM LAKE-APRIL,2020

NAME OF THE MONITORING STATION→ / PARAMETERS↓	Umiam lake	Umiam Lake middle point	Umiam Lake at outfall of umiam river	Umiam Lake near United Christian College
pH	7.8	8.1	7.4	7.7
Conductivity µS/cm	110.0	112.0	138.0	108.0
Alkalinity mg/L	36.0	36.0	42.0	24.0
P. Alkalinity mg/L	NIL	NIL	NIL	NIL
Nitrite mg/L	NIL	NIL	NIL	NIL
Nitrate mg/L	0.80	0.92	1.0	0.68
Dissolved Oxygen mg/L	6.5	6.4	5.0	6.0
BOD mg/L	5.6	5.6	7.2	5.8
COD mg/L	10.0	20.0	30.0	20.0
Chloride mg/L	14.0	13.0	13.0	14.0
Sulphate mg/L	8.75	8.9	11.13	8.75
Sodium mg/L	7.8	6.7	6.7	3.1
Calcium CaCO3 mg/L	30.0	28.0	34.0	10.0
Magnesium as CaCO3 mg/L	14.0	14.0	18.0	6.0
Feacal Coliform (MPN/100ml)	630	380	580	480
FeacalStreptococci (MPN/100ml)	43	41	79	39
Turbidity (NTU)	12.8	5.8	10.8	5.5
Total Kjeldahl-N mg/L	0.06	0.28	0.32	0.34
Hardness as CaCO3 mg/L	44.0	42.0	52.0	44.0
Total Coliform (MPN/100ml)	1300	1200	1100	920
Total Dissolved Solids mg/L	76.0	77.0	95.0	76.0
Ammonia Nitrogen (mg/l)	0.17	0.14	0.16	0.20
Total Phosphate mg/L	0.03	0.04	0.08	0.03
Total Suspended Solids mg/L	16.0	16.0	17.0	16.0
Potassium mg/L	3.7	3.1	3.2	1.5
SAR	0.30	0.23	0.23	0.19
%Sodium (meq/L)	0.34	0.29	0.29	0.14
Cadmium mg/L	BDL	BDL	BDL	BDL
Chromium mg/L	BDL	BDL	BDL	BDL
Copper mg/L	BDL	BDL	BDL	BDL
Lead mg/L	BDL	BDL	BDL	BDL
Nickel mg/L	BDL	BDL	BDL	BDL
Zinc mg/L	0.02	BDL	BDL	0.03
Arsenic mg/L	BDL	BDL	BDL	BDL
Flouride mg/L	0.05	0.05	0.05	0.06
Iron mg/L	0.32	0.34	0.56	0.30
Manganese mg/L	0.02	BDL	BDL	0.02

MANAGEMENT PLAN FOR UMIAM RESERVOIR

1. BRIEF HISTORY

1.1 The Umiam reservoir is located in Ri-Bhoi district between 25°37'30"N to 25°40'30"N Latitude and 91°51'0" E to 91°54'30" E Longitude in the north-central part of the State of Meghalaya. The Reservoir covers an area of 1,015.8 hectare with live water storage capacity of 181.42 Mm^3 at maximum reservoir level of 981.46 m (3,220 ft). The minimum reservoir level has been kept at 960.12 m (3,150 ft) to provide a dead storage of 395 lakh m^3 (32,000 acre ft).

1.2 The Umiam reservoir is an artificial lake created in the year 1965 by erecting a 195 m main dam across the Wah Umiam river and a 463.3 m earthen dam and a 167.7 m long road dyke by the then Assam State Electricity Board. With the reorganization of the composite State of Assam resulting in creation of a new State of Meghalaya on 22.01.1972, control and management of the Umiam Reservoir was transferred to the Meghalaya State Electricity Board (MSEB). On division of the MSEB into four Corporation under the Meghalaya Power Sector Reforms Transfer Scheme, 2010 the Umiam Reservoir is presently owned, controlled and managed by the Meghalaya Energy Corporation Limited (MeECL), 'the holding company', through its 'generation utility arm' Meghalaya Power Generation Corporation Limited (MePGCL).

2. ECOLOGICAL AND ECONOMIC IMPORTANCE

2.1 The Umiam reservoir is an artificial lake created mainly for electric power generation with an installed capacity of 36 MW. The hydro-power produced by utilizing water from this lake has contributed greatly to the economy of the State. The Umroi Cantonment draws about 2 million liters of water from the lake daily. The presence of the Umiam Lake has also contribution towards ground water recharge within its area of influence. During winter months few migratory birds visit the reservoir.

2.2 The picturesque Umiam reservoir is a major tourist attraction. Several hotels, resorts and restaurants are located in periphery of the reservoir. Apart from these hotels, resorts and restaurants; the boating facilities operated in the reservoir by the Meghalaya Tourism Development Corporation Limited provides employment to many persons. The reservoir is home to several fish species. Though commercial fish farming has not been introduced in the reservoir so far, local residents harvest fish resources available in the lake.

3. CURRENT STATUS

Umiam reservoir is free from encroachment. Due to discharge of untreated sewage and other liquid, solid and plastic waste emanating from Shillong Urban Agglomeration (UA) into the Umiam reservoir, water quality reports for the Umiam reservoir reflects high bio-chemical oxygen demand,

low level of dissolved oxygen and high faecal coliform content. Siltation in catchment area of the reservoir is resulting in gradual reduction in its carrying capacity. Plastic waste floating on surface of the reservoir in some areas has also been noticed occasionally.

4. MAJOR THREATS

4.1 Discharge of Untreated Sewage, Industrial and Plastic Waste from Shillong Urban Agglomeration

A major part of the Shillong UA having a current population of about 3.75 lakh is located in catchment area of the Umiam reservoir. In the absence of a sewage collection network and a sewage treatment plant, entire untreated sewage emanating from these areas is discharged into Umiam reservoir through two tributaries (Wah Umkhrah and Wah Umsyrphi) of Wah Ro-Ro which joins the Umiam river, the main source of water to the Umiam reservoir.

Even in the areas falling under the Shillong Municipal Board about 9% households have no toilets, 44% households depend on shared toilets and 47% households have individual toilets. Among the households having individual toilets, only 39% households have septic tank with soak pits, 4% have septic tank without soak pit and the toilets in the remaining 4% households are directly connected to the nearby drains. In the households having individual or community/shared toilets, sewage flows into septic tanks and soak pits and the sullage/supernatant is directly or indirectly disposed of in nearby drains. All such drains have outfalls in the Wah Umkhrah and Wah Umshyrpi streams. 20 such drains having total estimated flow of about 45.325 million litres per day (MLD) join the Wah Umkhrah. Similarly, 12 such drains having a flow of about 43.25 MLD join the Wah Umshyrpi.

4.2 Discharge of Spent Oil, Grease and Other Pollutants from Vehicle Repair and Service Centers

The Shillong UA is home to several vehicle repair and service centers. Many such centers are located near the banks of Wah Umkhrah and Wah Umshyrpi. Spent oil, grease and other pollutants originating from these centers find a place in the Umiam reservoir through these streams resulting in further deterioration in quality of water in the reservoir.

4.3 Discharge of Leachate Emanating from Mawiong Solid Waste Processing Centre cum Landfill

The Mawiong Solid Waste Processing cum Landfill (hereinafter called as "Mawiong landfill") having an area of about 18 acres is located in direct draining catchment of the Umiam reservoir. Entire solid and plastic waste generated in Shillong UA is dumped in the said landfill. In the absence of a

proper guard wall, garland drain, leachate treatment plant and shelterbelt plantation, leachate containing several pollutants originating from the Mawiong landfill during rains finds its way to the Umiam reservoir through the intervening Riat Khwan Reserved Forest.

4.4 Discharge of Solid and Liquid Waste Originating from Ryndang Briew View Point

Every day large number of tourist halt at Ryndang Briew viewpoint located at an elevated point on a hill slope overlooking the Umiam reservoir on Shillong -Guwahati highway to have a glimpse of the picaresque Umiam reservoir. Several small shops and stalls have been established along the highway at the said viewpoint. A major part of the solid, liquid and plastic waste generated by tourists visiting the viewpoint and the shops and stalls located therein finds its way to Umiam reservoir resulting in its pollution.

4.5. Siltation

Fast urbanization and associated deforestation, increased forest fires and unregulated mining in catchment area of the Umiam reservoir is resulting in heavy siltation in the reservoir. As per the recent hydrographic surveys carried out by WAPCOS and Tojo Vikas International (P) Ltd, the average siltation rate is about 26.10 ha m/100 sq km/year and 23.79 ha m/100 sq km/year respectively. Siltation rate for Umiam reservoir are higher than the average siltation rate of 17.65 ha. m/100 sq km/year for the Himalayan Region consisting of Indus, Ganga and Brahmaputra basins. Though the siltation so far has not affected live storage capacity of the reservoir, it is resulting in fast loss of its dead storage.

4.6 Un-demarcated Boundary

The land occupied by the Umiam reservoir was acquired from the respective land owners before construction of the dam. The boundary of the reservoir has however, not been physically demarcated on the ground by erection of a fencing or boundary pillars. The open un-demarcated boundary makes the Umiam reservoir prone to encroachment.

5. KEY MANAGEMENT ISSUES

5.1 Inter-Sectoral Coordination

The Umiam reservoir is owned, managed and controlled by the MeECL through its generation utility arm MePGCL. The MeECL however has little control over the agents/activities responsible for degradation of the Umiam reservoir. Effective control of the agents/activities responsible for degradation of the Umiam reservoir and planning, execution and monitoring of various activities to

undertake ameliorative measure to undo the damage already caused to Umiam reservoir require active participation and involvement of all concerned department/ agencies.

5.2 Untapped Economic Potential

Apart from the hydel power generation, the picturesque Umiam reservoir has a very high potential for various other income generation activities such as adventure and water sports, eco-tourism and fish farming to promote the local economy. If properly tapped, it can significantly contribute to the local economy.

5.3 Absence of Integrated Information System for Informed Decision Making

Non-availability of information relating to the Umiam reservoir and the agents/activities responsible for its degradation at a centralized location is a major hindrance for informed planning, execution and monitoring of various activities to ensure scientific management of the Umiam reservoir.

5.4 Weak Enforcement of Regulatory Regime

Till date, the Umiam reservoir has not been notified under the Wetlands (Conservation and Management) Rules, 2016. In the absence of notification of the Umiam reservoir under these Rules, it is legally not feasible to prevent and regulate activities responsible for degradation of the Umiam reservoir. Majority of the agents/activities responsible for degradation of the Umiam reservoir are also attributed to weak enforcement of environmental laws in the zone of influence/catchment area of the Umiam reservoir.

5.5 Stakeholder Participation and Awareness

The pollution of Umiam reservoir occasionally attracts attention of the print and electronic media, policy makers and residents of the State. Majority of the residents of the State are however unaware of the poor health of the Umiam reservoir. There is a very limited avenue for stakeholders, beyond Government departments and agencies, to participate in management of Umiam reservoir.

6. MANAGEMENT OBJECTIVES

The goal of integrated management of Umiam reservoir is to secure the ecological integrity of the wetland ecosystem while providing ecological, economic and cultural benefits to the society on a sustainable basis. The purpose is to put in place adequate institutional and governance arrangements for stakeholders led management of the Umiam reservoir.

7. INSTITUTIONAL ARRANGEMENTS

The Meghalaya State Wetlands Authority (MSWA) is the state level designated nodal authority for management of wetlands in the State. A crucial role of the MSWA is to ensure coordination of various sectoral programs on matters related to wetlands in the State. An Umiam Reservoir Management Cell constituted within the MSWA will be responsible for coordinating day to day implementation of the Management Plan.

8. MANAGEMENT COMPONENTS AND ACTIVITIES

8.1 COMPONENT 1: INSTITUTION AND GOVERNANCE

8.1.1 Establishment of an Umiam Reservoir Management Cell to Coordinate Management Plan Implementation

An Umiam Reservoir Management Cell consisting of representatives from the MeECL, Forest and Environment Department, Urban Affairs Department, Tourism Department, Fisheries Department, Soil and Water Conservation Department, Water Resources Department, Police Department, District Administrations of East Khasi Hills and Ri-Bhoi districts, Meghalaya State Pollution Control Board, Shillong Municipal Board, Shillong Cantonment Board and North Eastern Space Application Centre, will be constituted in the Meghalaya State Wetlands Authority. The Cell will coordinate and oversee implementation of the Management Plan.

8.1.2 Notification under the Wetlands (Conservation and Management) Rules, 2017 to Provide Statutory Backup to Management Interventions

To provide statutory basis to prohibit and regulate various activities responsible for degradation of the Umiam reservoir, notification of the Umiam reservoir under the Wetlands (Conservation and Management) Rules, 2017 will be expedited.

8.1.3 Demarcation of Wetland Boundary

To prevent and detect encroachment of the Umiam reservoir, its boundary will be accurately delineated and demarcated on the ground. For this purpose the Umiam reservoir and the areas located within 500 meters from boundary of the reservoir within its catchment will be mapped by undertaking drone survey with the help of the North Eastern Space Application Centre (NESAC), Department of Space, Government of India. The boundary of the Umiam reservoir will be demarcated on the ground by erecting RCC boundary pillars at each corner points. Areas located in vicinity of habitations and commercial establishments which are prone to encroachments will be secured by erecting appropriate fencing/ boundary wall.

8.1.4 Development of a GIS Based Decision Support System

To facilitate identification, prioritization, execution and monitoring of various management interventions in an informed and transparent manner it is proposed to create a geographical information system (GIS) based decision support system (DSS) by the Umiam Management Cell. Apart from the information relating to land-use-land-cover of the Umiam reservoir and its zone of influence, the DSS will contain information relating to various agents/activities responsible for degradation of the health of the Umiam reservoir and management interventions undertaken or proposed to be undertaken to restore the health of the Umiam reservoir.

8.1.5 Capacity Development

To ensure effective implementation of various activities for restoration of the Umiam reservoir, it is proposed to enhance, strengthen and maintain the capabilities of key stakeholders and authorities involved in planning, execution and monitoring of the activities envisaged in the Management Plan by organizing trainings, workshops, refresher courses, exposure trips *etc.* for such stakeholders/authorities.

8.1.6 Community Participation and Outreach

Active participation of communities, especially the youth, in planning, execution and monitoring of various activities envisaged in the Management Plan for restoration of the health of Umiam reservoir is a pre-requisite for its successful implementation of the Management Plan. It is therefore proposed to enlist participation of local communities by constitution of Umiam *mitras* (friends of Umiam). The following activities will also be undertaken to promote stakeholders engagement in management of Umiam reservoir:

(i) Establishing signage proclaiming importance of Umiam reservoir at prominent locations;

(ii) Creating a dedicated webpage for Umiam reservoir, as an electronic interface to connect stakeholders with wetland managers;

(iii) Publication of brochures, fact sheets, awareness material and newsletters for public distribution; and

(iv) Organizing public outreach events on Word Wetlands day (Feb.2), International Day for Biological Diversity (May 22) and World Environment Day (June 5).

8.1.7 Research

Research studies on the present health of the wetland, the threats affecting its wellbeing, the change in land use, agricultural practices, monitoring of water quality, *etc.* are proposed to be undertaken by involving North Eastern Hill University (NEHU) and other universities/research institutions.

8.1.8 Monitoring and evaluation

To assess the progress in implementation and achievement of the desired results/targets, various activities undertaken under the Management Plan will be periodically monitored by the Umiam Management Cell by using the proposed GIS based DSS.

8.2 COMPONENT 2: WATER QUALITY MANAGEMENT

8.2.1 Prevention of discharge of Untreated Sewage, Industrial and Plastic Waste Emanating from Shillong UA

Discharge of untreated sewage, industrial and plastic waste emanating from Shillong UA is the main reason for poor quality of water in the Umiam reservoir. Hilly terrain, unplanned development, lack of financial resources and non-availability of adequate space for setting up of Sewage Treatment Plants (SPTs) make it difficult to establish and operate conventional sewage collection and treatment infrastructure consisting of sewer lines and sewage treatment plant (STP) in Shillong UA, atleast in near future. The following short-term and long term measures are proposed to undertaken prevent discharge of untreated sewage, industrial and plastic waste emanating from Shillong UA in the Umiam reservoir.

8.2.1.1 Short Term Measures

8.2.1.1.1 Biological Reclamation of Wah Umkhrah and Umshyrpi

Recent advances in use of micro- organisms (*viz.* algae and bacteria) in treatment of polluted water offer cost-effective solutions to restoration of water quality in Wah Umkhrah and Wah Umshyrpi streams. It is therefore, proposed to deploy these technologies for treatment of polluted water in Wah Umkhrah and Umshyrpi steams. If found successful, the same may provide a lasting solution for restoration of water quality in these streams as well as the Umiam Reservoir.

8.2.1.1.2 Installation of Plastic Traps

Plastic traps each consisting of a RCC barrier to impound and guide the flow of plastic waste laden water through openings in such barrier and a synthetic wire-mesh bag fitted at exit of each such openings to trap and hold plastic and other trash available in the water flowing through these openings are proposed to be constructed in the Umshyrpi and Umkhrah streams. To traps the plastic waste during rainy seasons when water may overflow these barriers, each such barrier will be provided with a steel wire mess fixed on a mild steel (MS) superstructure. The plastic collected in the synthetic wire mesh bags will periodically be collected for further processing.

8.2.1.2 Long Term Measures

8.2.1.2.1 Installation of Decentralized STPs at Major Sewage Outfalls in Umkhrah and Umshyrpi Streams

To facilitate treatment of sewage flowing into Wah Umkhrah and Wah Umshyrpi streams, it is proposed to install decentralized sewage treatment plant (STP) at each of the 32 major sewage outfalls. To assess the effectiveness and to standardize the design of such STPs conforming to the local site conditions, as a beginning, in the initial phase covering the period of this Management Plan decentralized STPs are proposed to be installed at atleast two major outfalls in each of the afore-mentioned streams.

8.2.1.2.2 Installation and Operation of Faecal Sludge Collection and Treatment Facilities

Faecal sludge is a fluid mixture of untreated and partially treated sewage solids, liquids and sludge of human or domestic origin. About 16 de-sludge trucks, each having a capacity of 6 cum are required to collect about 90,000 cum sludge generated in the Shillong UA. In the initial phase it is proposed to cover about one-fourth of the Shillong UA by faecal sludge collection and treatment facility by purchasing 4 de-sludge trucks of 6 cum capacity.

8.2.2 Prevention of Discharge of Spent Oil, Grease and Other Waste from Vehicle Repair and Service Centers

8.2.2.1 Installation of Grease and Oil Traps

It is proposed to make it mandatory to install grease and oil traps/interceptors in the plumbing system of each Vehicle Repair and Service Centre in the Shillong UA to capture Spent Oil, Grease and other waste originating from these areas.

8.2.2.1 Shifting of Vehicle Repair and Service Centers Located on or Near Banks of the Wah Umkhrah and the Wah Umshyrpi Streams

The owners of Vehicles Service Centers and Repair Shops located on or near the banks of Wah Umkhrah and Wah Umshyrpi streams will be persuaded to shift to a areas located at certain minimum distance from banks of these rivers so that the spent oil, grease nad other pollutants originating from these centers may can be intercepted before it reaches afore-mentioned streams.

8.2.3 Prevention of Discharge of Untreated Leachate Emanating from Mawiong Landfill

8.2.3.1 Short Term Measures

8.2.3.1.1 Collection and Biological Reclamation of Leachate

To prevent discharge of untreated leachate emanating from the Mawiong landfill it is proposed to collect such leachate at one or more appropriately located leachate collection sumps/pits by construction of a garland drain along the lower periphery of the Mawiong landfill. The leachate collected in these sumps/pits will be biologically treated by using micro-algae/ bacteria before it is allowed to discharge into the Umiam Reservoir.

8.2.3.1.2 High Density Plantation of Broad-Leaved Native Species

To prevent direct discharge of untreated leachate emanating from the Mawiong landfill into the Umiam reservoir it is proposed to undertake dense plantation of broad leaved native species in the blank and degraded forest areas located between the above landfill and the Umiam reservoir. The litter and other ground flora available in floor of these areas will intercept and reduce flow rate of the leachate emanating from the Mawiong landfill resulting in percolation of a major part of the leachate to the ground before it reaches the reservoir.

8.2.3.2 Long Term Measures

8.2.3.2.1 Shifting of Mawiong Landfill to a Suitable Alternate Site

Operation of the Mawiong landfill site at its present location is against the siting norms stipulated in the Solid Waste Management Rules, 20116 notified by the Ministry of the Environment, Forest and Climate Change, Government of India. Subject to availability of land at an appropriate location, the Mawiong landfill is proposed to be shifted to such alternate site to provide a lasting solution to the pollution of Umiam reservoir caused by leachate emanating from the said facility.

8.2.3.2.2 Reclamation/Treatment of Legacy Waste Available At Umiam Solid waste Processing Centre cum Landfill

Once suitable site(s) for establishment of alternate solid waste processing center(s) cum landfill(s) for the Shillong UA are identified, the untreated legacy waste available at the Mawiong landfill will be treated to prevent generation of polluting leachate from the said landfill.

8.2.4 Prevention of Discharge of Untreated Solid and Liquid Waste Originating from Ryndang Briew View Point

Activities such as installation of waste bins, periodic collection and transfer waste deposited in these waste bins to the Mawiong Solid Waste Processing Centre and construction of public sanitary blocks are proposed to be undertaken to prevent discharge of untreated solid and liquid waste originating from the Ryndang viewpoint into the Umiam reservoir.

8.3 COMPONENT 3: CONTROL OF SILTATION

8.3.1 Protection of Existing Forests in Catchment

Forests play a major role in prevention of soil erosion. All existing forests in catchment area of the Umiam reservoir are therefore proposed to be mapped and protected. Felling of trees in catchment area of the reservoir will be regulated by strict enforcement of the Meghalaya Tree Preservation Act, 1976 to maintain the existing green cover.

8.3.2 Afforestation of Catchment

To arrest soil erosion and consequent siltation of the Umiam reservoir, it is proposed to undertake massive afforestation of native broad leaved species in catchment area of the Umiam reservoir with active involvement of the local residents. Green belts will be raised around the periphery of the reservoir as well as along the roads located in catchment area of the Umiam reservoir.

8.3.3 Control of Forest Fires

Monoculture stands of Khasi pine (*Pinus kesiya*) standing on substantial area of the catchment area of the Umiam reservoir are vulnerable to forest fires during the dry winter months. Accidental forest fires in these forests results in destruction of protective layer of litter and ground flora which in turn results in higher soil erosion. Efforts will therefore be made to prevent and control accidental forest fires in catchment area of the Umiam reservoir. These efforts will include engagement of fire watchers, creation and periodic cleaning/maintenance of fire lines and planting of fire resistant broad-leaved species.

8.3.4 Control of Jhum Cultivation

Though jhum cultivation is not widely practiced in catchment area of the Umiam reservoir, efforts will be made to regulate jhum cultivation wherever it is practiced in catchment area of the Umiam reservoir by providing alternate livelihood to persons engaged in such practices.

8.3.5 Promotion of Sustainable and Scientific Agricultural Practices

Unscientific agriculture and horticulture practices on hill slopes results in soil erosion. Efforts will therefore be made to promote scientific agriculture and horticulture practices such as terrace cultivation, contour cultivation, strip cultivation *etc.* in catchment area of the Umiam reservoir to reduce overland flow velocity. Efforts will also be made to control potato Bun cultivation and promote safe methods to ensure protection of soil and to enhance annual crop yield.

8.3.6 Construction of Check Dams

Check dams are proposed to be constructed in the identified high erosion sub-catchment to arrest the silt and to improve the water regime.

8.3.7 Regulation of Dumping of Construction and Demolition Waste in Catchment

The rapid urbanization in catchment area of the Umiam reservoir results in regeneration of a huge quantity of construction and demolition waste. Unregulated and haphazard dumping of such waste in catchment area of the Umiam reservoir results in siltation of the Umiam reservoir. The dumping of such waste in catchment area of the Umiam reservoir is proposed to be regulated by strict enforcement of the Construction and Demolition Waste Management Rules, 2016 notified by the Ministry of Environment, Forest and Climate Change, Government of India.

8.3.8 Regulation of Mining in Catchment

Unregulated and unscientific mining of hill sand, river sand and river-bed aggregates in upper reaches of the catchment results silt deposition and alterations in natural pathways of rivers and streams. The Department of Mineral Resources should seek to regulate such activities with effective legislation. Scientific land treatment and land reclamation should be taken up by the concerned project authorities wherever mining has ceased with care given to percolation of minerals into natural or underground water bodies.

8.3.9 Stabilization of Hill Slopes

During monsoon season landslides are noticed in some of the areas in catchment of the Umiam reservoir. A substantial part of loose silt finds generated during such landslides finds its way to Umiam reservoir through rivers/streams. The same also results in silt deposition and alterations in natural pathways of rivers and streams landslides Slope stabilization is useful in instances where steep slopes are designed to maximize land use. If the frictional and strength characteristics of the soil cannot provide the stability needed then slope stabilization methods are required. Slope stabilization can be employed for embankment stabilization, landslide mitigation, ground retention, etc. Structures such as retaining walls, reinforced steep slopes, gabion walls, etc. can be constructed on identified slopes prone to slides.

COMPONENT 4: PROMOTION OF SUSTAINABLE ECO-TOURISM

8.4.1 Development of Islands

The Umiam reservoir is dotted with few beautiful islands. Beautification of these islands by planting of ornamental flowering plants is proposed to be undertaken to enhance beauty of the Umiam reservoir. Apart from beatification of the existing islands, similar to Madiwala and Agara lakes in

Bengaluru, artificial floating islands, consisting of a low platform on which plants with large root surface are planted, are also proposed to be introduced into the Umiam reservoir. Such floating islands will not only enhance beauty of the Umiam reservoir but will also aide in purification of surface water in the reservoir as the roots of these plants react with pollutants and improve the quality of water. Grasses such as vetiver and typha are also proposed to be planted in these platforms to reduce the level of ammonia and nitrogen in the reservoir.

8.4.2 Planting of Ornamental Flowering Plants on Periphery of the Reservoir

Low maintenance flowering plants are proposed to be planted to enhance scenic and aesthetic beauty of the Umiam reservoir.

8.4.3 Development of Lum Nehru Park

A thin strip of land protruding inwards into the Umiam Reservoir has been developed as a beautiful recreation park named as 'Lum Nehru Park'. The Park is managed by wildlife wing of the Forest and Environment Department is a popular tourist destination. Scenic beauty of the Park is proposed to be enhanced by following activities.

8.4.3.1 Installation of a Water Fountain

To enhance the beauty of the Umiam reservoir in general and the Lum Nehru Park in particular, a water fountain is proposed to be established in the reservoir near southern tip of the Lum Nehru Park. Apart from presenting a spectacular view to the Tourists visiting the Lum Nehru Park as well as the Ryndang Briew View Point, fountain will also help in improvement in quality of water in the reservoir.

8.4.3.2 Ornamental Night Illumination of the Park

To enhance beauty of the reservoir, a small section of the Park is proposed to be illuminated during night hours. To minimize the recurring cost, a small solar park is proposed to be established in the Park to power the night illumination.

8.4.3.3 Provision of Canopy Walk

Canopy walkways, also called canopy walks, treetop walks or treetop walkways - provide pedestrian access to a forest canopy. The Park already has a small population of trees along its periphery that can be further developed with plantation, if required, to provide for installation of a

canopy walk. This will appeal to tree enthusiasts and nature lovers to draw attention to sustainable eco-tourism practices.

8.4.3.4 Establishment of an Interpretation Centre cum Museum

The Lum Nehru Park already has few unoccupied surplus buildings. To ensure productive use of these buildings, it is proposed to establish an interpretation center cum museum in these buildings. The museum cum interpretation center will contain suitable audio-visual and physical exhibits to create awareness about the importance of wetlands and other environmental issues.

8.4.4 Promotion of Water Sports

Water adventure sports such as jet skiing, paddle boarding, kayaking, canoeing, parasailing, etc. are proposed to be promoted in the Umiam reservoir to attract tourists and also to generate employment opportunities for local residents. Care will be taken to ensure that such activities should in no case, contribute to the degradation of the reservoir. Special attention will be given to littering, spills and leakages, and noise and thermal pollution.

COMPONENT 5: FISHERY RESOURCE DEVELOPMENT

The Umiam reservoir and its tributaries are inhabitated by several native fish species such as catla, rohu, mrigal, grass carp, silver carp, common carp, mahseer, loaches, etc. Gradual reduction in depth of the reservoir due to siltation, lower level of dissolved oxygen due to dumping of untreated municipal waste and introduction of exotic fish species has resulted in disappearance of some of the native fish species.

Though commercial fish farming has not been introduced in the reservoir so far local residents do harvest fish resources available in the reservoir.

To generate income and productive employment to local residents, it is proposed to introduce scientific and sustainable fish farming in the Umiam reservoir under close supervision and technical guidance of Fisheries Department. The fish farming in the Umiam reservoir will preferably be undertaken A Co-operative Society will be set up for promotion of those activities in villages near the reservoir. This will help uplift livelihood of local residents and contribute to their economic and social well-being.

9. BUDGET, PHASING AND FINANCING

The activities proposed to be undertaken for restoration of the water quality in the Umiam reservoir involves several departments/agencies. The actual estimated cost, year-wise phasing and source of funding for each of these activities are being formulated in consultation with all

respective departments. Pending finalization of these details it is proposed that financial assistance amounting to Rs. 400 lakhs (including 10 % State share) may be provided to the State of Meghalaya under the Centrally Sponsored Scheme "National Plan for Conservation of Aquatic Ecosystem during the current financial year 2019-20 for execution of the following activities:

Sl. No.	Activities	Estimated Cost (Rs. in lakhs)
1.	Drone survey of the Umiam Reservoir and area located in its catchment area within 500 meters from its boundary by the North Eastern Space Application Centre (NESAC) to prepare to-the-scale high resolution maps of the reservoir and its proposed buffer and transition zones.	3.25
2.	Creation of a geo-graphical information system (GIS) based decision support system containing information on land-use-land-cover of the Umiam reservoir and its zone of influence, agents/activities responsible for degradation of the health of the Umiam reservoir and management interventions undertaken or proposed to be undertaken to restore the health of the Umiam Reservoir.	4.75
3.	Erection of RCC boundary pillars to demarcate boundary of the Reservoir	5.00
4.	Eliciting public participation in conservation of the Umiam Reservoir by (i) establishing signage proclaiming importance of Umiam reservoir at prominent locations; (ii) creating a dedicated webpage for Umiam reservoir, as an electronic interface to connect stakeholders with wetland managers; and (iii) publication of brochures, fact sheets, awareness material and newsletters for public distribution.	5.00
5.	Construction of four (4) number plastic waste traps each consisting of a RCC barrier to impound and guide the flow of plastic waste laden water through openings in such barrier and a synthetic wire-mesh bag fitted at exit of each such openings to trap and hold plastic and other trash available in the water flowing through these openings at an estimated cost of Rs. 8 lakh per trap.	32.00
6.	Design, development and operation for a period of one year a pilot-project involving bio-remediation of the quality of water in one of the two streams (Umkhrah or Umshyrpi) flowing through Shillong UA to bathing standard (*viz.* dissolved oxygen > 5 mg/l, biological oxygen demand < 3 mg/l, faecal coliform < 500 MPN /100 ml, colour < 10 hazen units) by using micro-algae.	350.00
	Total	**400.00**

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(37)

Meghalaya State Pollution Control Board

Forests & Environment Department, Government of Meghalaya
'ARDEN' Lumpyngngad, Shillong-793014
Website: http://megspcb.gov.in

mspcb

No. MPCB/GEN-298/2019/37 **Dated Shillong the 18th May 2020**

To

Shri .A.Sudhakar
Division Head ,WQM-I Div
Central Pollution Control Board,
Ministry of Environment , Forest, & Climate Change Govt. of India,
Parivesh Bhavan ,East Arjun Nagar
Delhi -110030.

Email: asudhakar.cpcb@nic.in/jcb.cpcb@nic.in

Sub: Hon,ble NGT Order Dated 10.05.2019 in M.A.No 26/2019 in OA .No 325 /2015 in the matter of Lt.Col. Sarvadaman Singh Oberoi Vs UOI & Ors

Ref: No.F-A-14011/1/325/2020-WQM-I/13378 Dated 06.03.2020

Sir,

With reference to the subject above, enclosed please find herewith the filled in format where the required information were incorporated along with the enclosures. This is for favour of your information & necessary action

Yours faithfully

Enclo: As stated

MEMBER SECRETARY
MSPCB, SHILLONG

Memo No. MPCB/GEN-298/2019/37A **Dated Shillong the 18th May 2020**

Copy to:

1. Shri MBK Reddy ,Addl.Principal Chief Conservator Of Forests ,Planning ,Development And Legal Matters ,Meghalaya, Shillong for information and necessary action

MEMBER SECRETARY
MSPCB, SHILLONG

o/c

AT FOR SUBMISSION OF INFORMATION ON PROPPOSED ACTION PLANS FOR RESTORATION OF TED WATER BODIES (LAKES AND PONDS)' IN COMPLIANCE TO THE HON,BLE NGT ORDERS D 10.05.2019 & 25.02.2020 IN O.A. NO. 325/2015

ntent

ame of the State/UT	:	MEGHALAYA

ntact Details Department wise)

Name of the State/UT Department	Name of the Nodal Officer	Contact Tel. No	Mobile No	E-mail
Fisheries Department	Director		9436176 16	megpisc@gmail.com

nformation on water odies such as Lakes & Ponds

Type of water body	Total No. of Water bodies Identified	Ownership of Identified water Bodies(Indicate No. of Water Bodies)		Status On-going Restoration of Water bodies with financial support from NRCD own measures of the State/UT		
		Government	Private/ Individual	Total No. of Water Bodies Selected for Restoration	Total No. of water Bodies restored on far	Total No. of Water Bodies
Lakes	1	Yes				
Ponds						

Whether Water Bodies are geo-tagged/ provided with Unique Identification No. (UIN)	:	No
Major causes of Pollution in identified water bodies	:	Littering.
Other Problem associated with the Identified Water Bodies	:	The water in the lake is mainly stagnant in most part of the year

Water quality compliance Status of Identified Lakes and Ponds in the State/UT. :

Type of water Body	No. of identified water bodies	No. of water quality monitoring stations	No. of water bodies complying in		
			Primary water Quality Criteria for Bathing	Drinking Water Quality Criteria after conventional treatment	Water Quality Criteria for Agriculture/Fishing/Any other criteria
Lakes	1	1	-	-	1
Ponds					

Proposed Water Body-wise action Plans for Restoration of Prioritised water bodies with timelines and Implementing Agencies	:	(PL. attach water body-wise details as per Annexure-I)
Any other relevant information	:	

(PL Provide Following Details Water Body-Wise)

	Location details of water body (Address with GPS location)	:	Wards Lake, Shillong. latitude of 25.34 N and longitude 91.32 E
	Details of Area and Dimensions of the Water body	:	Maximum Length 333 meters Maximum Width 75 meters. Area 2.38 ha. Data obtained from ZSI Report.
	Water depth (in m) (During monsoon and non-monsoon period)	:	6 meters. Mean Depth of 3.5 meters.
	Ownership of the Water Body	:	Government of Meghalaya
	Allocation Unique Identification Number (UIN)	:	
	Details of Habitat (Surrounding Areas/towns with population and no. of industries in the surrounding area/ industrial estates in the establishments of pond or lake)	:	Lake is surrounded by green cover maintained by the Forest Department, Government Offices &Buildings and Two Hotels
	Details of inflow/outflow, evaporation, flooding frequency, magnitude of flow into the water body	:	None
	Major Plant and Animal communities present in the water body	:	**Phytoplanton** (Chlorophyceae, Euglenophyceae, Zanthophyceae, Chrysophyceae, Bacillariophyceae, Dinophyceae and Myxophyceae) **Zooplanktons** (Protozoa, Rotifera,Cyclophoda,Cladocera, Ostracoda) **Fishes** (Common Carp, Grass Carp, Silver Carp, Catfishes)
)	Designated Use of Pond or Lake (Drinking/ Irrigation/Aqua Culture/ Tourism/Protected Bio-diversity	:	Aquaculture, Fish Breeding, Tourism (Boating), Recreational activities.
10	Major Drains outfall into Water Body	:	None. (Lake is fed by spring water)
11	Physical condition of the Water Body	:	Water is murky when inspected in March 2020. Appears to be cleaner in May 2020. Presence of fish is visible. Breeding programme conducted in March 2020. 10000 nos of fish fries was obtained from one breeding cyle.
12	Water Quality of Water Body	:	Enclosed

1	Proposed Action Plans with action-wise implementing agency, estimated cost and timelines for completion.							
	Status of Sewage Management in the Catchment area	:	Total sewage inflow into the water body (in MLD)	Existing sewage Treatment Capacity (in MLD)	Gap in Sewage treatment (in MLD)	Proposed No. of Treatment Facilities	Proposed Sewage Treatment Capacity (in MLD)	Implementing Agency. Estimated Cost and Timelines for Completion
			NIL					
13	Status of Industrial Effluent Management in the Catchment area	:	Total Industrial Effluent Inflow into the waterbody (in MLD)	Existing Industrial Effluent Treatment Capacity (both captive and CETPs) (in MLD)	Gap in Industrial Effluent Treatment (in MLD)	Proposed No. of Treatment Facilities	Proposed Treatment Capacity (in MLD)	Implementing Agency, Estimated Cost and Time lines for completion
			NIL					
14	Waste Management in the Catchment area of water body	:	Type of waste	Quantity of Waste Generation in the catchment area (TPD)	No. of Treatment and disposal Facilities and Capacity in the catchment area (inTPD)	Gap in Treatment and Disposal of Waste in the catchment area (in TPD)	Proposed No. of Facilities and their (in TPD)	Implementing Agency, Estimated Cost and Time lines for completion
			MSW	NIL				
			HW	NIL				
			BMW	NIL				
			C&D	NIL				
			Plastic	NIL				
15	Additional Measures (Pl indicate action-w se implementing agency estimated cost and the timelines for		Interception & Diversion of Industrial treated effluent from the two hotels near the lake is carried outvia a conduit pipe to the nearby public drain which is in the downstream of the lake; The Two Hotels will be directed to install zero liquid discharge trearment method for reuse of water. In-situ measures (like surface aeration, floating adoption of biological treatment options); maintenance of Greenery development around the lake ; Recreational Provision, Training and Awareness Programme, Public Participation for Cleaning of Surroundings.					

Annexure II

In view of the Hon'ble NGT O.A 325/2015 in the case of Lt. Col. Sarvadaman Singh Oberoi Vs. Union of India & Ors. for restoration of identified polluted water bodies, an action plan for the same is prepared.

Wards lake a nature's park and a sylvan of breath taking beauty comprising an area of 6.61hectares is located in the hearth of Shillong. Water body covers an area of 2.38 hectares which was artificially created by constructing a dyke in the northern side.

The lake is situated at an altitude of 1460 meters above sea level at a Latitude of 25.34 N and Longitude 91.32 E

The periphery area of the lake area is fenced with iron grills. The lake is surrounded with a lawn area for people to relax and enjoy the serene beauty an idyllic setting around. A good number of tree species e.g. Pine Alder, Butterfly tree/ Purple Orchid Tree(Bauhinia purpurea), Pipli (Bucklandiapopulnea), Crape mertle (Largerstroemiaspp), Boxmurtle (Myrica esculenta), Rose tree(Rhododendron arboreum) etc. Bamboo species e.g. Tama bamboo and Yellow Bamboo (Bambusabulgaris) and shrubs like Camellia (Camelia japonica), Azelia rhododendron (Mucronulatum), Hyndrangea (Microphylliaspp), Cap, Jasmine (Cardeniajasminoldes), roses etc. are present within the vicinity of the lake premises combine with flower beds around with the arrays of seasonal flower.

The water from the lake is neither used for water supply nor for bathing. Swimming is strictly prohibited. The lake water is used only for recreational purposes (boating) and aquaculture.

Water Quality Monitoring:

The Meghalaya State Pollution Control Board is a monitoring the water quality of Ward's Lake at one location under National Water Quality Monitoring Programme. As per the analytical data shown in Table.1, it is observed that the average BOD during the year 2019 is 4.3mg/L with a maximum of 4.8mg/L and the concentration is recorded to be 3.5mg/L. during April 2020. As per the water quality criteria-designated best used prescribed by CPCB the water quality is fit for propagation of wildlife and fisheries which is the use assigned specifically for Ward's Lake.

As per the Central institute of Fresh water Aquaculture (ICAR) ,the desirable limit of BOD for Cyprinid fish(eg common carp, grass carp, silver carp etc) is 6.0 mg/l, thereby indicating that the water quality of Ward's lake is still fit for stocking and breeding of fish.

TABLE 1: WATER QUALITY DATA OF WARD'S LAKE-APRIL, 2020

PARAMETERS	CONCENTRATION
pH	7.1
Conductivity µS/cm	153.0
Alkalinity mg/L	46.0
P. Alkalinity mg/L	NIL
Nitrite mg/L	NIL
Nitrate mg/L	0.36
Dissolved Oxygen mg/L	7.6
BOD mg/L	3.5
COD mg/L	8.0
Chloride mg/L	14.0
Sulphate mg/L	17.45
Sodium mg/L	7.3
Calcium CaCO3 mg/L	34.0
Magnesium as CaCO3 mg/L	18.0
Feacal Coliform (MPN/100ml)	130
Feacal Streptococci (MPN/100ml)	41
Turbidity (NTU)	13.5

Total Kjeldahl-N mg/L	1.4
Hardness as CaCO3 mg/L	52.0
Total Coliform (MPN/100ml)	430
Total Dissolved Solids mg/L	105.0
Ammonia Nitrogen (mg/l)	0.69
Total Phosphate mg/L	0.04
Total Suspended Solids mg/L	18.0
Potassium mg/L	3.5
SAR	0.25
%Sodium (meq/L)	0.30
Cadmium mg/L	BDL
Chromium mg/L	BDL
Copper mg/L	BDL
Lead mg/L	BDL
Nickel mg/L	BDL
Zinc mg/L	0.02
Arsenic mg/L	BDL
Flouride mg/L	0.05
Iron mg/L	0.44
Manganese mg/L	0.02

SOURCES OF POLLUTION:

There is no discharge of any sewage into the lake water however it was observed that there is high amount of organic detritus (comprising of leaves, flowers, dead plants and fish feed). This is probably the main factor contributing to BOD level of above 3mg/l. The 2 hotels located on the catchment area of the lake are provided with ETP and the treated effluent is conveyed through the conduit pipeline which ultimately discharges downstream of the lake.

There is no discharge from the outlet of the lake during lean season and the water remains more or less stagnant.

PROPOSED ACTION PLAN:

The action plan is prepared to prevent future degradation of the lake water and to maintain its quality and to support the aquatic life.

Sl. No.	Action Plan Activity	Implementing Agency	Estimated Cost	Timeline
1.	Sewage Control No Sewage is discharged into the lake.		NA	NA
2.	Industrial Pollution Control Interception & Diversion of Industrial treated effluent from the two hotels near the lake is carried out via a conduit pipe to the nearby public drain which is downstream of the lake. Implementation of Zero Liquid Discharge of the two Hotels for reuse of water (flushing and gardening)	Proprietor of the Hotels has carried out the work. MSPCB	NA NA	NA 31st March 2021
3.	Regulated Boating and Recreational activities.	Tourism Department		Continuous
4.	Bio remediation of the lake.	Fisheries Department	Rs. 34,000/- pm	31st March 2021
5.	Awareness Programmes	Forest Department	Rs. 1,00,000/-	Continuous