आज़ादी का अमृत महोत्सव

Azadi Ka Amrit Mahotsav

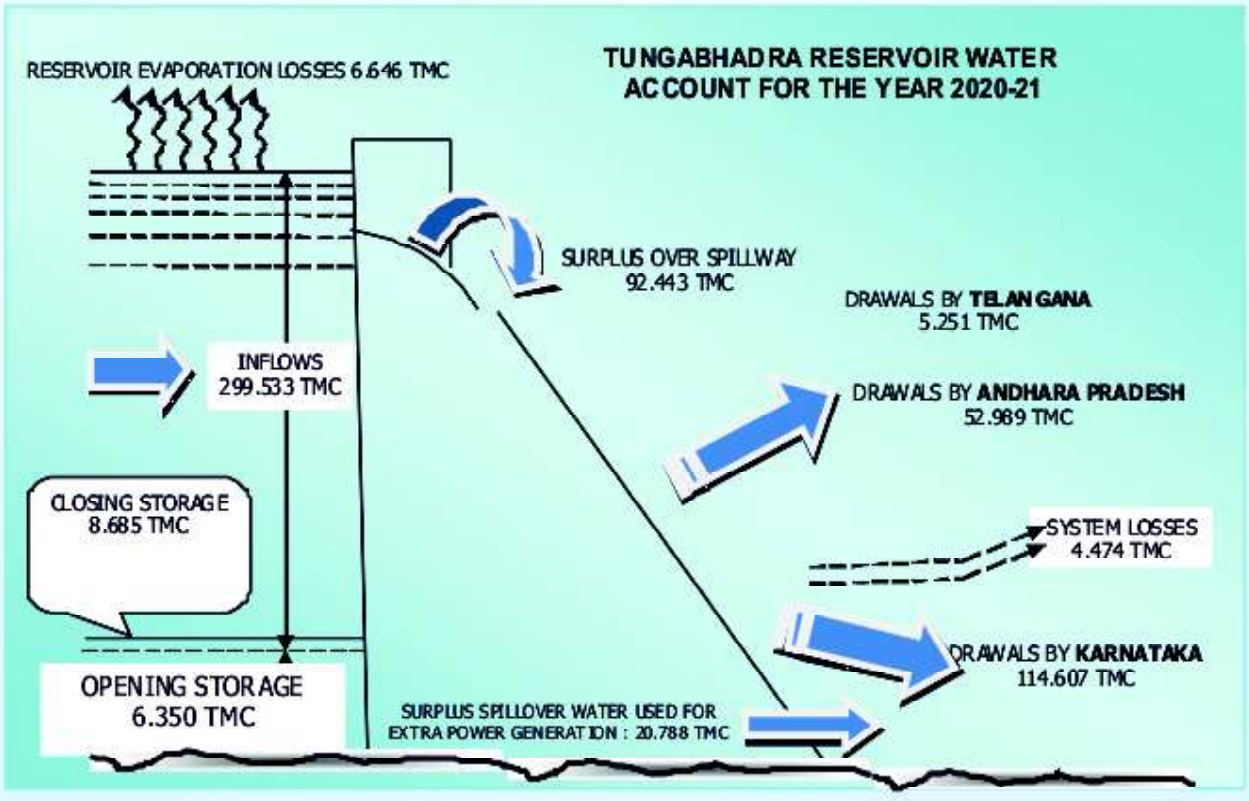
ANNUAL REPORT 2020-21

TUNGABHDRA BOARD, T B DAM, HOSPET, KARNATAKA

TUNGABHADRA BOARD

HIGHLIGHTS OF THE WATER YEAR 2020-21

- ✓ The Tungabhadra Project has completed 68 years of operation since the first release of water into canals on 1st July 1953.
- ✓ The inflow realized in the Tungabhadra reservoir was 8481.576 Mm^3 (299.533 TMC) during the water year 2020-21.
- ✓ The utilization including evaporation losses and system losses was 5209.209 Mm^3 (183.967 TMC) during the water year 2020-21.
- ✓ The total withdrawals excluding evaporation and system losses by Karnataka Andhra Pradesh and Telangana were 4894.335 Mm^3 (172.847 TMC) for 2020-21.
- ✓ The total withdrawals by Karnataka were 3245.211 Mm^3 (114.607 TMC) against their share of 3201.945 Mm^3 (113.079 TMC) including Bhadra Assistance of 31.147 Mm^3 (1.100 TMC) for 2020-21.
- ✓ The total withdrawals by Andhra Pradesh were 1500.436 Mm^3 (52.989 TMC) against their share of 1517.058 Mm^3 (53.576 TMC) for 2020-21.
- ✓ The total withdrawals by Telangana were 148.687 Mm^3 (5.251 TMC) against their share of 148.517 Mm^3 (5.245 TMC) for 2020-21.
- ✓ Tungabhadra Hydro-electric scheme generated power of 173.118 million units in 2020-21. The same has been shared between Karnataka and Andhra Pradesh in the ratio of 20:80.



ANNUAL REPORT
2020 - 21

TUNGABHADRA BOARD

T.B. DAM, Hospet, Karnataka

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FROM CHAIRMAN'S DESK

The Tungabhadra project was initially taken up by then States of Madras and Hyderabad during February 1945. After the independence of India, the Tungabhadra Board was formed in 1953 and is the oldest Statutory Organization of Govt. of India. It was formed for interstate river water cooperation among erstwhile States of Mysore, Andhra and Hyderabad. The primary responsibilities of the Board is to supply water to the Member States as per the KWDT award. The Board is fulfilling its responsibility very efficiently. Tungabhadra Board manages water to benefit and ayacut of 17,33,878 acres in the states of Karnataka, Andhra Pradesh and Telangana.

The Board had initiated the works of modernization of the canal system of Tungabhadra dam. The modernization of RBHLC and partial modernization of RBLLC during the past few years has resulted in good water management with increased realization and delivery of water to the stake holders. Tungabhadra Board is now able to deliver the indented water in all the canal reaches more efficiently. A telemetry system has also been introduced to monitor the water flows in the canal systems of the project. It has resulted in improvement in transparent and efficient water mangement in the canal system.

Apart from water management for irrigation, the Board manages various other functions of Tungabhadra project such as Hydropower generation, Drinking water supply, Industrial water supply, Fisheries, Recreation etc. Further, it manages various recreational activities such as Gardens, Mini Zoo, Aquarium, Musical dancing fountain etc. The hospital maintained by the Board caters for the well being of the Board employees. The Health services are also extended to the general public. Thus, the Board has been instrumental in catering to various important needs of the public in area of its jurisdiction.

(D.M. Raipure)
Chairman,
Tungabhadra Board

MESSAGE FROM SECRETARY

I am very glad & delighted to bring out **'Annual Report of Tungabhadra Board for the year 2020-21'**. The Report gives a comprehensive overview of the role of Tungabhadra Board and activities of Tungabhadra Board highlighting the contribution made in the Development and Water Management of TB Reservoir and Canal systems.

As the Right Bank Canals under TB Board were more than 60 years old & RBLLC being an unlined canal, to deliver indented water to Member States as per the KWDT award, the Modernization of Tungabhadra Board Canals was taken up in a phased manner since 2016-17 with the able support and cooperation from the Member States.

Modernization of Power Canal and RBHLC from Km 0.00 to 105.00 has been completed and with resulting increased velocity of water flow, the RBHLC is now able to draw the design discharge of 4000 cusecs at head with ease and delivered a discharge of 2350 cusecs (against earlier discharge of 1400 cusecs) recently and is capable of delivering the design discharge of 2575 cusecs at Andhra Pradesh border.

Similarly, Modernization works of RBLLC was started in 2019 and planned to be completed in a span of 5-6 years. The Modernization works of RBLLC from Km 0 to 115 (out of total 250 km) were taken up and completed except for 3.00 Km. This along with good monsoon rains has resulted in increased delivery of 1100 cusecs at Km 133 (against earlier 750 cusecs) and around 600 cusecs (average) at Km 250 (at AP border near Adoni in AP). In spite of COVID situation, a good progress of modernization works was achieved during April to June 2021.

In this year (2020-21) also, Tungabhadra Dam has got filled to its brim thus making a **hat trick of good years** owing to the good monsoon rains in the catchment area and the spillway gates were opened for releasing of surplus water into the river successfully 3rd year in a row. The negative inflows completely disappeared and continued to be recorded as zero from 2018-19 onwards, due to successful implementation of Telemetry.

Tungabhadra Project 77th foundation day was grandly celebrated on 28th February 2021 by organizing games, sports & competitions among TB Board staff & their families and prizes were distributed for the winners including organizing a cultural program.

The goals achieved during the year 2020-21 by Tungabhadra Board are solely by the hard work and sustained efforts put in by the Officers and staff of Tungabhadra Board. It gives me immense pleasure to acknowledge and appreciate their sincere efforts in ensuring smooth Water Management without any major disputes.

I express my sincere gratitude to the Chairman, TB Board and Members of the TB Board for their kind support and guidance to the Team of our Field Engineers in discharging their responsibilities efficiently. I thank and hope for the same kind of support from the higher authorities and continued sincere timely efforts by the Officers / Engineering staff of Tungabhadra Board in discharging their duties in the ensuing years also.

(G Naga Mohan)
Secretary, Tungabhadra Board

TUNGABHADRA PROJECT HISTORY 1

1.1 RIVER TUNGABHADRA

Tungabhadra River is one of the major tributaries of Krishna River in South India. The river finds a mention in the epic Ramayana as Pampathirtha. Hampi, the seat of power of the Vijayanagar Empire founded in 1336 AD, is located on the southern bank of the Tungabhadra River.

Tungabhadra River derives its name from the confluence of two streams, the Tunga and the Bhadra, both of which rise in the wooded eastern slopes of the Western Ghats in the State of Karnataka and flow eastward. After confluence of these two streams at Kudali near Shimoga, the Tungabhadra runs for about 531 km and joins the river Krishna at Sangameswaram near Kurnool in the State of Andhra Pradesh. The river runs for 382 km in Karnataka, thereafter forms the boundary between Karnataka and Andhra Pradesh for 58 km and flows for the remaining 91 km in Andhra Pradesh. Tungabhadra sub-basin is part of the Krishna basin with a drainage area of 69,552 Sq.km. The river basin is influenced by the South-West monsoon, with copious inflows during monsoon which dwindles to few cumecs in summer months.

The drainage area of the Tungabhadra River in the Western Ghats receives about 4500 mm of rainfall, while in the Rayalaseema area in the Peninsular Plateau receives less than 500 mm of rainfall. As major portion of the Tungabhadra catchment lies in the center of the Peninsular plateau. The basin receives around 560 mm of rainfall only in a year.

The high spatial and temporal variation of the rainfall exposed the valley in the Peninsula to the vagaries of intermittent famine and droughts.

1.2 HARNESSING OF TUNGABHADRA WATERS

For harnessing the Tungabhadra water, the great Rayas of the Vijayanagar Empire built 17 anicuts across the Tungabhadra. With the fall of Vijayanagar Empire later in 1565 AD, these irrigation systems lapsed into despair. During pre- independence days, the Tungabhadra was the border between the Princely State of Hyderabad on the north bank and then British State of Madras on the south bank. These States were keen to harness waters of the Tungabhadra, but no agreement on sharing the water could be reached. The sharing of waters of Tungabhadra between Hyderabad and Madras began with the construction of Sunkesula Anicut in the year 1861 for diverting water to Kurnool-Cuddapah Canal.

1.3 GENESIS OF TUNGABHADRA PROJECT

Sir Arthur Cotton originally conceived the Tungabhadra Project in the year 1860 to

alleviate the sufferings of the people of the districts of Bellary, Kurnool and Cuddapah in the then State of Madras on the south bank and Raichur district of the then Hyderabad on the north bank. However, the project was not taken up due to economic considerations. It was in 1902, Col. Smart, Chief Engineer of Madras Irrigation submitted a project report on Tungabhadra Dam to the First Indian Irrigation Commission. The report envisaged construction of a storage reservoir, to make a low level canal on the right bank to supply water to Bellary District and to Kurnool District and at the same time a High level canal on right bank to cut through the water shed into Pennar and supplement the supply into that river which would then by means of storage serve portions of Anantapur, Cuddapah and Nellore District. A preliminary report was made in 1903. After detailed investigation Mr. Mackenzie, Chief Engineer of Madras Irrigation submitted a detailed project report in 1906. This report envisaged a reservoir at Mallapuram, at the present site, to provide irrigation for 3.23 lakh hectares of wet and garden crop, 0.61 lakh hectares of second crop and for protection of 3.34 lakh hectares of dry crops in the districts of Bellary, Kurnool, Anantapur, Cuddapah and Nellore.

In the year 1930, Government of Madras proposed a joint project with Hyderabad at the present dam site. After protracted negotiations and discussions, followed by arbitration of the Government of India, two agreements were reached, between Madras and Hyderabad during June 1944 and between Madras and Mysore during July 1944 finally clearing the ground for execution of the Tungabhadra Project.

The June 1944 agreement between Madras and Hyderabad provided that each side may draw 1841 Mm^3 (65 TMC) of water for irrigation, construction of a large dam jointly at Mallapuram (present dam site) and an unspecified quantity of water to be used for hydropower generation and let down the river. The July 1944 agreement between Madras and Mysore provided that Mysore would not claim any share of water from the reservoir at Mallapuram after upstream abstraction of the agreed quantity.

1.4 PROJECT CONSTRUCTION

After, the two agreements executed between Madras & Hyderabad during June 1944 and between Madras & Mysore in July 1944 finally clearing the ground for execution of Tungabhadra Project, Sri C.C.Dalal, a Hyderabad Engineer proceeded to design the Dam. The Government of Madras entrusted a team of engineers under Sri M.S. Thirumale Iyengar to design the dam and canal system. Thus, two independent project reports were prepared.

The project report prepared by Sri M.S. Thirumale Iyengar in 1942 consisted of a dam at Mallapuram and two canals with alternative schemes for the right bank. The Government of Madras accepted this project report with certain modifications. The project was finally accepted as a Joint Project consisting of a Dam at Mallapuram to impound 3,766 Mm^3 (133 TMC) of water in

the reservoir. The irrigation system comprised a left bank main canal for irrigating areas in Raichur district, a right bank low level canal for irrigating areas in Bellary and Kurnool districts along with distribution system from these canals. Development of hydroelectric power through powerhouses at left and right banks at dam and a workshop was established on the Right Bank for manufacturing at Hampi was also envisaged.

By the end of year 1944, Government of India sanctioned the joint scheme. The index map of the project is at ***Annexure 1.1.*** The project was formally taken up for construction with laying of foundation stone on 28 February, 1945 by His Highness the Prince of Berar on the left bank and His Excellency Sir Arthur Hope, Governor of Madras on the right side as a joint venture of the Governments of Hyderabad and Madras.

Two independent builders, two governments, two Chief Engineers and two corps of workmen built the dam from opposite banks of the river. There were differences of opinion on many issues including designs, specifications and method of execution. A Committee of Chief Engineers was setup to sort out these issues. The Committee often met to settle the arising issues. The eminent Engineer and Statesman Sir Mokshagundam Visvesvaraya was unanimously selected as Chairman of the Board of Chief Engineers in 1947. It was the decision of the Chairman that prevailed on many of the contentious issues of designs, use of surkhi mortar, single design for the dam and sharing of the cost etc. The Government of India was always available as a court of last resort. The field engineers were given complete set of drawings and printed specifications for each item of work. The use of surkhi in mortar made a big saving in cost of construction. A tram line was constructed to transport earth for surkhi. Due to adoption of stone masonry, use of machinery was kept to bare minimum. A workshop was established on the Right Bank for manufacturing the sluice gates and spillway gates. This workshop later became a pioneer fabricating company of India known as M/s Tungabhadra Steel Products Ltd.

As the Reservoir submerged the Valvapur and Hosakota anicuts constructed by the Rayas, a sluice was provided on the right side of the dam with a lead channel to connect the old Raya and Basavanna channel to provide irrigation for 11 months. Similarly, the old Koregal Anicut (left flank of Valvapur Anicut) and its channel got submerged in the Reservoir. So a channel has been connected to the first distributory of the left bank main canal to serve the old ayacuts.

The 1.6 km long dam, with its two saddles on the left side was ready to impound the monsoon flow up to 491.642 m (1613 ft) level in the year 1953. Water was let into the canals on both banks on 1st July 1953.The full reservoir capacity was, however, not available as erection of 33 spillway gates was not completed by then. The erection of gates, Spillway Bridge, road on top of dam, utility tower, etc. were completed by June 1958. The salient

features of Tungabhadra Project is at ***Annexure 1.2.***

The Tungabhadra Dam comprises of 1798.28 m long masonry Dam including Spillway portion of 701 m with 33 Spillway gates, a 472.44 m long composite dam and 137.16 m long earthen Dam. The reservoir of the project is spread over 378.10 Sq.km at FRL. Irrigation is provided through canal systems taking off from Left Bank and Right Bank. The project generates hydro power through three powerhouses located at left & right toe of Dam and at Hampi.

The breakup of the project cost is given in the following table. The project has a very high Benefit Cost ratio. The Benefit Cost ratio considering irrigation and power was 9.6 and the Benefit Cost ratio for irrigation alone was 11.8.

Breakup of Project Cost

Sl. No.	Scheme	Cost (Rs. crores)
1.	Irrigation Scheme: • Head Works • RB LLC • RB HLC • LBMC	 17.98 16.27 33.22 50.00
	Sub-total	117.47
2.	Hydro Electric Scheme	13.29
	Total	130.76

TUNGABHADRA BOARD

2

2.1 CONSTITUTION OF THE BOARD

The Tungabhadra project was taken up by then States of Madras and Hyderabad during February 1945. With the formation of Andhra State, as per the Andhra State Act 1953, certain areas of the project on the right side of the river belonging to the then Madras State were transferred to the then Mysore State and the project became a Joint venture of the then States of Mysore, Andhra and Hyderabad. This resulted in more than 55 percent of irrigated area on the right bank of the river falling in the state of Andhra and the Reservoir with the head reaches of the canal system lying in the State of Mysore. The center line of the Tungabhadra River which was the boundary earlier no longer remained so and the canal on the right bank meandered through the State of Andhra and Karnataka. This situation warranted constitution of an independent body to look after the timely completion of the approved project, its maintenance and oversee distribution of benefits to the States. Subsequently, as per the Andhra State Act, 1953, President of India was authorized to give directions for the completion of the Project and its operation & maintenance thereafter. Accordingly, the Tungabhadra Board, a Statutory body was constituted by the President of India in exercise of the powers vested under sub section (4), section 66 of Andhra State Act, 1953 for completion of Tungabhadra Project and its operation & maintenance. It started functioning from 1st October, 1953 vide notification No. DW II-22 (129) dated 29.09.1953 of the then Ministry of Irrigation and Power.

The Board consisted of Chairman appointed by Government of India and six Members. The Members were Chief Engineers of both Irrigation and Power Departments of the Government of Andhra, Mysore and Hyderabad. Chairman of the Central Water and Power Commission was appointed as the Chairman of the Board in addition to his normal duties. The Board was entrusted with the task of completion of the Project and to deal with all matters relating to works, which were common to both the States of Andhra and Mysore.

The Board was reconstituted with effect from 15th March, 1955 vide Notification No DW VI (4) (9) dated 10.03.1955 of the then Ministry of Irrigation and Power ***(Annexure2.1)***. The reconstituted Board consisted of a Chairman appointed by the Government of India and four Members representing Government of India, Andhra, Mysore and Hyderabad. After the reorganization of the States in 1956, the Hyderabad Government representative was deleted from Board vide Notification No. 39(25)/56 DW.VI dated 01.11.1956 by the then Ministry of Irrigation and Power. The Board was further reconstituted as per AP Reorganization Act, 2014 that bifurcated the State of Andhra Pradesh into Telengana and residuary Andhra Pradesh State.

2.2 PRESENT COMPOSITION OF BOARD

The present composition of the Tungabhadra Board is as follows:

Chairman (Nominated by GoI)	Chief Engineer, KGBO, CWC, Hyderabad / Member-Secretary, KRMB, Hyderabad.
Member (Representing GoI)	Financial Adviser and Joint Secretary, Ministry of Jal Shakti, New Delhi.
Member (Representing GoAP)	Engineer-In-Chief (Irrigation) Water Resources Department, Vijayawada.
Member (Representing GoT)	Engineer-In-Chief (Irrigation), Irrigation & CAD Department, Hyderabad.
Member (Representing GoK)	Secretary to Government, Water Resources Department, Government of Karnataka, Banglore.

The following were the Chairman, Members and Secretary during the year 2020-21:

Chairman, Tungabhadra Board:
Shri D. Ranga Reddy
(From 12.01.2018 to 15.06.2021)
Shri D.M.Raipure (Since 16.06.2021)

Member, Government of India:
Shri Jagmohan Gupta
(From 22.06.2015 to 16.05.2021)
Shri Manoj Sethi (Since 17.05.2021)

Member, Government of Karnataka:
Shri N. Lakshman Rao Peshwe
(From 06.08.2019 to 30.08.2020)
Shri Anil Kumar
(From 31.08.2020 to 31.05.2021)

Member, Government of Andhra Pradesh:
Shri C. Narayana Reddy (Since 01.01.2020)

Member, Government of Telangana:
Shri C. Muralidhar (Since 28.05.2014)

Secretary, Tungabhadra Board:
Shri G. Naga Mohan (Since 06.08.2018)

2.3 FUNCTIONS OF THE BOARD

The important functions of the Board, initially laid down were:

- ✓ Completion of the construction of the sanctioned project;
- ✓ Regulation of supplies of water and power in accordance with such rules as may be made in this behalf by the Board (From 1976-77 onwards, in compliance of the KWDT Award, as notified by GOI);
- ✓ Maintenance of canals and other works common to both the States of Karnataka and Andhra Pradesh;
- ✓ Maintenance of the dam and reservoir of the project;
- ✓ Granting of lease of fisheries in the reservoir and in the canals;
- ✓ Proper utilization of land acquired for the purpose of the project; and
- ✓ Any other function incidental to or connected with the functions specified in above clauses.

In the discharge of its assigned functions, the Board exercises powers of a State Government. Board makes its own rules for the conduct of its own business. The Board appoints a whole time Secretary.

2.4 STAFFING PATTERN

All the posts in the Board are sanctioned on year-to-year basis by the Board. The post of Secretary is filled by Ministry of Jal Shakti, River Development & Ganga Rejuvenation and Assistant Secretary is filled by Indian Audit and Accounts Service on deputation basis from the Government of India. All other

regular posts of the Board are cadre posts of the participating States of GoK and GoAP in an agreed ratio. Work charged and Contingent staff of the Board are treated as Board employees. Officers and staff drawn on deputation from the GoI and posted by GoAP and GoK to the Board are governed by the respective service rules of their parent Department. However, they remain under the administrative control of Board during their tenure in Board.

Eight regular staff members comprising of four Assistant Sub-Inspectors & four Security Head Constables from Police Department of GoK are on deputation to Board and they are working in the Security Section of TB Board.

2.5 KWDT AWARD AND BOARD

The award of the Krishna Water Disputes Tribunal came into force from the water year 1976-77. The relevant extracts of clause IX and clause XVI of the Final Order of the KWDT is at ***Annexure 2.2***.

2.6 State wise Water Allocation as per KWDT Award (TMC)

State	Gross allocation	Reservoir Evaporation losses	Net allocation
GoK	151.49	12.50	138.99
GoAP	72.00	5.50	66.50
GoT	6.51	0.00	6.51
Total	230.00	18.00	212.00

As per the KWDT award, the reservoir evaporation losses of 509.70 Mm^3 (18 TMC) shall be equally shared by the left canal system and right bank canal system (9.00 TMC each). The share of the reservoir loss of right bank canal system (9.00 TMC) shall be shared by Karnataka and Andhra Pradesh in the ratio of 3.5:5.5. Details of the water allocation to various systems are given in ***Figure 3.1.***

The Krishna Water Disputes Tribunal (KWDT) award states that, the Board would continue to prepare the working table for utilization of the water stored in the reservoir and regulate the sharing of water between the States of Karnataka, Andhra Pradesh and Telangana as per the allocations made in the award.

2.7 PRESENT FUNCTIONS

The project was fully commissioned with completion of the Right Bank High Level Canal in 1970. Since then Tungabhadra Board has not taken up any major construction till 2016. Modernization of Right Bank Canals of TB Board has been taken up from January 2017 onwards. The present functions of the Board include:

- ✓ Regulation of supplies of water to the States of Andhra Pradesh and Karnataka in accordance with the clause IX E(1) to (5) of Final Order of the Krishna Water Disputes Tribunal relating to the Tungabhadra Project;
- ✓ Regulation & monitoring of power from the three power houses on the right side in accordance with such rules as may be made in this behalf by the Board;
- ✓ Maintenance of the dam and reservoir of the project, common to both the States viz., right half of the dam and 33 spillway gates including safety aspects of the dam and spillway;

- ✓ Maintenance of the common portion of the Right Bank High Level Canal and Low Level Canal including common distributaries of Right Bank Low Level Canal and any other works common to both the States of Andhra Pradesh and Karnataka;
- ✓ Maintenance of the two power houses on the right side including renovation and refurbishing;
- ✓ Granting of lease of fisheries in the reservoir and in the main canal;
- ✓ Proper utilization of land acquired for the purposes of the project;
- ✓ Development of new schemes for hydro power generation on common facilities and its regulation;
- ✓ Generation of revenue from the assets of the Board and create assets for increasing the revenue;
- ✓ Any other function incidental to or connected with the functions specified in above clauses.

2.8 ORGANIZATIONALSTRUCTURE

For carrying out its various functions the Board has been divided into the following two main Wings:

- Irrigation Wing (IW)
- Hydro Electric Wing (HEW)

In addition, the Board comprises a Fisheries Wing, a Park and Gardens Unit, a Health and Medical Unit and a Security Section. All the Wings and Units of the Board are under the administrative control of the Secretary of the Board. The Secretary also functions as Chief Security Officer and Vigilance Officer of the Board. The IW and HEW are headed by part time Chief Engineers of the Karnataka and Andhra Pradesh respectively. The Organization Chart of the Tungabhadra Board is at ***Annexure 2.3 & 2.4.***

2.9 APPLICABILITY OF RULES TO BOARD EMPLOYEES

The Work charged and Contingent employees of the Board are recruited by the Board at the time of construction of Project and termed as "Board employees", and they are governed by the following rules.

Category	Rules Applicable
Work charged staff who have completed 10 years of service	Karnataka Civil Service Rules.
Contingent staff of Health and Medical Unit who have completed 10 years of service	Karnataka Civil Service Rules.
Work charged & Contingent staff of all wings and units, who have not put in 10 years of Service	Work Charged Service Rules as laid down in the KPWD Code and Other orders of Karnataka Government.

2.10 ADMINISTRATION

The administrative control of all officers and staff working in the Board rests with the Board. Their appointments, repatriation from the Board and their internal postings and transfers within the Board are decided by the Board. Secretary is the executive head of the Board and authenticates all orders and decisions of the Board. He is assistedby a Secretariat and exercises administrative control over the IW, the HEW and other Units. Day to day administrative control of

all officers and staff working in the various wings of the Board rests with the respective heads of Wings.

2.11 BOARD MEETINGS

During the year 2020-21, Board held a meeting on 22nd October 2020 through video conference and took decisions on the issues placed before it. Some of the important decisions are as below;

1. Drawals of water by Irrigation Schemes (LIS) / Industries located on the periphery of TB Reservoir. &

Proposal of Minor Irrigation Department on water allocation from defunct projects to Marabbihal Lift Irrigation Scheme.

The Board in its 216th meeting held on 22.10.2020 directed to conduct the Joint Inspection of SE's of Member States along with SE(IB), TB Board during November/ December 2020 on defunct, existing, ongoing and proposed lift schemes for irrigation, drinking and industrial water and submit a Report to the Board.

2. Topographic Survey of T.B.Reservoir.

Topographic survey has been done by Ms. AARVEE ASSOCIATES during 2016. The outcome of the survey is an increase in the storage capacity from 100.855 (2008 Survey) to 105.788 TMC. The same has been examined and compared with the discharges recorded through Telemetry and submitted in the 214th Board meeting held on 17.08.2019 for approval of Board. Since, there is difference of 4.933 TMC, the Board in its 216th meeting held on 22.10.2020 concluded to go for joint cross checking by the team of KERS, APERL, TSERL during April-June 2021.But, The Joint Cross checking could not be taken up as the Director KERS has expressed that, it is not possible to cross check the field data of 2016 survey after lapse of 5 years and further, he suggested to go for fresh Reservoir survey on the basis of the recommendations of CWC that, the Capacity survey of reservoir shall be conducted every once in 5 years. Hence, it is decided to place the facts before the next Board meeting.

3. Reverse Tendering System (RTS) in TB Board.

TB Board concluded that, since Board is calling Tenders on the Andhra Pradesh e-procurement portal, Board can agree to adopt RTS in TB Board for one year, examine the experience and review the system accordingly.

4. Deletion of Mobilization Advance Clause in TB Board.

Board decided to dispense with payment of mobilization advance in TB Board in accordance with the Govt. of Andhra Pradesh GO MS No.83 dated 17.12.2019 as TB Board is adopting the rules and regulations of Government of Andhra Pradesh with regard to works.

5. Revision of Electricity Tariff Rate to the employees of Tungabhadra Board.

Board accorded approval for revision of Electricity Tariff to the employees of Tungabhadra Board at 50% on the KPTCL rates. For APGENCO and KPTCL staffs the rates fixed by their respective parent department.

2.12 TRANSFER AND POSTINGS OF OFFICERS TO AND FROM THE BOARD

The transfer and postings of Officers to and from the Board is given at ***Annexure2.6.***

2.13 FINANCE

The Tungabhadra Board is an Interstate Project, the funds required for functioning of all the three wings are initially allotted by Govt. of Andhra Pradesh in every year by passing in its Legislative Assembly. The Funds required for irrigation wing, hydroelectric wing and Fisheries wing are recommended and routed through Water Resources Department. Energy Department and Commissioner of fisheries Department of Govt. of Andhra Pradesh respectively. The entire expenditure for every month in respect of the TB Board is being initially borne by the Government of Karnataka through Sub Treasury, Hospet & District Treasury, Ballari. In turn the expenditure and receipt vouchers are forwarded to Ballari District Treasury and from there it is sent to Accountant General (A& E), Andhra Pradesh where the expenditure will be apportioned between Govt. of Andhra Pradesh and Govt. of Karnataka as per the agreed ratio/shares indicated below.

Share of Expenditure and Receipts

Sl. No.	Wing	Share of	
		GoAP	GoK
1.	Irrigation Wing:		
	RBHLC	71.00%	29.00%
	RBLLC	55.56%	44.44%
2.	Hydro Electric Wing	4/5	1/5
3.	Fisheries Wing	5/18	13/18

The Accountant General (A&E), Andhra Pradesh will send advise to RBI, CAS (Central Accounts section), Nagpur where necessary adjustments are done among the Member States (i.e. AP & Karnataka).

2.14 VIGILANCE CELL

The Vigilance Cell was set up in the Board with effect from June, 1957 to ensure high standard of work to prevent corrupt practices in the Board. Secretary, Tungabhadra Board is the Chief Vigilance Officer of the Board and enquires into all the complaints / allegations received against the officer's/officials working in the Board.

As per the clarifications issued by the Ministry of Water Resources, Government of India vide its letter No.16/4/87-PII dated 23.08.1991 the Central Vigilance Commission has no jurisdiction over the Tungabhadra Board. As per the decision taken by the Board in its 146th meeting held on 20.02.1993 that, all cases of allegations against officials working in Tungabhadra Board shall be investigated by Chief Engineer, IB/Chief Engineer, Elecy.,

TBHES or the Secretary himself as the case may be. Respective Chief Engineers shall send their investigation reports to the Secretary, TB Board who shall decide whether a prima-facie case exist or not. In case prima-facie case is established, Secretary, TB Board shall send his report to the respective State Governments of Karnataka/Andhra Pradesh for taking suitable action against the concerned official/officer. Such officials shall be repatriated by the Board to the respective State Governments. The Board in its 166th meeting held on 29th June, 1998 resolved that, "views of the Secretary, TB Board who framed charges against officers/officials on deputation to TB Board shall be ascertained before deciding the cases having financial implications and irregularities. All cases of allegations against TB Board Work-charged employees (WCE) shall be investigated by the Secretary, Tungabhadra Board and will take suitable action against such WCE".

STRENGHENING OF VIGILANCE AND QUALITY CONTROL UNITS UNDER THE BOARD.

I. VIGILANCE UNIT

The Board decided to form a vigilance unit under the direct control of Secretary, Tungabhadra Board as decided in the 204th meeting held 03.08.2013 with the following set up;

1. Executive Engineer (AP Cadre)
2. Sub-Divisional Officer (Karnataka Cadre)
3. 2 Section Officers (1AP & 1KA)

II. QUALITY CONTROL UNIT

Quality control unit consists of 1 SDO and 2 SO's. Board directed that Quality Control reports of various works under taken by the QC & ST Unit need to endorse a copy of the report to the Secretary, TBB including third party QC. This helps Secretary, TB Board in discharging Vigilance function in a better way which needs strict compliance.

III. INTERNAL AUDIT CELL

A team consisting of Assistant Secretary and Divisional Accounts Officer was constituted during 2013 to conduct internal auditing of Divisions, Sub-Divisions and all Offices under the Board every year. Since the post of Assistant Secretary was vacant for a long time, Board approved for outsourcing of retired Audit Officers/Senior Audit Officers as internal Audit Officer in the office of the Secretary, Tungabhadra Board on temporary basis in view of the ongoing modernization works and introduction of Pre- Audit cell. Accordingly, Shri Raminaidu was appointed as Internal Audit Officer on outsourcing basis since June 2018 and continuing.

2.15 LEGAL DISPUTES

Since the formation of the Board, many disputes have arised between the Board management and its employees, contractors, public etc., and are at various courts in the States of Karnataka and Andhra Pradesh. Such disputes have been generally resolved amicably as far as possible.

2.16 ESTATE MATTERS

The Board had acquired considerable land for the construction of Dam, Canals, Office

buildings, Residential colonies and also for meeting the community requirements. In the beginning, leasing of small extent of areas in and around the residential colonies was made, facilitating traders to run different types of commercial establishments for the benefit of Project staff. This has created inherent problem of encroachments of vacant lands in the colonies as well as along the canals. Encroachments along the canals restrict the borrow area for closing the breaches of the canals. Similarly, encroachment in the natural rivulets and drains near the escapes creates problems for operating the shutters of the escapes, whenever necessary.

In order to prevent encroachments, plantation of the vacant land and all along the canals has been taken up on a large scale. This has controlled encroachment of Board's land to a large extent. Efforts have also been made to evict the illegal occupants. Further, decision has been taken in the Board meetings relating to leasing of Board land as follows:

1. In 207th meeting held on 01.08.2015:" The land under T.B Board are the property of three states of Karnataka, AP and Telangana and the land can only be leased to the Government Organizations and Public Sector Undertaking".
2. In 187th meeting held on 04.04.2008:"Further Board directed that gardening/fencing/Plantation may be taken up in the vacant land to avoid encroachments".
3. In 171th meeting held on 07.04.2001:"In view of the likely expansion of activities of the Board in future and status of the board as trustee of the land in its possession, the Board opined that, its land should not be transferred by it directly for any other work".

The Board reviewed the ground rent in its 213th meeting held on 27.12.2018 and accorded approval as shown in ***Annexure 2.5***. These rates have come into effect from 01.01.2019.

The amount of license fee/rent towards Board land leased, Board quarters allotted to Non-Board / Private persons etc., collected for the year 2020-21 in respect of Irrigation Wing and Hydro Electric Wing is Rs.95,78,292/- and Rs. 14,46,359/- respectively.

2.17 LEASING OF M.S. THIRUMALE IYENGAR HALL ON PPP MODEL

The M.S.Thirumale Iyengar hall was handed over to the agency on PPP model for 7 years from 01.01.2021 to 31.12.2027 at the rate of Rs.84,60,000/- payable in 14 half yearly installments.

2.18 FOUNDATION DAY CELEBRATION OF TUNGABHADRA PROJECT (1945-2021)

Tungabhadra Project was taken up for construction by laying of foundation stone on 28th February 1945 by His Highness the Prince of Berar on the left bank and His Excellency Sir Arthur Hope, Government of Madras on the right side as a joint venture of

the Governments of Hyderabad and Madras. Tungabhadra Project stepped into 77th year foundation day on 28th February 2021. On this account, TB Board has celebrated its foundation day by organizing games/ sports/ competitions like Shuttle, Carom, Running, Cooking, Rangoli etc. with TB Board staff & their families. All the employees and their families have participated in these competitions/ celebrations very actively.
Foundation day function was organized with grand cultural program at Gundlakere (At Km 0.00 of R.B.LLC), Board employees & their families participated in the cultural program. The winners of different games/ sports/ competitions and also to those who participated in the cultural program were awarded with prizes by Chief Guest Shri D. Ranga Reddy, Chairman, TB Board, Shri C.Narayana Reddy, Member A.P, Shri G. Naga Mohan, Secretary, TB Board & Shri K.V Ramana, Superintending Engineer, IB, TB Board.

2.19 AZADI KA AMRIT MAHOTSAV

As per the direction of Ministry of Jal Shakti, the Calendar of Celebration of Azadi Ka Amrit Mahotsav for 75 Weeks have been chalked out since March 2021 and the events are being celebrated every week as per the calendar of events.

2.20 REDRESSAL OF STAFF GRIEVANCES

All the regular posts of Board are cadre posts of Government of Karnataka and Andhra Pradesh, except that of the Secretary and Assistant Secretary, who are drawn from Government of India on deputation basis. The grievances of all staff regarding service matters are thus dealt by their parent departments only.

2.21 MONITORING OF RESERVATION FOR SC/ST/ OBC AND FOR PHYSICALLY CHALLENGED

All the regular posts of Board are cadre posts of Government of Karnataka and Andhra Pradesh, except that of the Secretary and Assistant Secretary, who are drawn from Government of India on deputation basis. There is no direct recruitment in the Board. The State Governments, both Andhra Pradesh and Karnataka have to monitor and deploy their staff as per prevailing rules in their respective States.

2.22 COMMITTEE FOR COMPLIANTS ON SEXUAL HARASSMENT

In accordance with the guidelines laid down by the Supreme Court to deal with complaints of sexual harassment of women employees, following Committee has been constituted to look into the complaints of women employees at work place under Tungabhadra Board.

1	Shri G. Naga Mohan, Secretary, TB Board	Chairman
2	Shri K.V. Ramana, SE, IB, TB Board	Member
3	Smt. G.B. Shyamala Devi, SO, Garden Unit, TB Board	Member
4	Smt. V. Mumtaz Begum, Typist, O/o the Secretary, TB Board	Member

The Committee has held its meetings from time to time and also met the women employees of the Board. No formal complaints were received by the Committee during the year 2020-21.

77th YEAR FOUNDATION DAY CELEBRATIONS

77TH YEAR FOUNDATION DAY CELEBRATIONS

77TH YEAR FOUNDATION DAY CELEBRATIONS

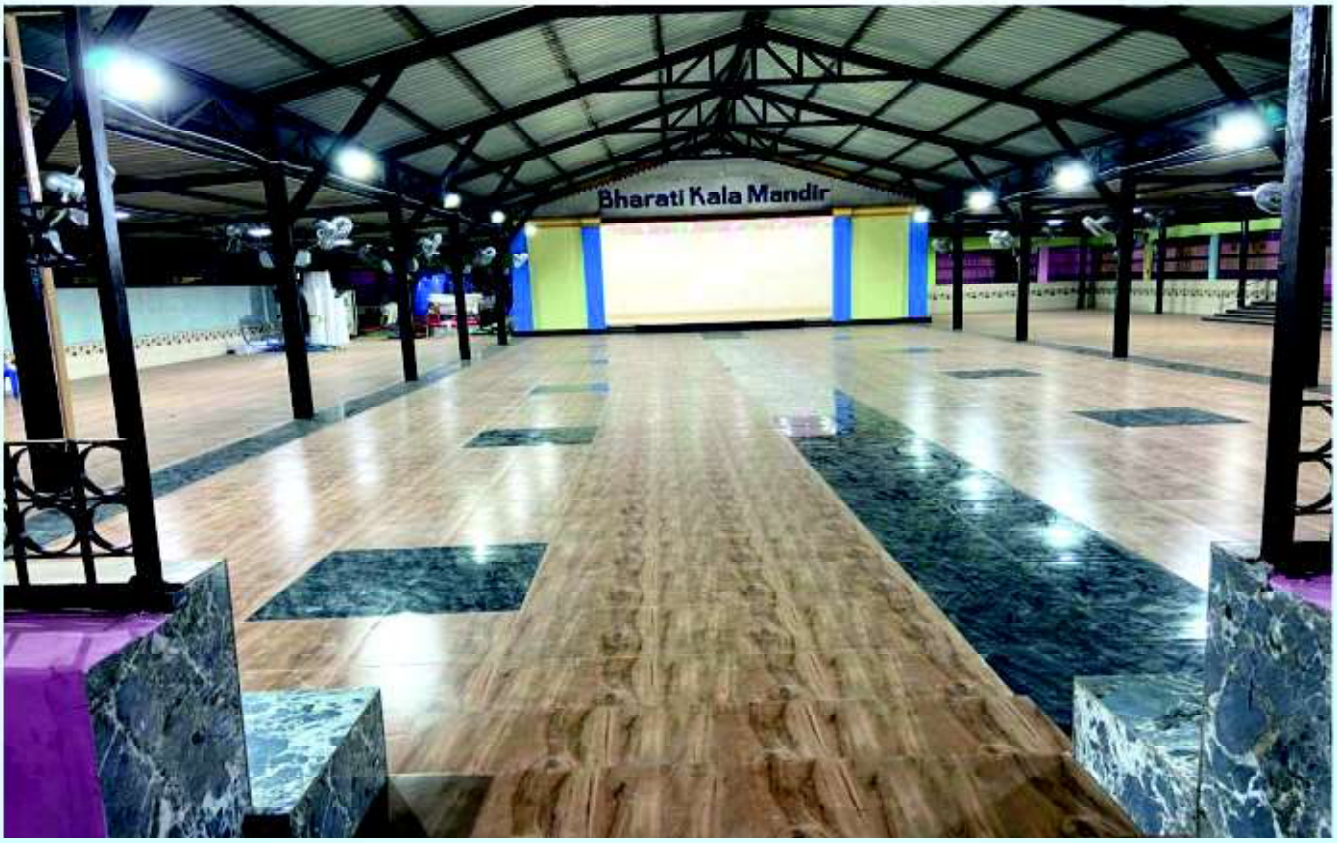
RELEASE OF ANNUAL REPORT FOR THE YEAR 2019-20 ON FOUNDATION DAY (28.02.2021)

CELEBRATION OF EVENT ON OCCATION OF AZAADI KA AMRIT MAHOTSAV

15TH AUGUST 2020 INDEPENDENCE DAY CELEBRATIONS

26TH JANUARY 2021 REPUBLIC DAY CELEBRATIONS

M.S.T HALL RENOVATION ON PPP MODEL



INAUGURATION OF NEW OFFICE BUILDING AT LLC COLONY BELLARI
BY SRI RANGA REDDY, CHAIRMAN & SRI C.NARAYAN REDDY, ENC & MEMBER A.P

WATER MANAGEMENT OF TB PROJECT 3

3.1 IRRIGATION WING OF THE TB BOARD (IW)

Irrigation Wing (IW) of the Board is in charge of the right half of the main masonry dam, all 33 spillway gates, whole of the reservoir, Right Bank High Level Canal (RBHLC) and Right Bank Low Level Canal (RBLLC) up to Board's limit. The RBLLC also includes Power Canal and certain common distributaries. The Tungabhadra Project has been allocated 212.00 TMC of water by the KWDT, which is excluding reservoir evaporation losses. The utilization for the year 2020-21 is 4894.335 Mm^3 (172.847 TMC). As the Left Bank Canals serve command areas exclusively in Karnataka, water regulation and maintenance of these canals are carried out by the Government of Karnataka. The total area benefited by irrigation through the right and left bank canals in the States of Karnataka and Andhra Pradesh is 13.38 Lakh acres apart from about 3.95 lakh acres of existing irrigation systems already established. The Irrigation benefits of Tungabhadra project is at ***Annexure 3.1***

It is the responsibility of the Board to release indented quantity of water to the States of Andhra Pradesh and Karnataka at their off-take points beyond which, the responsibility lies with the respective State Governments.

3.2 FUNCTIONS

Primary Functions of Irrigation Wing are:

- To prepare working table for operation of the reservoir on the basis of water indent furnished by States, as well keeping with the KWDT award;
- To follow Reservoir operation in accordance with the Working Table including flood management and Dam safety
- To supply indented quantity of water, conforming to the working table, for Right bank Canal systems and River assistance
- To deliver specific discharges at Board limits of the RBHLC & RBLLC and at the common distributaries
- To render the water account of the reservoir and canal systems, including collection of daily drawals data for the systems on the left side from GoK

In addition to the above, the following maintenance and operation works are also entrusted to the IW:

- To maintain Right half of main dam from Ch 0.00 ft to Ch 3069.61 ft including drainage gallery and operation and maintenance of all the 33 spillway gates
- To maintain common portion of the Right Bank Canal system i.e., RBHLC from Km 0.000 to Km 105.437 and RBLLC from Km 0.000 to Km 250.580 including the Power Canal from Km 0.000 to Km 21. 300 and their regulators and distributary heads
- Common distributaries of the RBLLC between Km 131.500 to Km 250.580 serving both Karnataka and Andhra Pradesh

- To execute and maintain civil works in the colonies and for all the Board's buildings including Guest House and Inspection Bungalows and
- To improve the horticultural activities in he dam area, colonies and canal banks.

The IW is headed by a Chief Engineer (part-time), who belongs to the Water Resources Department of GoK. Chief Engineer, Irrigation Central Zone (ICZ), Munirabad is normally deputed by GoK to act as Chief Engineer of the Board in addition to his normal duties. There is one post of Superintending Engineer, which is filled up by an officer from Water Resources Department of GoAP.

There are two Divisions headed by Executive Engineers - one at Tungabhadra Dam, which is filled by an officer from GoK and the other at Bellary which is headed by an officer from GoAP. All the other officers and staff of the Irrigation Branch of the Board are drawn from the Water Resources Departments of GoAP and GoK on 50:50 basis. Organization chart of Irrigation Wing is at ***Annexure 3.2.***

3.3 INTER STATE CANALS

The RBLLC and the RBHLC serve the ayacuts in both the States and are termed as inter-State canals. The Board undertakes water management of these canals at distributary level. Maintenance of these canals together with the distributaries serving the two states rests with the Board. There are 86 Nos. off take points in the RBLLC and 24 Nos. at RB HLC for releasing water to the States apart from delivering indented discharge to AP at Board limit of RBHLC and RBLLC.

(i) RIGHT BANK LOW LEVEL CANAL (RBLLC)

The RBLLC under the jurisdiction of the Board serves an ayacut of 37,518 ha (92,670 acres) in Karnataka and 63,588 ha (1,57,062 acres) in Andhra Pradesh. It originates as Power Canal from the tailrace pool of the Dam Power House with a designed capacity of 70.79 Cumecs (2500 Cusecs), carries water for a length of 21.300 Km and empties into the Hampi Fore bay for power generation at Hampi Power House. The tailrace of Hampi Power House falls into the Gundlakere Lake. The RBLLC continues from the Gundlakere Lake with Km 00.000 as chainage. Its designed discharge is 50.970 Cumecs (1800 Cusecs) and is 348.200 Km in length, of which the initial 250.580 Km is under the control of the TB Board. The rocky- undulating terrain in the initial 10 km length called for side walling, tunneling, aqueduct, high embankment, etc. Before finally entering into the State of Andhra Pradesh, the RBLLC meanders through the States of Karnataka and Andhra Pradesh. The details of the canal reaches in Andhra Pradesh and Karnataka are given below.

RB LLC Reaches in States

Karnataka Length in km	Total Length in km	Andhra Pradesh Length in km	Total Lenth in km
0.00 to 131.50	131.50	131.50 t o 135.70	4.20
135.70 to 147.80	12.10	147.80 to 148.00	0.20
148.00 to 156.00	8.00	156.00 to 188.00	32.00
188.00 to 190.80	2.80	190.80 to 250.58	59.78
Total	**154.40**		**96.18**

The RBLLC generally runs for nine to ten months in a year and is closed during May & June for maintenance works. Originally, it was an unlined canal. Subsequently, the lining of the canal has been taken up in a phased manner in identified vulnerable reaches in order to improve the efficiency of the canal. There are 10 common distributaries between Km 131.810 and Km 250.580, which serves ayacuts in both the States. The details of these common distributaries are given in ***Annexure 3.3.***

The details of RBLLC up to Board Limit and beyond Board limit distributaries wise schedule discharge and ayacut are given in ***Annexure 3.12*** and ***3.13.***

As per the KWDT award the water allocated for RBLLC for Karnataka and Andhra Pradesh is 538 Mm^3 (19.00 TMC) and 679.60 Mm^3 (24.00 TMC) respectively, which is exclusive of pro-rata reservoir evaporation losses of 99.11 Mm^3 (3.50 TMC) and 155.74 Mm^3 (5.50 TMC) respectively.

As per the design of RBLLC, transmission losses were envisaged at a rate of 4 cusecs per million square feet of wetted area for unlined reaches and 1.50 Cusecs per million square feet of wetted area for lined reaches. In the Board meeting held on 5th and 6th May, 1989, based on the results of joint gauging, Board granted approval for adopting transmission losses at 4 cusecs per million square feet of wetted area for the present. The Board has also permitted to make provision towards system losses not exceeding 3.4 Cumecs (120 cusecs).

(ii) Right Bank High Level Canal (RBHLC)

The agreement of June, 1956 between Andhra Pradesh and Mysore provided that the quantity of water to be drawn annually in right bank high level canal is to be 1415.84 Mm^3 (50.00TMC) and is to be shared in the ratio of 35:65 between Mysore and Andhra Pradesh and the cost is to be shared on cusec mile basis between the two Governments. The agreement also provided that the common works of the canal should be undertaken by the Board. Accordingly, the joint scheme submitted by the States, was approved by Government of India in 1958 for executing in two stages. The Board commenced the construction works within its jurisdiction in 1958. This canal passes through a very rough terrain dotted with hillocks, which necessitated deep cuts, high sidewalls, tunnels etc. It cuts across the Uravakonda ridge through a deep cut and drops into Pennar Valley to join the Penna Ahobilam Balancing Reservoir (PABR). The first stage of the canal was commissioned by releasing water on 27th July, 1966. The second stage work was commenced in 1967 and got completed by June 1970. The total length is 196.430 km. The Board's jurisdiction ends at 105.437 km, where it enters Andhra Pradesh territory. The RBHLC has a design capacity of 113.27 Cumecs (4000 cusecs) at the head. The details of Ayacut and Discharges of RBHLC distributaries up to Board Limit are given in ***Annexure 3.14*** and beyond Board limit are given in ***Annexure 3.15***.

The details of Ayacut and Discharges of LBMC distributaries, LBHLC and Raya Basavanna canals are given in ***Annexure 3.16*** and ***Annexure 3.17.***

The KWDT has not made any change in the allocation of water to RBHLC for the States. The RBHLC was designed to deliver a maximum of 72.87 Cumecs (2,575 cusecs) at Board's limit for use in Andhra Pradesh. This included a provision of 1.42 Cumecs (50 cusecs) as transmission losses from the dam upto Board's limit. In the meeting held on 22nd October 1974, observing that the carrying capacity of the canal had reduced to 90.56 Cumecs (3,200 cusecs), Board approved pro-rata reduction of the discharges to 29.720 Cumecs (1,050 cusecs) for Karnataka and 60.840 Cumecs (2,150 cusecs) for Andhra Pradesh inclusive of 5. 660 Cumecs (200 cusecs) of transmission losses.

3.4 RIVER ASSISTANCE

There were fourteen anicuts built by the Raya Kings down stream of the Tungabhadra Dam up to the Rajolibanda Anicut, constructed in 1960, with independent channels collectively known as Vijayanagar Channels. Water requirements of these channels are met either by the regenerated water and river releases or the releases made through the Raya and Basavanna Channel and Power Canal by the Board. The ayacuts of the Rajolibanda Anicut depend on the regenerated water and the river releases from the Tungabhadra dam.

Similarly, the Kurnool-Cuddapah Canal too depends on the regenerated water and river releases made from the Tungabhadra dam. The KWDT has awarded specific allocations to Vijayanagar channels, Rajolibunda Anicut and K.C. Canal system, which are indicated in ***Figure 3.1.***

3.5 LIFT IRRIGATION SCHEMES

There are a number of lift irrigation schemes located on the foreshore of the Reservoir, which directly draw water for irrigation. In order to account for such drawls during Rabi season, the Board in its 133rd meeting held on 11th January, 1989 resolved to debit 1.25 TMC water from 15.10.1988 to 31.12.1988 and 0.75 TMC from 01.01.1989 to 15.02.1989 to Karnataka share provisionally towards drawals for lift irrigation schemes on the foreshore of the reservoir during the Rabi season. Pending final decision of the Board, debit as well as accounting of inflow of this 2.00 TMC in the manner aforesaid is continued. The Board in its 216th meeting held on 22.10.2020 directed to conduct the joint inspection of SE's of member States along with SE (IB), TB Board during November/ December 2020 on defunct, existing, ongoing and proposed lift schemes for irrigation, drinking and industrial water and submit a report to the Board. Accordingly, The Joint Inspection was carried out on right side of the fore shore area on 09.12.2020 and 10.12.2020 and on Left side of the foreshore area on 17.12.2020, 18.12.2020, 12.01.2021 and 02.02.2021. The actual utilization as per the joint inspection from the foreshore area is as below.

Sl No.	Purpose of utilization	Qty permitted by TBB (TMC)	Qty as per Joint inspection (TMC)	Excess Drawls (TMC)
1	Irrigation	2.00	2.741	0.741

The above report has been communicated to the SE's of the Member States for their comments.

3.6 OTHER WATER DEMANDS

The Tungabhadra Project is a major source for meeting domestic and industrial water requirement of the region.

a) Drinking Water

Through the network of canal systems, the drinking water demand is also met along with the irrigation demands of the project. Board has permitted drawal of drinking water out of the share of water for the two States. Details of the drinking water schemes approved by board are given in ***Annexure 3.4.***

b) Industrial usage

With the overall economic development of the area due to commissioning of the Tungabhadra Project, many industries have come up around the dam. The water demands of industries are met out of the share of the respective States. The details of industries drawing water from various systems of the Project as approved by the Board is given in ***Annexure 3.5.***

3.7 NEGATIVE INFLOWS

The daily inflows into the Tungabhadra reservoir are indirectly computed based on the change in the reservoir levels, evaporation losses and the outflows on account of canal drawls and spillway surplus during the preceding 24 hours using the storage equation:

$I = O + E \pm D$, where

I = Inflows into the reservoir.

O = Outflows from the reservoir.

E = Evaporation losses.

(Measured as per evaporation from standard pan evaporimeter and applying a co-efficient of 0.8 to represent evaporation from the water spread area of the reservoir).

D = Difference in the storage capacity during the preceding 24 hrs. (Computed using the capacity - elevation table obtained through hydro-graphic surveys)

The inflows assessed using the above equation generally becomes negative during the months from December to April of a water year. Earlier the negative inflows were not accounted for and were considered as zero inflow. However, from 1976-77 onwards the negative inflows are accounted for.

Negative inflows recorded during the last 9 Years are given below.

Negative inflows

Sl.No.	WaterYear	Negative inflows (inTMC)
1.	2010-2011	8.018
2.	2011-2012	6.097
3.	2012-2013	12.686
4.	2013-2014	18.100
5.	2014-2015	17.053
6.	2015-2016	10.152
7.	2016-2017	1.889
8.	2017-2018	0.037
9.	2018-2019	0.000

Due to Implementation of Telemetry for all the canal heads from 2017-18, the negative inflows have gradually decreased and recorded as zero from 2018-19 onwards.

3.8 LOSSES IN THE CANAL SYSTEM

I) TRANSMISSION LOSSES

Board in its 88th meeting held on 20th August, 1976 has decided that the canal transmission losses are to be apportioned in the ratio of X/2 to Y where the drawals of X is of Karnataka State and drawals of Y is of Andhra Pradesh State. It was also decided that tentatively till more accurate data are collected, the Low-Level Canal transmission losses may be taken as 275 Cusecs. The transmission losses in respect of High Level Canal may be taken as 200 Cusecs. At present, the transmission's losses are considered as 200 Cusecs for both LLC & HLC.

II) SYSTEM LOSSES

Whenever piping or breaches occur in the canals a certain quantum of water is allowed to flow through the escapes to deplete the water level at the piping/breach site quickly, to take up repairs. Certain amount of water also flows through the breaches whenever they occur. Board in its 130th meeting held on 29th January, 1988 being aware of the water losses due to certain unauthorized drawals by various means and noting that the law enforcing authorities are not able to effectively prevent / control these unauthorized drawals, permitted to make provision for these losses, termed as system losses. This is in addition to the usual provision of transmission losses. In respect of RBLLC, the Board permitted to account a maximum of 3.40 Cumecs (120 cusecs) as system losses from the water year 1987-88. Similarly, during the 165th meeting, the Board permitted to account for a maximum of 3.40 Cumecs (120 cusecs) as system losses in RBHLC also with effect from 1998-99. At present Transmission and system losses are considered as below.

Sl. No	Losses	RBHLC (in Cusecs)	RBLLC (in Cusecs)
1	Transmission Losses	200	200
2	System Losses	120	120

3.9 OPERATION OF RESERVOIR

A Water Review Committee at the level of Superintending Engineers of the participating States with Superintending Engineer, Irrigation Branch of the Board as Chairman has been constituted to assist the Board for assessing the quantum of utilization, distribution and regulation of water in various systems of the project. The Committee holds its first meeting generally in the month of June and recommends the probable utilization for the year and its distribution in various systems as per KWDT award. Based on the suggested probable inflow and pattern of drawals for each system furnished by the respective States the Working Table for operation of the reservoir on 10 daily basis is prepared and submitted for approval of the Board. The operation of the reservoir is carried out on the basis of approved working table. The working table was reviewed from time to time based on actual inflows received and pattern of drawals indicated by States for various uses.

3.10 WATER REGULATION DURING THE WATER YEAR 2020-2021

The first meeting of the Water Review Committee was held on 09th June 2020 and the utilization was suggested as 4615.508Mm^3 (163.000 TMC) for the likely inflow of 191.457 TMC. The second meeting of the Water Review Committee held on 11th November 2020 and the committee decided an abstraction of 168.000 TMC. After considering the actual inflows received up to 20th December 2020 the abstraction is revised as 170.800 TMC.

3.11 DATE OF OPENING OF CANALS FOR THE YEAR 2020-2021

The dates of opening of canals as per Working table and actual dates of opening are given below:

Canal	As per working table	Actual date of opening
RBLLC	25.07.2020	25.07.2020
RBHLC	31.07.2020	31.07.2020
LBMC	25.07.2020	25.07.2020

3.12 MEETING IRRIGATION DEMANDS KHARIF SEASON 2020-2021

The reservoir at the beginning of the Kharif season on 01.06.2020 was 1584.56 feet with a storage of 6.35 TMC. The inflows realized were 299.33 TMC as against 191.457 TMC originally considered in the Working Table. The water surplused over spillway was 92.443 TMC in addition to 20.788 TMC of water drawn for extra power generation by the power houses on both the sides without jeopardizing the Irrigation interests. Water of 92.661 TMC was drawn by Karnataka, Andhra Pradesh & Telangana States.

The reservoir evaporation and system losses recorded during Kharif season were 3.913 TMC and 2.597 TMC respectively. At the end of Kharif season on 30.11.2020 the water level in the Reservoir was (+) 1627.90 feet with a storage of 82.425 TMC.

Rabi Season 2020-2021

The reservoir level at the beginning of Rabi season was (+) 1627.90 feet with a storage capacity of 82.425 TMC. The inflows realized

during Rabi season is 11.056 TMC this includes Bhadra Assistance as realized at TB reservoir 1.100 TMC out of 1.500 TMC of water released at Bhadra Reservoir.

During Rabi season a total quantity of 80.186 TMC of water was drawn by Karnataka, Andhra Pradesh & Telangana States. The Reservoir evaporation and system losses recorded during Rabi season were 2.733 TMC and 4.474 TMC respectively. Ultimately, at the end of the Water Year on 31.05.2021, the Residual storage in the Reservoir was 8.685 TMC. The final annual abstraction came out to be 172.847 TMC.

RBHLC was closed on 07.02.2021, RBLLC on 12.04.2021 and LBMC on 23.04.2021. However, the drawals into Raya Basavanna canals were continued till the end of the year i.e., up to 31.05.2021.

3.13 WATER UTILIZATION DURING THE WATER YEAR 2020-21.

The quantity of water drawn by the States of Karnataka and Andhra Pradesh through different systems for the year 2020-2021 as against allocations made in the KWDT award are given in ***Annexure 3.6.*** The 10-day water indent and actual releases made in RBHLC and RBLLC during 2020- 21 are graphically represented in **Fig 3.2 and 3.3.** The utilization for Karnataka shown in the Annexure is inclusive of water drawn from the canals for other utilizations and water drawn from the reservoir directly for industrial use. The water utilization shown for Andhra Pradesh is inclusive of water drawn for drinking water supply. The water account for the year 2020-21 is given in ***Annexure 3.7.***

The year wise utilization for the last 44 years is given in ***Annexure 3.8*** and graphically represented in ***Figure 3.4.***

The annual share of Karnataka and Andhra Pradesh on pro-rata entitlement of actual availability and actual drawals for the past 43 years are graphically represented in ***figure3.5.***

3.14 PIPINGS AND BREACHES

Initially at the time of construction of RBLLC and the RBHLC locally available material was used in construction of canal embankments and compaction achieved through dry rolling. At many locations, the material used was calcareous, not ideal for the construction of embankments. In reaches where the canal embankments were as high as 8m, homogeneous section of calcareous filling got dissolved with the aging of these canals resulting in formation of large cavities inside the embankment. A number of pipings and breaches have taken place in such vulnerable reaches over the years.

Patrolling all along the canals was intensified for quick detection of vulnerable points, piping, siphons if any and to curtail illegal drawals. The breaches and pipings occurred during 2020-2021 as given in ***Annexure 3.9.***

3.15 FLOOD MANAGEMENT

The Tungabhadra reservoir has not been provided with flood storage capacity for flood absorption. The FRL and MWL of the Reservoir are same and is at 497.740Mt. (1633.00 ft.).

Therefore, the entire flood impinging the Reservoir has to be either stored to the extent possible or passed over the spillway. The spillway with 33 gates is designed to allow a maximum discharge of 18,406 cumecs (6,50,000 cusecs) at Full Reservoir Level of 497.740m (1633 ft). The operation of spillway gates is carried out in accordance with approved schedules duly ensuring the safety of the dam.

Central Water Commission provides daily information about the floods and rainfall occurrence at (i) Thirthahalli on the Tunga river, (ii) Harlahalli on the Tungabhadra River and (iii) Marol on the Varada river. Based on the Hydro-Meteorological data of these stations CWC issues inflow forecasts to the Reservoir with a lead time of 24 hours to enable operation of the spillway gates. The forecasts are communicated to the Board through Wireless and whatsapp.

The maximum level attained during the year 2020-2021 was 497.740 M (1633.00 ft.), on 26.08.2020 and the reservoir level started receding from 31.10.2020 onwards. Statement showing Maximum and Minimum Reservoir levels and Spillway Discharges from 1960-61 to 2020-21 as given in ***Annexure 3.9 A***

3.16 RESERVOIR SEDIMENTATION

Periodic assessment of the capacity of the Reservoir has been made since impounding of water in 1953. The gross storage capacity of the Reservoir was assessed in 1953 as 3,751.17 Mm^3 (132.47 TMC) at FRL 497.740 m (1633 ft) and dead storage capacity as 32.83 Mm^3 (1.160 TMC) at 472.440m (1550 ft). A siltation rate of 4.29 ha m/100 km^2 / year (0.427 TMC / year) was adopted in the design of the project.

In order to update the reservoir capacity at closer intervals, remote sensing technology was tried during 1995-96. The work was got done through Andhra Pradesh State Remote Sensing Application Center. But due to inconsistencies in the reservoir capacity obtained through the remote sensing technique vis-à-vis hydrographic surveys, the board did not approve the same for adoption. The Remote Sensing Directorate of Central Water Commission also evaluated the capacity during 1993-94 and 1999-2000. However, in view of the variation in capacities indicated by the study same has also not been considered by the Board. As directed by the Board, another joint survey of TB Reservoir, by APERL and KERS using the integrated bathymetric system, was completed during the month of October & November of 2008 on the basis of latest FRL of 1633 ft given by NRSC (National Remote Sensing Centre), Hyderabad. The report on the survey of TB Reservoir estimated that the storage now is 2855.90 Mm^3 (100.855 TMC) against 3751.17 Mm^3 (132.470 TMC). The average annual rate of decrease in the reservoir capacity is 0.575 TMC in 55 years.

The TB Board in its 197th meeting held at Bangalore on 24.06.2011 approved the new survey of 2008 finalized by KERS & APERL for adoption from the water year 2011-12 onwards.

The capacity of the Reservoir as per various surveys done from 1953 to 2008 with annual rate of decrease are given in ***Annexure 3.10*** and graphically represented in ***Figure 3.6***. The capacity elevation table obtained from 2008 Surveys of the Reservoir approved by the Board is shown in ***Annexure 3.11.***

3.17 TOPOGRAPHIC SURVEY OF TB RESERVOIR.

To overcome the inconsistency in the Hydrographic survey data, physical survey i.e., Topographic survey and Bathymetric survey of the reservoir has been taken up to assess the present capacity and status of siltation, which will be considered more reliable and authentic. The survey work was entrusted to M/s Aarvee Associates, Hyderabad during June 2016 and draft report has been submitted by the consultancy M/s Aarvee Associates, Hyderabad. The outcome of the survey is an increase in the storage capacity from 100.855 (2008 Survey) to 105.788 TMC. The same have been examined and compared with the discharges recorded through telemetry and submitted in the 214th Board meeting held on 17.08.2019 for approval of Board. Since, there is difference of 4.933 TMC, the board in its 216th meeting held on 22.10.2020 concluded to go for joint checking by the team of KERS, APERL, TSERL during April-June 2021.

But, The Joint Cross checking could not be taken up as the Director KERS has expressed that, it is not possible to cross check the field data of 2016 survey after lapse of 5 years and further, he suggested to go for fresh Reservoir survey on the basis of the recommendations of CWC that, the Capacity survey of reservoir shall be conducted every once in 5 years. Hence, it is decided to place the facts before the next Board meeting.

3.18 MODERNIZATION OF RBHLC & RBLLC (INCLUDING PC)

RBHLC MODERNIZATION

As per KWDT award, the water allocation for TBP-RBHLC is 50.00 TMC, out of which the share of Karnataka State is 17.50 TMC and Andhra Pradesh State is 32.50 TMC. Similarly, the water allocation for TBP-RBLLC is 43.00 TMC, out of which the share of Karnataka State is 19.00 TMC and Andhra Pradesh State is 24.00 TMC.

The primary responsibility of TB Board is to supply water to the Member States as per the KWDT award. But the Member States are not receiving their quota as per KWDT award due to the decreased carrying capacity of TBP-RBHLC (more than 50 years old) and TBP-RBLLC (unlined) (more than 60 years old). The lining portion of TBP-RBHLC was damaged in most of the reaches and structures were in dilapidated condition. If any major damage occurs to the canal system, the canals water management fails to deliver the indented water to the Member States. The Left Bank Canal System and Distributary system of Right bank canals in

the jurisdiction of Govt. of Karnataka were already Modernized.

To deliver the rightful share of water of GoAP as per KWDT Award, it was felt very essential to modernize both the canal systems under the jurisdiction of TB Board with cement concrete lining for delivering the indented water at the border of Andhra Pradesh.

TB Board in its 177th meeting held on 18.09.2003 agreed to modernize both RBLLC & RBHLC, but the same could not be taken up due to financial constraints. Again, TB Board in its 194th meeting held on 16.11.2010 agreed to modernize both TBP- RBHLC and TBP-RBLLC (unlined). During the meeting held in November 2014 between the Govts. of Andhra Pradesh and Karnataka, it was mutually agreed to modernize the TBP-Canal System.

The DPRs for Modernization of TBP-RBHLC and TBP-RBLLC under the jurisdiction of TB Board were vetted by Member States (GoK & GoAP) and CWC (Central Water Commission).

Meanwhile the HECRAS Model studies in case of RBHLC were conducted by Shri. Rama Prasad, Retired Professor of Civil Engineering, IISC, Banglore. The recommendations are as under:

"In deep cut reaches the bed width of the canal be increased to 11 mtrs in the reach from Km 14.925 to Km 22.425, and to 10 mtrs in the reach from Km 27.450 to Km 38.950 without lining in rock cut reaches. This will enable 4000 Cusecs to be released into the canal with water levels within permissible limits. At some places of deep cut sections, the masonry lining has fallen off. This can be removed and no fresh lining is necessary. Concrete lining may be repaired where it is damaged".

As per the recommendation of Shri. Rama Prasad, Retired Professor of Civil Engineering, IISC, Bangalore all the estimates for special repairs of RBHLC were sanctioned. The Chief Engineer, Irrigation Branch, TB Board, TB Dam also accorded technical sanction for the works of Special repairs (modernization works) from Km 0.00 to Km 14.33 reach of RBHLC vide letter dated 16.05.2016 and the tenders for the above works were called on 13.06.2016 for fixing the agencies. The modernization works for the above reach were taken up in four packages during 2016-17 and completed during the month of June 2017.

Further the modernization works of RBHLC were taken up from Km 15.000 to Km 105.000 and improvements and reconstruction of structures from Km 15.000 to Km 105.435 in a phased manner from 2017-18 to 2019-20 in 13 Packages and all works are completed by March 2020.

After completion of modernization of RBHLC from Km 0.00 to Km 105.00 (except for widening of the few reaches), the velocity of water flow in the canal has improved a lot and indented discharges of 4000 cusecs are being carried with ease at the canal head and able to deliver a discharge of around 2200 cusecs (against earlier discharge of 1500 cusecs) at Andhra

Pradesh border i.e., at Km 105.00 of RBHLC.

POWER CANAL MODERNIZATION

The Modernization works from Km 0.000 to Km 20.300 were taken up in two packages (Package Nos. 9 & 10) during the fag end of 2017-18 and completed successfully by July 2019.

RBLLC MODERNIZATION

As per the decision of the Board in its 213th meeting held at Hyderabad on 27.12.2018 and as per the recommendations of Shri Rama Prasad, Retired Professor of Civil Engineering, IISC, Bangalore, the modernization works of RBLLC from Km 0.000 to Km 72.000 were taken up in 7 Packages during May, 2019 and were completed by 2021 closure period. Further modernization works from K m 72.00 to KM 115.00 were taken up in 3 Packages and were completed by 2021 closure period except for 3.0 Km . Further modernization works From Km 115 to Km 250 of LLC s are proposed to be taken up in the next 2-3 years.

3.19 New Initiative in Water management – Live Flow Measurement in Canals and Distributaries using Telemetry and ADCP.

During 210th Board meeting held on 28.01.2017 it was decided to take up Telemetric gauging of all canals of TB Dam. As per the decision, 45 locations were selected in both left & right bank canals. As per the Board decision online tenders were called and the work was entrusted to M/s Mechatronics systems Pvt. Ltd. The telemetry started initially at head reaches i.e., TLBC, RBHLC, Power canal & AP Border of RBHLC and started recording from 22.09.2017 onwards and continued for water accounting since 2017-18 water year. Due to implementation of Telemetry/ Live flow data, the negative inflows were avoided since 2018-19 and overall average savings was around 10.00 TMC (as per statement of Negative inflows) which can be used in the crucial time to save the crops & drinking water needs for all the canals.

The TB Board entrusted the work of calibration and checking the correctness of telemetry stations to CWPRS, Pune & they visited each Telemetry station and calibrated the Telemetry equipment's with an error of $\pm$ 2% which is within the acceptable limits.

The TB Board has also demonstrated and compared the telemetry/live flow data with Board ADCP in front of ICC members, MLAs, Farmers & public. On comparing/ cross checking they expressed their satisfaction with discharges obtained by telemetry/Live flow data.

Stakeholders such as farmers and officials can get the details of discharges of canal system by browsing the TB Board official website: **www.tbboard.gov.in** or **www.tbbliveflow.com** or by installing the **TBPLIVE app** from the Google play store in android mobiles. The details of

telemetry locations are given in ***Annexure 3.18.***

3.20 FINANCIAL PERFORMANCE

The budget allocation for the Irrigation Wing for the past 5 years i.e., from 2015-16 till 2020-21 under the Major Head 4700 & 2700 is indicated below:

(Rupees in lakhs)

Year	Head of account	Budget allotted	Expenditure
2015-2016	MH 4700	2000.00	1324.46
	MH 2700	6380.00	5548.25
2016-2017	MH 4700	5712.00	3787.26
	MH 2700	6810.00	6358.81
2017-2018	MH 4700	31439.00	23203.56
	MH 2700	6810.00	6452.37
2018-2019	MH 4700	26253.53	26253.53
	MH 2700	8408.00	8408.00
2019-2020	MH 4700	49015.00	47950.50
	MH 2700	8736.53	8124.81
2020-2021	MH 4700	22590.00	22318.61
	MH 2700	8132.22	7730.37

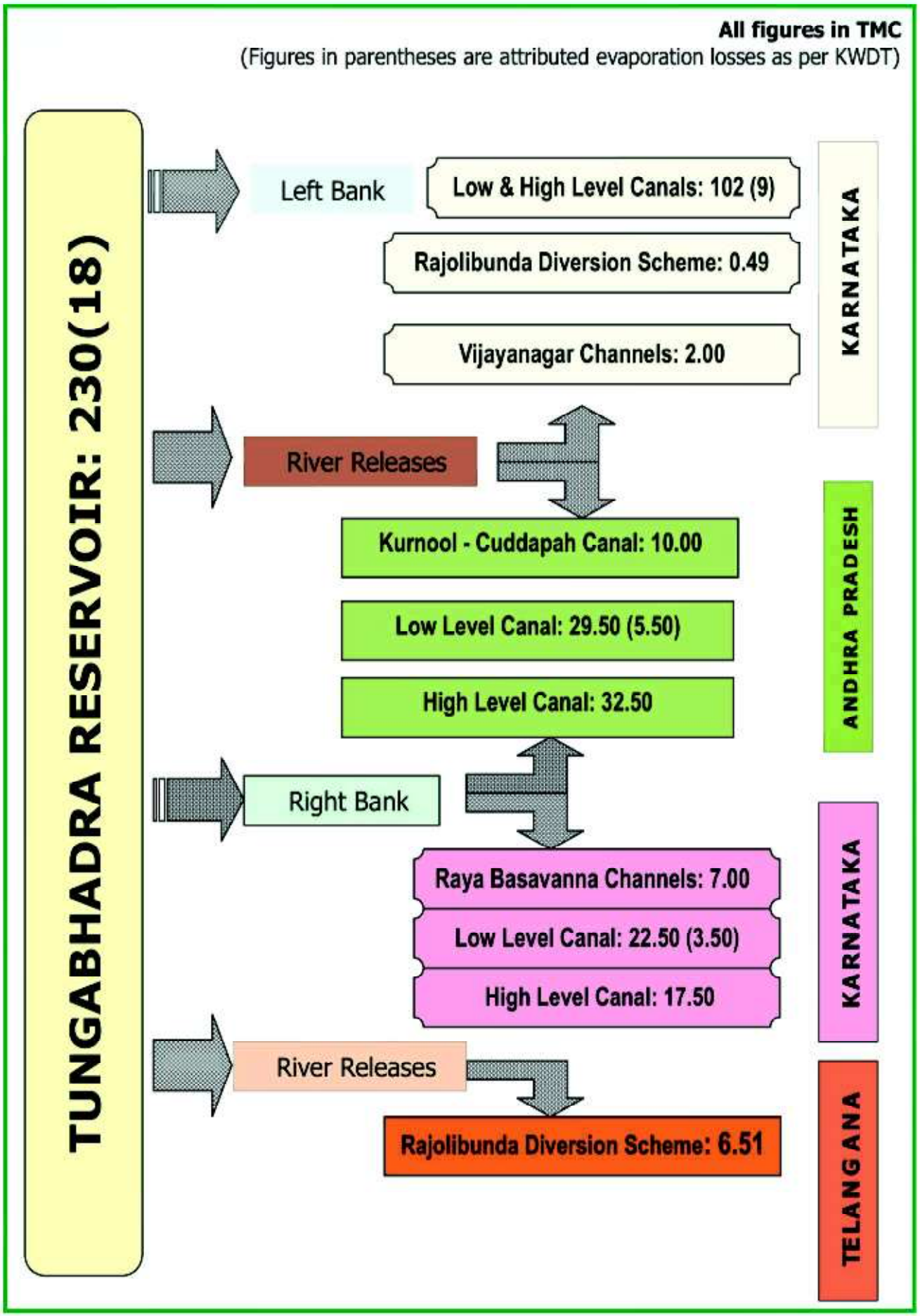
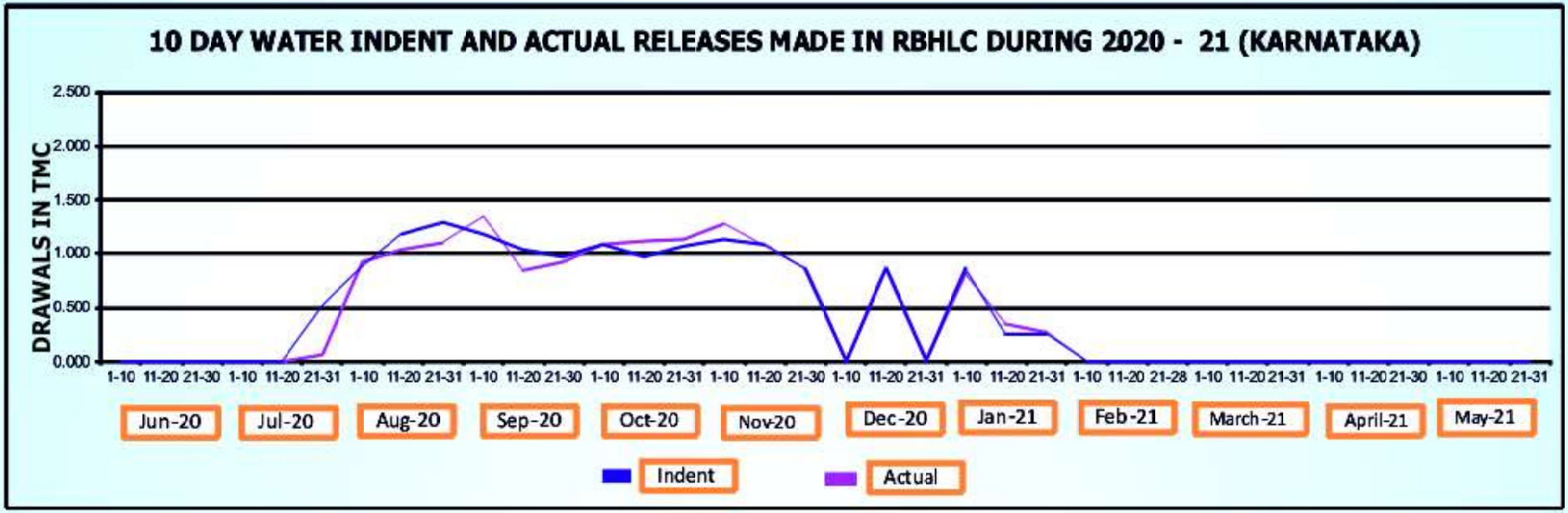


Figure 3.1: Water Allocation in various Irrigation Systems of TB reservoir as per KWDT


10 DAY WATER INDENT AND ACTUAL RELEASES MADE IN RBHLC DURING 2020 - 21 (KARNATAKA)
DRAWALS IN TMC
2.500
2.000
1.500
1.000
0.500
0.000
1-10 11-20 21-30 1-10 11-20 21-31 1-10 11-20 21-31 1-10 11-20 21-30 1-10 11-20 21-31 1-10 11-20 21-30 1-10 11-20 21-31 1-10 11-20 21-31 1-10 11-20 21-28 1-10 11-20 21-31 1-10 11-20 21-30 1-10 11-20 21-31
Jun-20
Jul-20
Aug-20
Sep-20
Oct-20
Nov-20
Dec-20
Jan-21
Feb-21
March-21
April-21
May-21
Indent
Actual

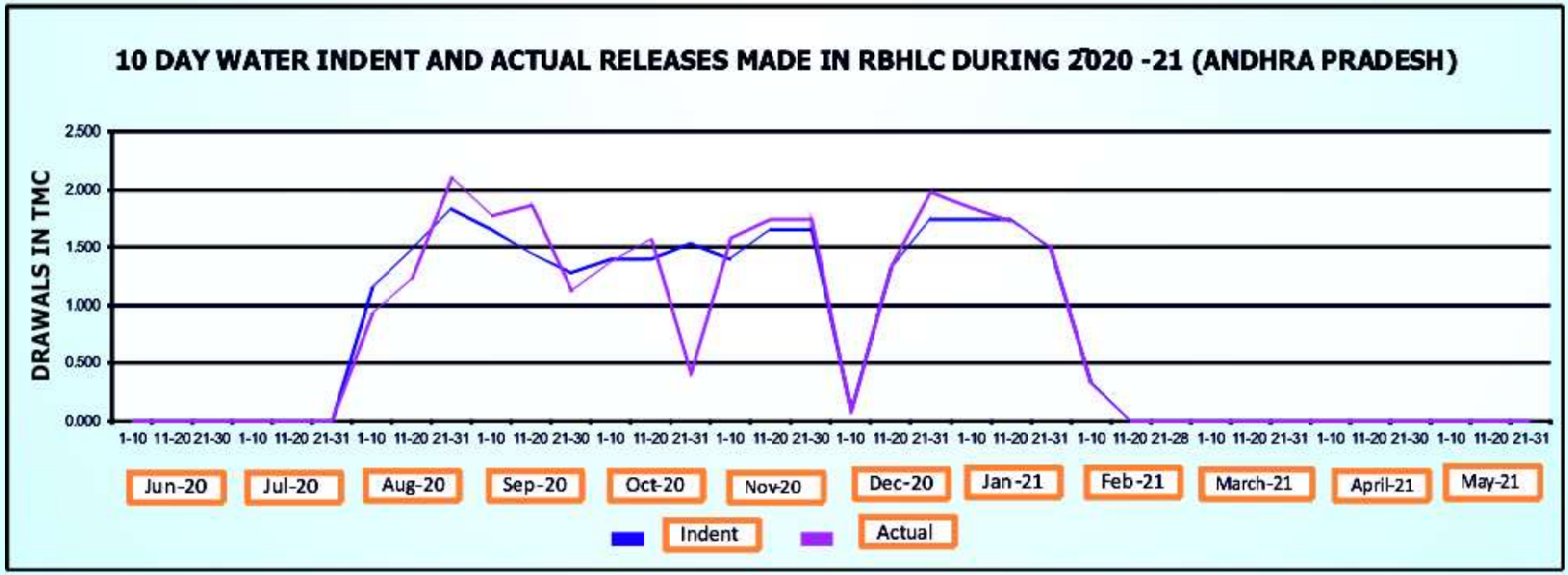
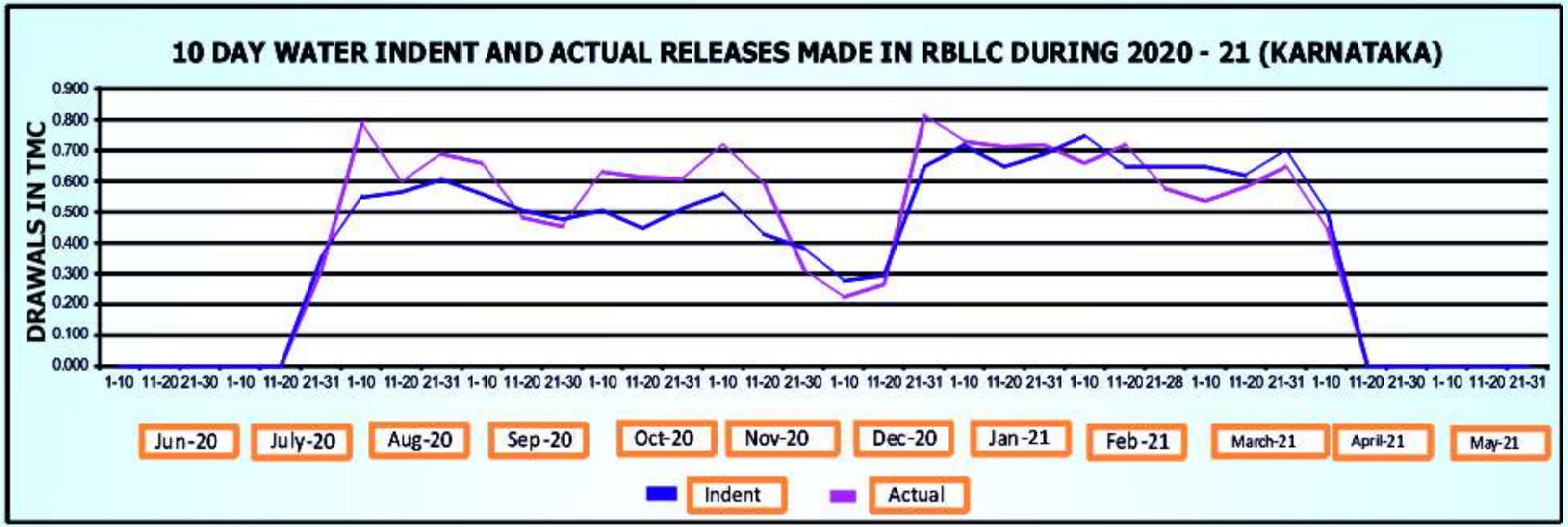

10 DAY WATER INDENT AND ACTUAL RELEASES MADE IN RBHLC DURING 2020 -21 (ANDHRA PRADESH)
DRAWALS IN TMC
2.500
2.000
1.500
1.000
0.500
0.000
1-10 11-20 21-30 1-10 11-20 21-31 1-10 11-20 21-31 1-10 11-20 21-30 1-10 11-20 21-31 1-10 11-20 21-30 1-10 11-20 21-31 1-10 11-20 21-31 1-10 11-20 21-28 1-10 11-20 21-31 1-10 11-20 21-30 1-10 11-20 21-31
Jun-20
Jul-20
Aug-20
Sep-20
Oct-20
Nov-20
Dec-20
Jan-21
Feb-21
March-21
April-21
May-21
Indent
Actual

Figure 3.2


10 DAY WATER INDENT AND ACTUAL RELEASES MADE IN RBLLC DURING 2020 - 21 (KARNATAKA)
DRAWALS IN TMC
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
1-10 11-20 21-30 1-10 11-20 21-31 1-10 11-20 21-31 1-10 11-20 21-30 1-10 11-20 21-31 1-10 11-20 21-30 1-10 11-20 21-31 1-10 11-20 21-31 1-10 11-20 21-28 1-10 11-20 21-31 1-10 11-20 21-30 1-10 11-20 21-31
Jun-20
July-20
Aug-20
Sep-20
Oct-20
Nov-20
Dec-20
Jan-21
Feb-21
March-21
April-21
May-21
Indent
Actual

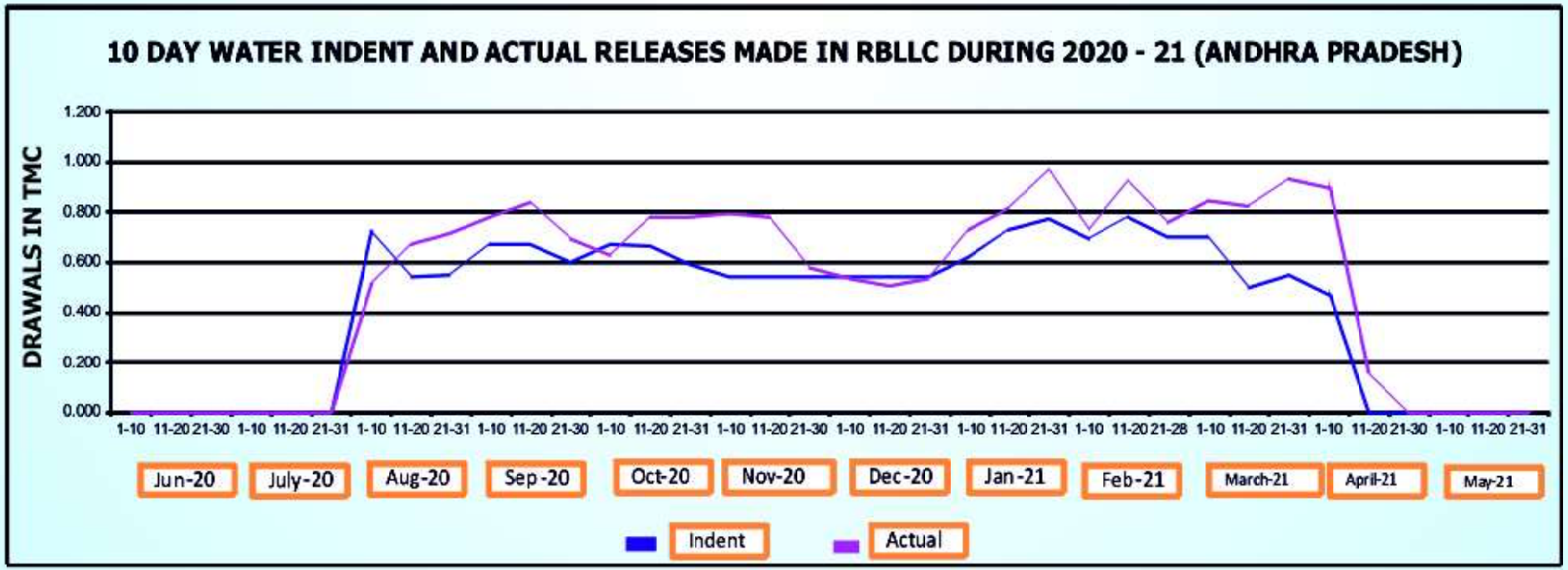

10 DAY WATER INDENT AND ACTUAL RELEASES MADE IN RBLLC DURING 2020 - 21 (ANDHRA PRADESH)
DRAWALS IN TMC
1.200
1.000
0.800
0.600
0.400
0.200
0.000
1-10 11-20 21-30 1-10 11-20 21-31 1-10 11-20 21-31 1-10 11-20 21-30 1-10 11-20 21-31 1-10 11-20 21-30 1-10 11-20 21-31 1-10 11-20 21-31 1-10 11-20 21-28 1-10 11-20 21-31 1-10 11-20 21-30 1-10 11-20 21-31
Jun-20
July-20
Aug-20
Sep-20
Oct-20
Nov-20
Dec-20
Jan-21
Feb-21
March-21
April-21
May-21
Indent
Actual

Figure 3.3

Figure 3.4

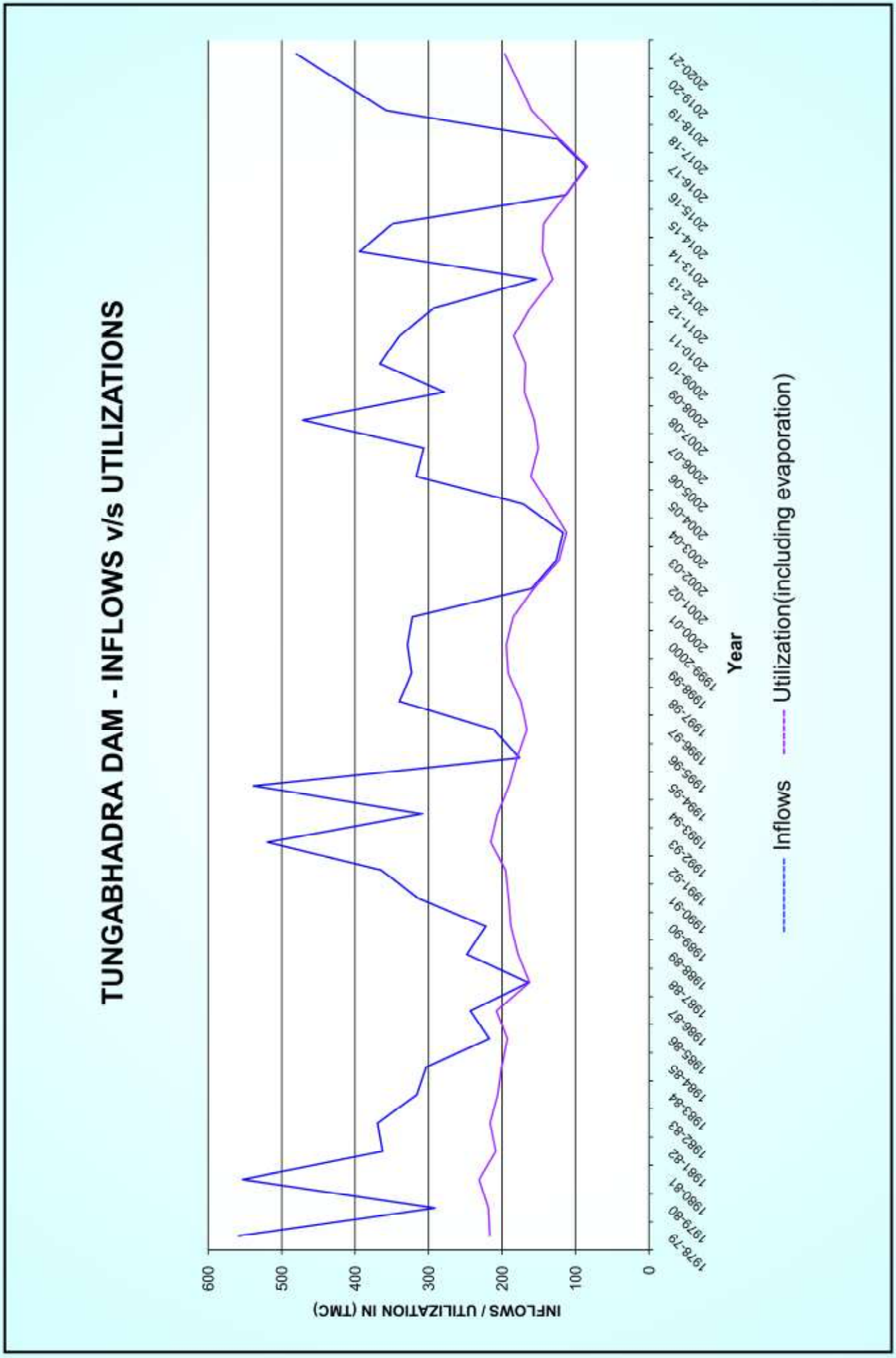

TUNGABHADRA DAM - INFLOWS v/s UTILIZATIONS
INFLOWS / UTILIZATION IN (TMC)
600
500
400
300
200
100
0
Year
1978-79
1979-80
1980-81
1981-82
1982-83
1983-84
1984-85
1985-86
1986-87
1987-88
1988-89
1989-90
1990-91
1991-92
1992-93
1993-94
1994-95
1995-96
1996-97
1997-98
1998-99
1999-2000
2000-01
2001-02
2002-03
2003-04
2004-05
2005-06
2006-07
2007-08
2008-09
2009-10
2010-11
2011-12
2012-13
2013-14
2014-15
2015-16
2016-17
2017-18
2018-19
2019-20
2020-21
Inflows
Utilization(including evaporation)

Figure 3.5

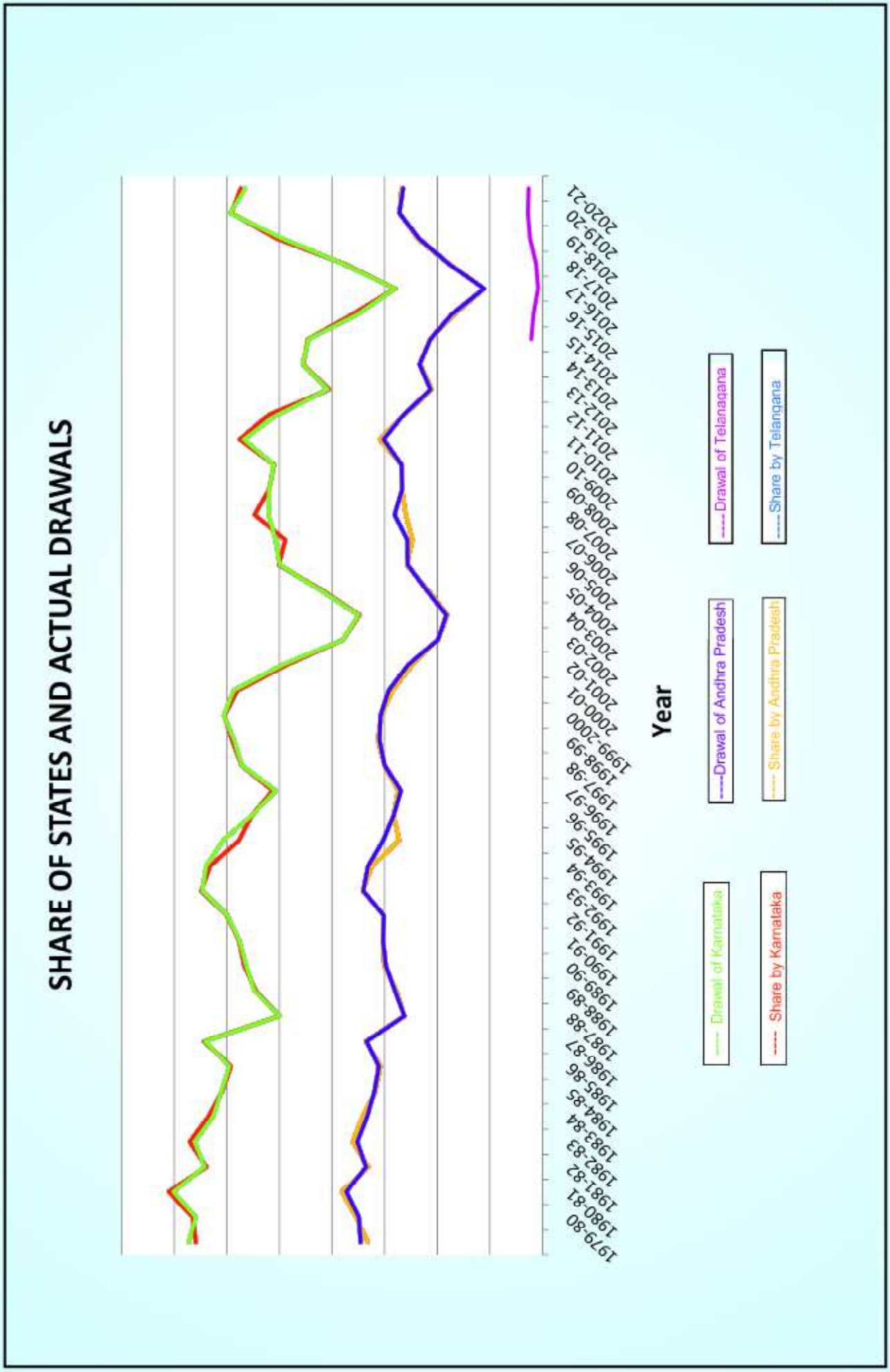
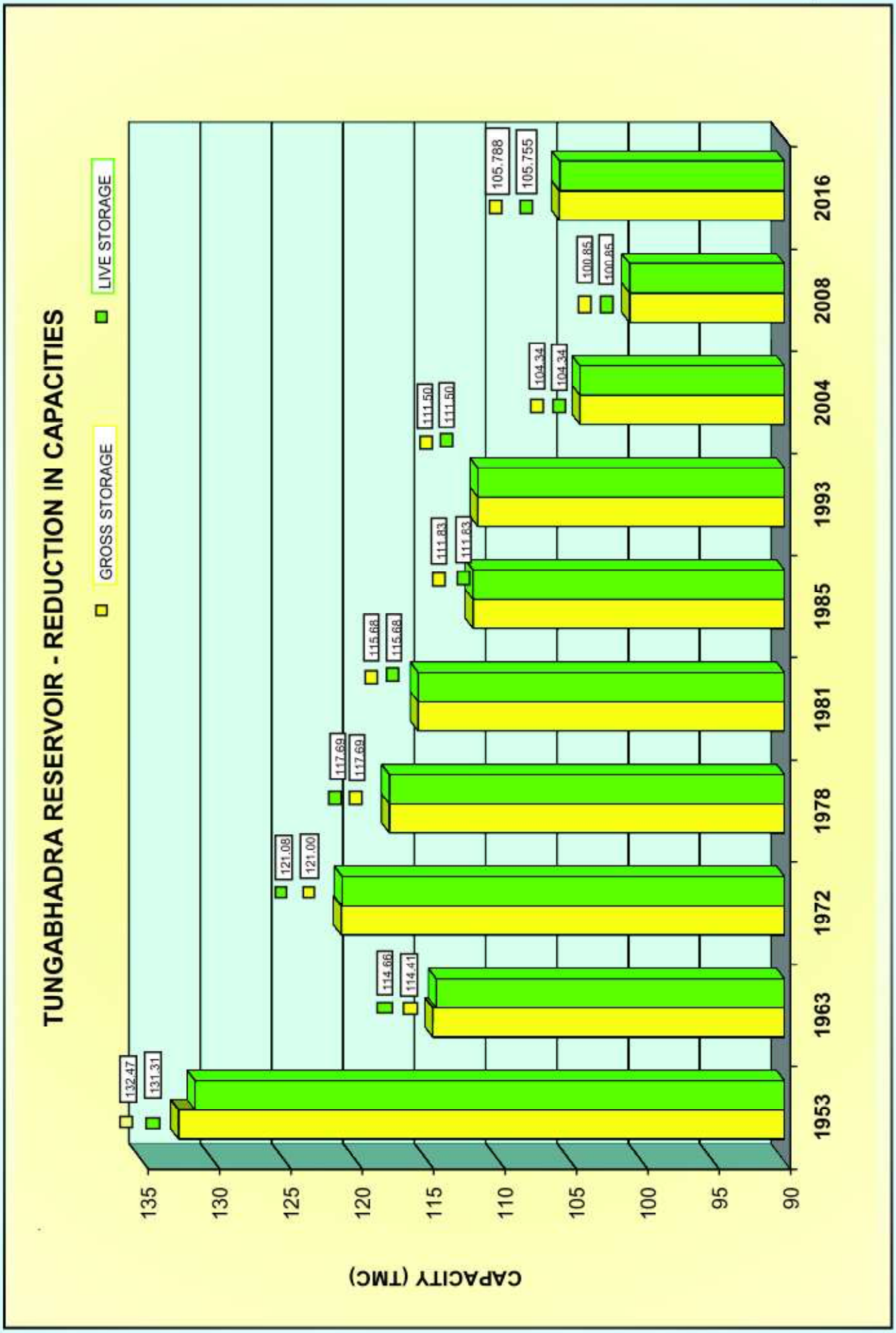

SHARE OF STATES AND ACTUAL DRAWALS
Year
Drawal of Karnataka
Share by Karnataka
Drawal of Andhra Pradesh
Share by Andhra Pradesh
Drawal of Telangana
Share by Telangana
1979-80
1980-81
1981-82
1982-83
1983-84
1984-85
1985-86
1986-87
1987-88
1988-89
1989-90
1990-91
1991-92
1992-93
1993-94
1994-95
1995-96
1996-97
1997-98
1998-99
1999-2000
2000-01
2001-02
2002-03
2003-04
2004-05
2005-06
2006-07
2007-08
2008-09
2009-10
2010-11
2011-12
2012-13
2013-14
2014-15
2015-16
2016-17
2017-18
2018-19
2019-20
2020-21

Figure 3.6


TUNGABHADRA RESERVOIR - REDUCTION IN CAPACITIES
GROSS STORAGE
LIVE STORAGE
CAPACITY (TMC)
135
130
125
120
115
110
105
100
95
90
1953
1963
1972
1978
1981
1985
1993
2004
2008
2016
132.47
131.31
121.08
121.00
117.68
117.69
115.68
115.68
114.66
114.41
111.83
111.83
111.50
111.50
104.34
104.34
100.85
100.85
105.788
105.755

MODERNIZATION OF RBLLC

MODERNIZATION OF RBLLC

MODERNIZATION OF RBLLC

MODERNIZATION OF RBLLC

MODERNIZATION OF RBLLC

POINTING WITH POLY IRONITE CERAMIC CEMENTITIOUS (PICC) TO THE PIER OF SPILLWAY

CONSTRUCTION OF STEEL SUPER PASSAGE AT KM 9.00 OF POWER CANAL

HYDRO POWER MANAGEMENT 4

4.1 INTRODUCTION

The Tungabhadra Hydro Electric Scheme (TBHES) of Tungabhadra Board comprises two power houses, one on the right bank at the foot of the Dam and another at Hampi, located 21 km from the Dam. Though the Scheme was sanctioned by the then Government of Madras in the year 1950, work on the Dam Power House was started in 1951 and that of Hampi Power House in 1956. The power generated by the two power houses on the right side is shared between Karnataka and Andhra Pradesh in the ratio of 20:80. Another power house located at the left bank of the Dam is under the control of Karnataka State. The hydro power generated on the left side is entirely utilized by Karnataka. The salient features of the power houses of the Tungabhadra project is at ***Annexure 1.2.***

4.2 RIGHT BANK DAM POWER HOUSE

The Right Bank Power House is located at the foot of the Dam. The gross head available at the Dam powerhouse for power generation varies from 13 to 26.8m. Four steel penstocks, each of 3.3m in diameter carry water from reservoir to generator turbines. In the first stage, two units each of 9 MW were commissioned on 26th January,1957 and 23rd May, 1957 respectively. The First unit Generators and indoor switch gears were supplied and erected by M/s Brown Bowery, Switzerland through Valkart & Bros, the Indian agents and Turbines with accessories by M/s Escherways Ltd., Switzerland through Kumara Dholi Engineering Works, Calcutta. The second Unit Generators, indoor switch gears and turbines accessories were supplied and erected by M/s. Hitachi Company Ltd, Tokyo, Japan. The two units each of 9 MW of second stage were commissioned on 26th February, 1964 and 17th June, 1964 respectively.

The total installed capacity of the Dam Power House is 36 MW with 4 units of 9 MW each.

As the main objective of the TB Project being irrigation, the electricity generation is dependent on the water releases made for irrigation in the RBLLC, RBHLC and river assistance to the RDS and K.C.Canal. Water releases vary from time to time as per the irrigation demands indented by the States. During rainy season, especially when the reservoir is nearing full level or is overflowing, generation at full capacity of 36 MW is done at the Dam power house, drawing water at the rate of 160.27 cumecs (5660 cusecs) with maximum differential head of 26.8 m.

4.3 HAMPI POWER HOUSE

The tailrace water of the Dam Power House is fed through the Power Canal to the fore bay located at Hampi, which has a storage capacity of 0.74 M cum with normal level of 463.1 m (1519 ft). Water from forebay is carried to power house through two pipe lines, each of 5.48m diameter and 868.3m in length. At the end of each penstock there is

a steel differential surge tank of 18.3m diameter with a height of 18.3m. Two penstock pipes each of 3.66m diameter with a maximum discharging capacity of 31.15 cumecs (1,100 cusecs) takes off through the surge tank diverting water to four turbines in the power house. Each penstock is provided with a 3.66 m butterfly valve & an air valve at surge tank end and 3.05 m butterfly valve & venturi meter at power house end.

The first unit of 9 MW was commissioned on 10th February 1958 and the second unit of 9 MW on 26th March 1958. The two units were supplied and erected by M/s Brown Bowery Company, Switzerland.

The remaining two units, each of 9 MW, were commissioned in April and July 1964 and were supplied and erected by M/s Hitachi Ltd., Tokyo, Japan. The total installed capacity of Hampi Power House is 36 MW.

As the discharge carrying capacity of the Power canal is limited to 70.79 cumecs (2,500 cusecs), the maximum generation at Hampi Power House is limited to 20 MW against an installed capacity of 36 MW. The generation at Hampi Power House is dependent on water discharge through Power Canal. The water discharged from Hampi Power House enters in to Gundlakere Lake and from there it is led into Right Bank Low Level Canal and Gundlakere escape.

During the months of May and June when the Right Bank Low Level Canal is closed or when the minimum drawdown level of 482.35m (1,582 ft) is reached, the power houses are being shut down.

4.4 BELLARY SUB-STATION

The Board has installed a 66 KV Sub-station at Bellary to evacuate part of Power Generated from the Dam and the Hampi Power Houses to Andhra Pradesh and Karnataka. The substation is not in operation since 2007. But circuit breakers, CT's, PT's, Feeder panels and structures exist in the substation which are in obsolete condition which is under the control of Executive Engineer, O & M Division, Dam Power House. The quarters (27 No's) are being maintained by the Executive Engineer, LLC Division, Bellary. The electricity consumption charges are being collected by the TBHES, TB Board.

4.5 HYDRO ELECTRIC WING OF BOARD

A Chief Engineer belonging to APGENCO heads the Hydro-Electric (HE) Wing of Board on part time basis. The Chief Engineer (Electricity, Projects), APGENCO, Vijayawada is the present part-time Chief Engineer of the HE Wing. A Superintending Engineer belonging to KPTCL heads the TBHES Circle located at TB Dam. There are two Divisions, one at TB Dam and the other at Hampi. These Divisions are headed by Executive Engineers of APGENCO cadre. There are 14 Deputy Executive Engineers (3 GoK + 11 GoAP). Other staff members are drawn from the APGENCO and KPTCL, in the proportion of 80:20. The Organization Chart of Hydro Electric Wing is at ***Annexure 4.1.***

4.6 FUNCTIONS

The HE Wing is responsible for generation of hydroelectricity, transmission of the hydro-power generated to Andhra Pradesh and Karnataka in the ratio of 80:20, and also to

take up special repairs & maintenance of the power houses, equipment and transmission & distribution of electric power in the Board's colony at TB Dam and Hampi Camp colony.

4.7 HYDRO-POWER GENERATION

Hydro-power generation has been going on at two power houses since commissioning of the plants, by utilizing water released for irrigation purposes. The power generated at both the power houses of Board is shared in the ratio of 80:20 between GoAP and GoK. The extra power used if any, by GoK/GoAP is paid by the KPTCL/APTRANSCO as the case may be.

The plant-wise generation achieved, auxiliary consumption, shares and utilizations by Andhra Pradesh and Karnataka for the last 14 years i.e., from 2007-2008 to 2020-2021 are furnished in **Annexure 4.2.** The details of power generated and generation cost per unit for the period from 2004-05 onwards are given in **Annexure 4.3**, from which it could seen that, the cost of generation per Unit during the last six years is as indicated below;

Year	Power Generation in Mu.	Cost of Power Generation (Paise)
2015-16	116.676	171.94
2016-17	80.365	292.84
2017-18	87.325	291.95
2018-19	134.670	181.05
2019-20	176.973	113.01
2020-21	173.118	126.44

The power generated and costs per unit of generation for the period from 1993-94 to 2020-21 are depicted in **figure 4.1.**

4.8 FINANCIAL PERFORMANCE

The budget allocation from 2015-16 to 2020-21 provided to HEW is as follows;

(Rupees in Lakhs)

Year	Voted grants	Expenditure
2015-16	2525.30	2006.18
2016-17	3040.71	2353.38
2017-18	3355.48	2549.44
2018-19	2730.38	2438.13
2019-20	2000.94	2000.00
2020-21	2188.91	2188.91

The expenditure towards establishment and other sharable expenses relating to previous years for which advises from the Accountant General, Andhra Pradesh, Vijayawada were received during 2020-21.

The expenditure on account of salaries of O&M staff, Civil Maintenance works of Colonies and maintenance works in both the powerhouses is met from the budget allocation under the head of account 272 maintenance & 070 work charged establishment. The allocation provided under this head of account has been utilized for salary component of O&M staff and only very essential maintenance works were taken up during the year 2020-21.

4.9 ROYALTY TO IRRIGATION WING OF TB BOARD

The Board in its 202nd meeting has revised the rates of royalty charges payable by HEW to Irrigation wing (IW) of TB Board from then existing rate of Rs. 212.00 per KW per year to Rs. 429.00 per KW per year with effect from the financial year 2012-13 and directed that the royalty charges may be

reviewed every five years as per previous decision of the Board.

Accordingly, the rates of Royalty charges payable by TBHES to irrigation department was reviewed during the 215th meeting of the Tungabhadra Board held on15th February, 2020 and the rate was fixed at Rs. 680.65 per KW year with effect from 01.04.2020 based on All India Consumer Price Index. The details of which are as given below;

Year	Revised rates/KW year Paisa
1996-97	134.89
2001-02	212.00
2012-13	429.00
2020-21	680.65

The Total Royalty charges for the year 2020-21 is Rs. 1,34,51,299/-.

The Fisheries Wing (FW) is supplied with power by HEW at generation cost. In the 165th meeting of the Board it was decided to revise the tariff rate chargeable to the Fisheries Wing every year, based on the average generation cost for preceding three years.

Accordingly, rates are being revised every year and the rate of energy consumption payable to HEW by the Fisheries Wing of TB Board for the last six years is as indicated below;

Year	Revised rates in (Paise)
2015-16	111.50
2016-17	128.20
2017-18	192.90
2018-19	252.24
2019-20	255.28
2020-21	195.33

4.10 RATE OF ELECTRICAL CONSUMPTION CHARGES APPLICABLE TO THE TB BOARD EMPLOYEES

The Board in its 216th meeting held on 22.10.2020, accorded approval for revision of electricity consumption charges applicable to all employees of the Board with effect from 01.01.2021 as follows.

	CATEGORY	REVISED RATES
1	APGENCO Employees	0.2% OF BASIC PAY
2	KEB Employees 0 - 200 Units/Month 200 – 280 Units/Month 280–400 Units/Month Above 400 Units/ Month	 Free 10 Paisa 50 Paisa AEH (LT2a) tariff of KPTCL+ Rs.20/- Minimum charges
3	TB Board Employees 01-30 units 31-100 units 101-200 units 200-300 units Above 300 units Minimum charges	 Rs. 1.90 Rs. 2.60 Rs. 3.40 Rs 3.90 Rs 7.80 Rs 60.00
4	Pensioners and Non-Board Employees & other Establishment	As per KPTCL Rates

Further, Board agreed to extend TBHES power supply to BSNL exchange office situated in TB Dam and to the Tirumala Iyengar Hall, Stalls, Amusement Park, dashing cars at Boating area which are leased to the private agencies by the TB Board as per the KPTCL rates under the Category-4 in the above table.

4.11 MAINTENANCE WORKS

Important repairs and maintenance works attended during the year are:

T.B. Dam Power House

* Replacement of damaged HT bushing & old LT bushings and filtration of transformer oil of 10.6 MVA generator transformer of Unit-4.

- Providing under water services for arresting leakages of intake gate and draft tube cut off gate pertaining to Unit-1,2 & 3.
- Removing of damaged draft tube cut-off gate (Size 15/20) by cutting and lifting from Unit-1 draft tube.
- Re-babbitting and machining of damaged / failed Turbine guide bearing of Stage-1 & 2 Units.
- Reconditioning and overhauling of distribution transformer (250KVA DTC-08 No's and 06 No's of 100KVA Distribution transformer) along with earth pits renovation in the TBHES distribution network pertaining to lines section, operation subdivision.
- Replacement of Turbine guide bearing, carbon segment seals and stuffing box and fabrication and erection of platform for check both runner blade and guide vane clearances for Unit-2.
- Repair and rewinding main exciter armature of stage-2 Units pertaining to indoor section, operation sub division.
- Replacement of stuffing box, TGB oil circulation pipe, Turbine guide bearing, carbon segment seals and inspection of runner blades of Unit-1 duly erecting the platform in the draft tube.
- Grinding and lapping of Unit-3 Turbine bearing runner.
- Manufacturing and supply of throat ring liner plates (as per sample) and repairs and reconditioning of 20 no's of wicket gates and its shafts of Unit-3.
- Outsourcing of maintenance works in Electrical & Mechanical sub divisions.
- Design, fabrication, supply, erection, testing and commissioning of 1 no Draft tube cut off gate (for stage-2).
- Attended bus shut down maintenance works at station outdoor yard.

Hampi Power House:

- Forebay maintenance works at Hampi power house.
- Carrying out certain repairs works to the gate, providing roller bearings along with its accessories to the gates and sand blasting & painting of existing intake gate/ stop log gate at forebay of Hampi power house.
- Outsourcing of maintenance works in Electrical & Mechanical sub divisions of Hampi power house.
- Units-I, III and IV Generator transformer's oil filtrations were carried out with the filter set of the contractor.
- Cleaning and painting of Generator stator air coolers.
- Cleaning of Generator transformer coolers.
- Attended Bus shut down works in station outdoor yard.

4.12 NEW MINI HYDEL POWER STATION

A. M/s. NCL Energy Ltd

Water is released from reservoir to the Right Bank High Level Canal through 10 high level sluices 6' x 12' size. Board decided to utilize the head and discharges available at 3 of these 10 sluices for power generation. Accordingly, a mini-Hydel power plant was contemplated to be setup in private sector under Built, Own, Operate and Transfer

(BOOT) basis. The Board identified an Independent Power Producer (IPP) M/s. NCL Energy Ltd., Hyderabad and permitted them to set up the plant. Tungabhadra Board has provided required land in RBHLC stilling basin to IPP on lease for a period of 30 years. The IPP will own the mini power house for 30 years from the date of commissioning and thereafter will transfer the ownership to Tungabhadra Board.

The power plant comprises 3 units of 2.75 MW capacity each. From the consideration of head and power draft horizontal Full Kaplan Turbine and synchronous generator was selected. The annual generation available with the installed capacity of 8.25 MW is estimated to be 27.93 million units. The total project capital cost was Rs. 22 crores.

As the power plant is located adjacent to the masonry dam and to keep the vibration level within the safe limit, the excavation works were carried out using controlled blasting techniques in technical collaboration with National Institute of Rock Mechanics, Kolar Gold Fields, Karnataka. The guidance of Central Water Commission was also obtained in this regard.

The Civil and Electrical works of the mini–Power Plant were completed in a record time of 8 months and the Units were commissioned and synchronized with the grid on the following dates.

* Unit – I Commissioned on 28.09.2004
* Unit – II Commissioned on 09.10.2004
* Unit – III Commissioned on 25.10.2004

The power generated from this mini powerhouse for the last six years are as indicated below.

Year	PowerGenerated (In million units)
2015-16	12.8913
2016-17	3.4320
2017-18	12.9723
2018-19	20.3694
2019-20	27.7173
2020-21	26.0690

Generated power purchased by transmission corporations are as indicated below:

Transmission Corporations	Rate of purchase of power
KPTCL	Rs.1.98 per unit for the first 20 years and Rs. 1.89 per unit for the balance 10 years, including 10% royalty charges payable to Board.
APTRANSCO	Rs.1.782 per unit for the first 20 years and Rs. 1.701 per unit for the balance 10 years, excluding royalty charges.

B. M/s. Khandaleru Power Company Ltd.

Water is released from reservoir to the Raya basavanna canal through a single sluice. Board decided to utilize the head and the discharge available at single vent of sluice for power generation. Accordingly, a mini-Hydel power plant was contemplated to be set up in Private sector under Built, Own, Operate and Transfer (BOOT) basis. Independent Power Producer (IPP) M/s Khandaleru Power Company limited; Hyderabad was permitted to set up the

plant. Tungabhadra Board has provided required land in Rayabasavanna Stilling Basin to IPP on lease for a period of 30 Years.

The power plant comprises a single unit of 1.4 MW capacity, from consideration of Head and Power, Horizontal full Kaplan Turbine and Synchronous Generator were selected.

The Annual Generation available with the installed capacity of 1.4MW is 7.19 MU. The total project capital cost was Rs.11.50 crores.

The project construction was started in September-2012 and commissioned in record time of 11 months i.e., 31.08.2013. The power generated from this mini powerhouse for the last six years are as indicated below.

Year	Power Generated (in million units)
2015-16	5.0443
2016-17	3.3910
2017-18	3.7935
2018-19	7.0003
2019-20	6.3642
2020-21	6.3249

Generated Power is purchased by GESCOM at the Rate of Rs.2.80/- per unit.

4.13 POWER GENERATION UNITS ON LEFT SIDE OF THE T.B. DAM

Similar to power generation units on the Right side of the dam, the following four units are working on Left side of the TB Dam, which are being maintained by KPTCL (GoK). The power generated from these units for the last five years as indicated below:

Year	Generation (MU)
2016-17	31.81
2017-18	49.29
2018-19	90.82
2019-20	97.04
2020-21	103.25

REMOVAL OF DRAFT TUBE CUTOFF GATE AT T.B DAM POWER HOUSE

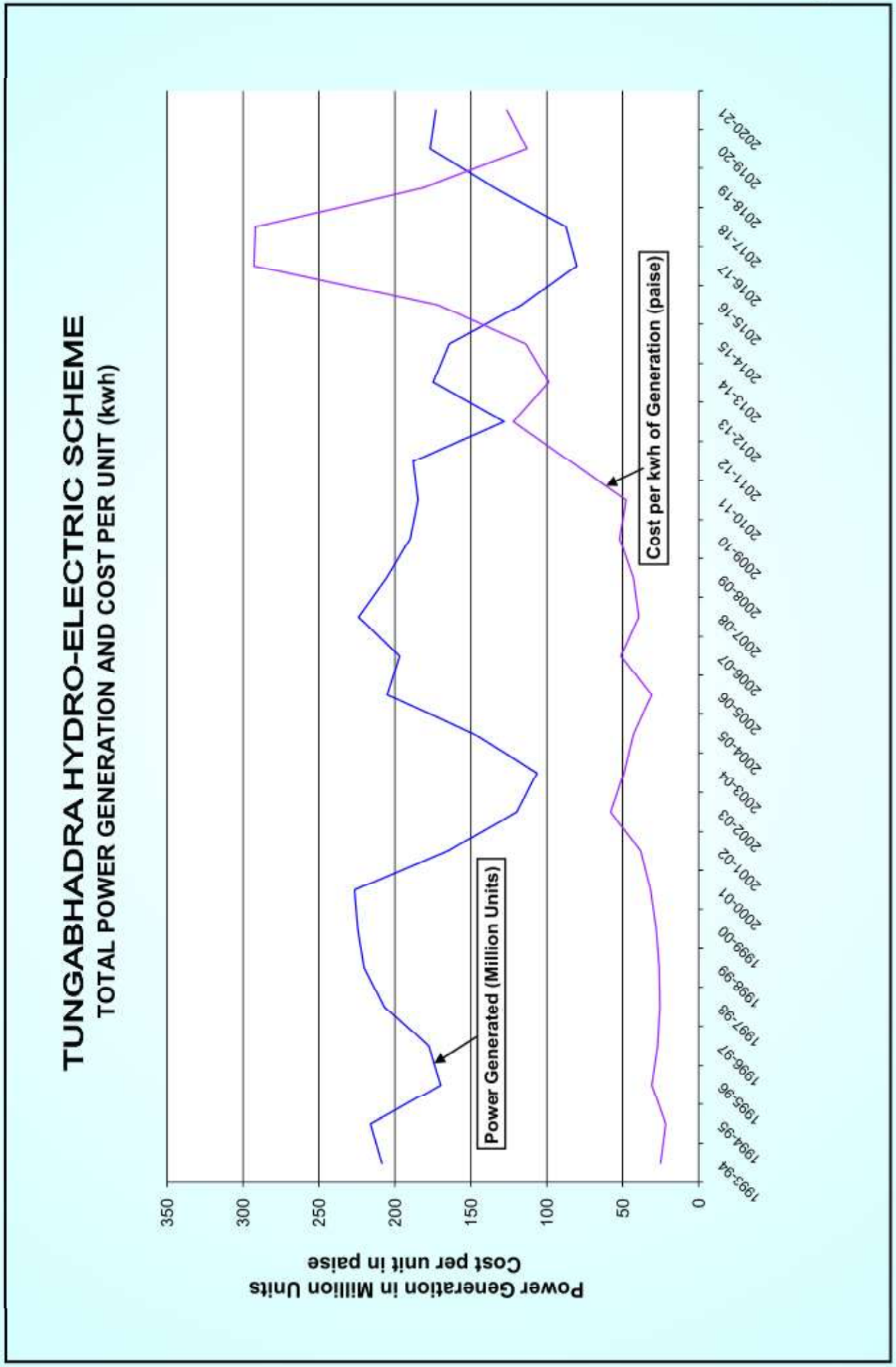
STAGE-I UNIT OVERHAULING WORKS AT DAM POWER HOUSE

INSPECTION OF UNIT -3 RUNNER BY SECRETARY, T.B.BOARD

OVERHAULING OF TURBINE AT HAMPI POWER HOUSE

INSPECTION OF SURGE TANK BY SECRETARY, TB BAORD

Figure 4.1


TUNGABHADRA HYDRO-ELECTRIC SCHEME
TOTAL POWER GENERATION AND COST PER UNIT (kwh)
Power Generation in Million Units
Cost per unit in paise
350
300
250
200
150
100
50
0
Power Generated (Million Units)
Cost per kwh of Generation (paise)
1993-94
1994-95
1995-96
1996-97
1997-98
1998-99
1999-00
2000-01
2001-02
2002-03
2003-04
2004-05
2005-06
2006-07
2007-08
2008-09
2009-10
2010-11
2011-12
2012-13
2013-14
2014-15
2015-16
2016-17
2017-18
2018-19
2019-20
2020-21

DEVELOPMENT OF FISHERIES 5

5.1 INTRODUCTION

Construction of the Tungabhadra dam has created a vast reservoir spread over an area of 378 sq km providing tremendous scope for development of fisheries for social upliftment of the people of the Region. The Board thus set up a fish farm for producing quality fish seeds for raising fishery wealth in the Tungabhadra reservoir and for sale to Government and private agencies in Karnataka and Andhra Pradesh. In addition, for the convenience of the fishermen of the area to facilitate preservation of fish catch, Board is also running an Ice-cum-Cold Storage Plant.

5.2 ORGANIZATION

Fisheries Wing (FW) consists of following four units.

- Fish Farm Unit (FFU)
- Reservoir Unit (RU)
- Ice Plant
- Aquarium

Organization Chart of Fisheries Wing is at ***Annexure 5.1***.

The Fisheries Unit works under the control of the Secretary, Tungabhadra Board. The Fisheries Development Officer (FDO) posted by Fisheries Department of GoK, looks after the day-to-day activities of the Wing. The staff of the Wing is drawn from GoAP and GoK in the ratio of 5:13 respectively.

5.3 FISH FARM

The Fish Farm was set up in the year 1959 in an area of 8.10 ha. This farm is having 20 earthen ponds of different sizes ranging from 15mx33m to 32mx80m and 87 cement ponds of size ranging from 3mx2m to 24mx12m. A glass jar hatchery with a capacity for hatching 50 lakhs eggs per cycle (5 days) was commissioned in the year 1982 and is non-functional since 2011 due old equipment's and machineries. Two Chinese / circular hatcheries were setup in the year 2011 with a capacity of 25 Lakhs eggs per cycle apart from two old Chinese / circular hatcheries each with a capacity of 15 lakhs of eggs per cycle which were constructed during the year 1992. The details of fish farm ponds are given below;

DETAILS OF FISH FARM PONDS

Brood Stock ponds	2.60 ha
Rearing & Nursery ponds.	1.60 ha
Water sedimentation ponds	0.20 ha
Breeding, hatching & conditioning ponds	0.20 ha
Total Water spread area of Farm	**4.60 ha**

The Fish Farm Unit (FFU) is producing spawn of major carp and common carp utilizing the parent stock (brood stock) raised in fish farm by hypophysation technique. This method induces the fish to release eggs in stagnant water by injecting pituitary hormone, which was first

introduced in the unit during 1962-63. The spawn so produced, apart from rearing further to fry stage and then to fingerling stage for supply are disposed off at spawn stage also. The FFU is a leading producer of Catla fish seed which is in great demand in the Region. It is ideal in respect of its location, design, maintenance of breeders, hatching facilities etc. The fishermen & aqua culturists of this area have great faith in the quality of seeds provided by FFU. Many undergraduate and post-graduate students of Zoology and Fisheries from various colleges pay visit to FFU every year as part of their practical training in fish culture and breeding aspects.

5.4 RESERVOIR UNIT

The fish wealth in the Tungabhadra Reservoir is auctioned to the Fishermen Co-operative Societies existing on the periphery of Reservoir.

The leasing of fishing rights of the Reservoir for the period from 01.10.2020 to 31.05.2021 was awarded to the M/s Koppal Fisheries Co-operative Society, Koppal for Rs.1,20,01,000/-.

5.5 ICE PLANT

Fish is a highly perishable commodity. Its preservation soon after its catch from the water is very essential. Icing the fresh fish is the simplest preservation method. In order to meet the ice demand of the fishermen, 5 ton capacity Ice Plant and 10 ton capacity cold storage plant were established in the year 1966. Again, in order to meet the ice demand of the fisherman 10 ton capacity of ice plant was established in the year 1986 as the earlier 5 ton capacity ice plant was non-functional due to long run which needs replacement. As there was no demand for the cold storage space, 10 ton cold storage plant machineries along with abandoned 5 ton ice plant machineries have been disposed off through public auction in the year 1995. The ice produced from present working 10 ton capacity plant is being marketed throughout the year, with its peak season falling between February and May.

5.6 THE AQUARIUM "PARNAJA"

As the Tungabhadra Project attracts large number of visitors annually, in order to inculcate the essence of aquatic lives in the visitors, an aquarium by name "Parnaja" was constructed in the Japanese Park at a cost of Rs.45.00 lakh and opened to the visitors during August, 1999. The aquarium with about 60 varieties of cultivable, indigenous and ornamental fish provides a feast to the eyes and relaxation to the mind. It also provides latest information on the aquatic lives to the inquisitive minds. The aquarium is constructed as a thematic building and equipped with modern aeration and filtration system to maintain good hygiene.

5.7 FINANCIAL CONSTRAINTS OF FISHERIES WING:

From the past few years, fisheries wing is not getting budgetary support from the Govt. of Andhra Pradesh. Due to this, fisheries wing is not able to carry out the

developmental activities and maintenance of the fish farm, ice plant and aquarium. In the 216th board meeting, it was decided that, the proposal for outsourcing the fish farms and ice factory in detail will be sent to both the State Governments for their views/comments and the reports submitted by the both Govts will be placed before the Board for further deliberation and decision. Accordingly, proposals were communicated to the both Governments. Their views /Comments will be placed before the next Board meeting.

5.8 FINANCIAL/ PHYSICAL PERFORMANCE

The physical performance of the Fish farm unit / Reservoir Unit and ice plant units of Fisheries wing from 2007-08 to 2020-21 is at ***Annexure 5.2.*** And the financial performance during last seven years is as given below;

(**Rupees in lakhs)**

Year	Budget Allocation	Expenditure	Receipts
2014-15	179.73	127.50	150.83
2015-16	179.73	117.36	143.18
2016-17	207.39	124.21	118.74
2017-18	215.49	124.79	125.89
2018-19	239.08	160.54	168.98
2019-20	140.87	149.64	152.31
2020-21	125.75	135.93	162.55

RELEASING OF FISH SEEDS IN TO T.B.RESERVOIR

FISH FARM VISIT BY SRI JAGMOHAN GUPTA, MEMBER GoI

INJECTING HORMONES FOR INDUCED BREEDING OF FISH

COLLECTION OF FISH SEEDS AT FISH FARM

FISH FARM VISIT BY DIRECTOR OF FISHERIES, GOVT OF KARNATAKA

HEALTH AND MEDICAL CARE 6

6.1 INTRODUCTION

Health and Medical Unit of the Board is taking medical care of Board's employees and is responsible for general sanitation of Board's colonies at TB Dam, Hampi and Bellary.

Dr. Kanakappa.Y, MBBS, MS General Surgeon holds the full charge of Health and Medical unit of TB Board Hospital at TB Dam & Hampi camp Dispensary since 12.07.2019.

6.2 ORGANIZATION

Health Officer Class-I (Jr.) is In-charge of the Unit. He is in the rank of Deputy Surgeon in Government of Karnataka. For assisting him in health activities there are two Health Inspectors one each from Andhra Pradesh and Karnataka for the effective discharge of the Public Health Activities i.e., one at Tungabhadra Board, TB Dam and another at Hampi Camp. There are two Civil Assistant Surgeons from Karnataka one each at the Project Hospital, TB Dam and at Dispensary, Hampi Camp. Further, there is one Lady Medical Officer in the rank of Civil Assistant Surgeon (Karnataka) in the Project Hospital, TB Dam. There are other para medical staff and ministerial staff in the Hospital and Dispensary. There are Health Mazdoors born on Workcharged and contingent establishment and they are treated as Board employees. The Organization chart of the Health and Medical Unit is at ***Annexure 6.1***.

6.3 FUNCTIONS

The important functions of the Unit are:

- General sanitation of colonies.
- Immunization programme for child health.
- Bacteriological and Chemical Examination of drinking water.
- Prevention of epidemics.
- Anti-Larval measures.
- Control of Dengue & Chikungunya
- National Malaria Eradication Programme.
- Medical facilities for outpatients and in patients.
- Minor operations.
- Family welfare measures and small family norms.
- X-Ray section
- Laboratory Section

6.4 ACTIVITIES OF PUBLIC HEALTH UNIT DURING THE YEAR 2020-21.

- **Measures taken in view of the Covid- 19 Pandemic:** In view of the Covid-19 Pandemic during March 2020, Health awareness campaigns were organized in TB Board Colonies by TB Board Hospital staff. Posters high lighting the importance of wearing masks & maintaining of social distance were exhibited at suitable locations in the office premises, colonies & public places to bring awareness in the employees & their families. Necessary masks & sanitizers were provided to all the Board

employees & action has been taken to sanitize the office premises and colonies regularly with sodium hypochlorite solution to prevent spread of infection. Also, Thermal Screening for the employees was made compulsory at the entrance of the office. Necessary measures were taken to detect and categorizing the Covid-19 patients as SARI, LRI on the basis of symptomatology and referring them to the nearest Covid-19 centers for further treatment.

- **Vital Statistics:** The District Statistical Officer Births & Deaths Registration office, Bellary had advised not to register Births & Deaths from 26.03.2017 onwards and hence registering Births & Deaths have been stopped there after.

  The children have been provided with DPT & Polio, T.T vaccines etc.

- **Cholera:** The Tungabhadra Board area is free from cholera and other epidemic diseases .

- **National Malaria Eradication Programme:** The Anti-Malaria drugs supplied by the District Malaria Officer, Bellary and Dist. Health & Family Welfare Officer, Bellary were given to all the fever cases duly collecting blood smear (samples) for all the fever cases under active and passive surveillance in the TB Board area. Malaria positive cases are treated with Radical Treatment by 4 Chloroquine and 8 Aminiquine Tablets for each case. General pathological investigations have also been carried out in this Hospital during 2020-21.

- **Spraying:** Malathion 50 EC has been used for Spraying, Fogging and for controlling adult Mosquitoes. Temephos 50 EC is also used for spraying and controlling mosquitoes and to kill the Larvae of the Mosquito in the TB Board colonies in the TB Dam / Hampi Camp / Toranagallu and Bellary. This has been sprayed on the water surface area as a measure of Anti Larval Operations. Responsar insecticide is also used for destroying mosquitoes, cockroaches and flies of indoors.

- **Bacteriological and Chemical analysis of water:** The water samples of TB Dam and Hampi Camp were sent periodically for conducting Bacteriological and Chemical analysis at Public Health Institute, Bangalore & Gulbarga during the year 2020-21. The Drinking water samples from TB Dam & HPC have been sent for Chemical & Bacteriological examination once in every 3 months.

- **General sanitations:** TB Dam / Hampi Camp Colonies are kept clean and tidy. The drains are cleaned on alternate days, apart from the sanitation. Malathion 50 EC is used for controlling the adult mosquitoes. Regular sanitation works were carried out during the year 2020-21. Removal of Juli flora and parthenium weed has been cleared off during the year 2020-21 on job work basis.

- **Immunization:** Since, there is no supply of vaccines from Taluk Health Officer, Hospet, children were not immunized during the year 2020-21 by the hospital.

6.5 TBP HOSPITAL, TB DAM & HPH DISPENSARY

Activities of the Medical Unit of the TBP Hospital, TB Dam and TBHES Dispensary, Hampi Camp during the year 2020-21 are as given below;

TBP Hospital, TB Dam

- Out patient Department – Nearly 34377 outpatients and 126 in-patients were treated during the year 2020-21.
- 15 TB Board Employees and 111 Non Board persons were treated as inpatients in the Hospital during the year 2020-21.
- Family Welfare Programme – All the couples in the TB Board area were advised to adopt small family welfare norms.

TBHES Dispensary, Hampi Camp

- Outpatient Department – Nearly 4668 outpatients were treated during the year 2020-21.
- Inpatients are not treated in the TBHES dispensary, Hampi Camp.

6.6 AMBULANCE SERVICES AT TBP HOSPITAL, TB DAM

A New ambulance was purchased during the month of May 2019 and is being used for the benefit of the patients.

6.7 X-RAY SECTION

The X-ray section is being maintained by the Hospital. During the year 2020-21, 159 X-rays have been taken and out of which 82 are Male and 77 are female.

6.8 LABORATORY SECTION

The laboratory section is being maintained by the Hospital authorities. Tests like HB, CBC, BT, CT, Blood sugar, Renal function test, Lipid profile, Liver function test and other Hematological tests are routinely conducted in the lab by semi auto analyzer. The total number of tests done during the year 2020-21 is 542 out of which 240 are Male, 292 are female and 10 are children.

6.9 OPERATION AND MAINTENANCE BY THE DIFFERENT UNITS

One Health Inspector each were working in TB Dam and Hampi Camp for Health & sanitation work and for smooth functioning of the scheme.

6.10 FINANCIAL PERFORMANCE

The budget for the Health and Medical activities at TB Dam, Torangallu and Bellary is provided under Irrigation wing of TB Board, whereas for Hampi Camp is provided under TBHES wing. The financial performance for the last seven years is indicated below-

(Rupees in Lakhs)

Year	Wing	Budget allocation	Expenditure incurred
2014-15	Health	55.51	173.66
	Medical	42.38	41.25
2015-16	Health	86.92	175.93
	Medical	62.78	48.21
2016-17	Health	108.86	177.75
	Medical	80.85	62.38
2017-18	Health	139.06	169.67
	Medical	86.52	65.90
2018-19	Health	140.66	281.38
	Medical	87.12	72.51
2019-20	Health	142.68	103.91
	Medical	76.26	71.81
2020-21	Health	133.97	123.69
	Medical	55.72	61.46

INAUGURATION OF NEW HOSPITAL BUILDING BY SRI RANGA REDDY, CHAIRMAN & SRI C.NARAYAN REDDY, ENC & MEMBER A.P

COVID-19 VACCINATION PROGRAMME AT TBP HOSPITAL

OUTPATIENTS VISIT AT T.B.PROJECT HOSPITAL

LAB AND X-RAY FACILITY AT TBP HOSPITAL

DOCTOR'S VISIT TO LABOUR CAMPS ON CANAL DURING COVID PANDEMIC

PARKS AND GARDENS - A TOURIST ATTRACTION 7

7.1 INTRODUCTION

The Tungabhadra Gardens in the downstream of Dam area is the main source of attraction for the tourist/visitors, who are visiting TB Dam. It is one of the oldest and biggest existing gardens since 1956 in the North Karnataka area. About more than 5 lakhs tourists/visitors are visiting the gardens annually, out of 10 to 12 lakh visitors who are visiting the TB Dam. Due to COVID-19 Pandemic, visitors are decreased as the garden was closed for visiting for public due to lockdown restrictions. The Garden Unit (GU) under the Irrigation Wing is incharge of all Horticulture activities in the Dam area, colonies and canal banks under the jurisdiction of the TB Board. It is also responsible for the development and maintenance of plant wealth in the Board's area.

7.2 ORGANIZATION

The Senior Assistant Director of Horticulture who has been deputed from the Department of Horticulture, GoK is working as Superintendent of Gardens in TB Board. He is looking after all the technical/scientific matters of Garden Unit. The Garden Unit was upgraded in the year 1999 vide 167th Board meeting, on par with Sub Divisional Officer, until then it was acting as a Garden section office.

Superintendent of Gardens of Garden Unit is assisted by one Assistant Horticulture Officer in Horticulture activities and one Section Officer for civil works of the Garden Unit. For administrative, accounting and execution of the works, the Garden Unit is functioning as a Sub Division under the Administrative and financial control of Executive Engineer, HW & HLC Division, TB Board, TB Dam.

7.3 TASKS

The tasks of the Garden Unit are given below:

- To maintain the existing parks, gardens and Children's park.
- To maintain still fountains, Musical Dancing Fountains.
- To maintain Boating Pond, vehicle parking, Garden Entrance fee collection etc.,
- To maintain the TB Dam Mini Zoo and Aviary.
- To maintain the Mini Bus facility, Canteens, Toilets etc.,
- To maintain canal plantations, woodlots and Vaikunta Guest House hillock plantations;
- To rejuvenate existing lawns in various parks and gardens of the Board;
- To raise new plantation in vacant land of the Board
- To raise seasonal and annual flower beds in parks and gardens and to make floral arrangement;
- To raise the new plantation in vacant lands of TB Board; and
- To maintain Gardens at Hampi Power House colony.

7.4 PARKS AND GARDENS

Since completion of the Dam, the Board has developed and maintained many parks, gardens at downstream of the Dam, plantation adjacent to canals and in the TB Dam colonies on the right side. These gardens are attracting many tourists. A brief description of the important parks and gardens, maintained by the Board is given as below;

I. NANDANAVANA

Nandanavana was developed during the year 1956-57 soon after completion of the Dam. This garden is located just below the Dam running parallel to it. It has an area of about 2.43 ha and is designed and developed on the lines of Brindavan Gardens at Krishna Raja Sagar Dam near Mysore. It is well laid with four terraces at different elevations. The first terrace is housing circular type fountain with a Nandi statue at the center. All terraces are provided with fountains of various designs, with different colour lights running parallel and perpendicular to the layout of the garden. At the end of the last terrace lord Shiva statue is placed at the top of the artificially created hillock. A water fall is also provided utilizing the height of the hillock. This garden has well maintained lawns, lantana on the slopes, seasonal and annual flower beds, Chirstmas trees, cypress plants and topiary arches.

II. JAPANESE PARK

Japanese Park was developed in the year 1968-69 with a total area of 7.29 ha and is located adjacent to Nandanavana garden. It has 3 water ponds. Namely mango shaped Pond, bean shaped pond and children peddle pond. This park has arches, ornamental flowering trees, flower beds, well laid out lawns, etc., Play facilities to the children are provided in the park. A musical dancing fountain and aquarium are also located in this park.

III. VAIKUNTA GUEST HOUSE GARDEN

Garden at Vaikunta Guest House was developed during the year 1960-61. It is a formal garden with well-designed fountains, flower beds, topiary arches, flowering trees, aesthetically cut lawns etc.,

IV. CHAKRAVANA AND TRIVENI BAGH

A Circular Park called as CHAKRAVANA and a triangular park called as TRIVENI BAGH are located in front of the Administrative Building. They are developed at the time of construction of the Dam. It is also a formal garden with lawns, flowering trees, shrubs, arches etc. In the centre of the Chakravana the concept of " GOVARDHANA GIRI GOPALA" art is created. It is provided with jet and flower fountains with colourful lights. The concept is suitably illuminated. The entire periphery of the Chakravana is provided with ornamental grill which provides protection apart from looking beautiful.

Flag hoisting on Independence Day and Republic Day will be carried out every year by the Secretary, TB Board at TRIVENI BAGH.

V. PLANTATION

As a mark of World Environment Day, Garden Wing has developed tree plantations by planting about 4000 plants in TB Board vacant

areas to safeguard the Board land as well as for enriching the greenery as a mark of minor contribution in reducing the Global Warming.

VI. BOATING FACILITY

During 2010-11, the Boating facility in pond of 200 x 90 Mtrs size was created at old TSP yard with beautified surrounding area. Later on, it has been renovated during 2012-13 and has been made available to tourists visiting the gardens. It is further renovated and beautified by providing SS railing, light poles and LED lamps around the pond. There is a small refreshment counter providing coffee, Tea and snakes for the visitors. This year the boating pond is more beautified by providing turffing (lawn) on sloping sides of pond area which enhanced the beauty of the pond with lush greenery around the pond.

VII. ROSE GARDEN

A new rose garden with about 500 rose plants was established by the side of Japanese park in 2001. The rose garden has verities of blooming plants aesthetically arranged.

7.5 NEW INITIATIVES: AMUSEMENT PARK & DASHING CARS

The Garden unit has taken up the following new works in the vacant place of Garden area of TB Board on PPP model as a part of Tourist attraction.

a) Amusement Park for children in vacant place of Garden area of TB Board for the period from 01.01.2021 to 31.12.2027 @ Rs.1,51,200/- per month payable to the TB Board.

b) Dashing Cars for children in vacant place of Garden area of TB Board for the period from 01.01.2021 to 31.12.2027 @ Rs.1,51,200/- per month payable to the TB Board.

c) Water Park in vacant place of Garden area of TB Board for the period from 01.01.2021 to 31.12.2027 @ Rs.90,480/- per month payable to the TB Board.

7.6 OTHER ATTRACTIONS

The gardens, parks and lush green surroundings of the Dam attracts a lot of visitors every year. In addition to the parks and gardens the visitors are much fascinated by seeing and enjoying the Aquarium, Musical Dancing Fountain, Mini Zoo, Aviary and Children's park.

I. MUSICAL DANCING FOUNTAIN

A set of fountains dancing to the rhythm of the music with varying colour lights using the state of art technology has been provided as a source of attraction and entertainment to the visitors. The musical dancing fountain was constructed in the year 1992 in the Japanese Park. The computerized operation to synchronize with the music was introduced in 1999 the reverberating music, fascinating colourful lights and vivacious fall of Water droplets dancing to the tune of music from the fountains take away the stress of the mind and offers full recreation to the young and old people alike. The visitors assemble around to enjoy the fountain as soon as the dusk falls. Musical Dancing Fountain (MDF) is surrounded by Avenue plant groves. All these Avenue plant groves are highlihted by providing RGB focus lights to enhance the beauty of the Garden. This made the Vicinity of MDF is more pleasing, colourful and beautiful.

II. TB DAM MINI ZOO

The TB Dam Mini Zoo is located by the side of Japanese Park. It was developed in the year 1982, in an area of about 6.07 ha. At present, it has got about 168 spotted deers and 23 black bucks.

III. AVIARY

A small aviary is housed near the Rose Garden and was developed in the year 1989. Presently, it has 5 Peafowls. An additional Aviary cell has been constructed during 2013-14 to accommodate new variety of birds.

IV. CHILDREN'S PARK

Children's park is located in the township area of TB Dam on the main road and was developed during 1984. It has got varieties of sea-saws, bars, swings and other items for children.

V. VERMI CULTURE COMPOST UNIT

The Gardens are known for their healthy atmosphere and as a result many people wish to spend more time in the Gardens. But the use of inorganic fertilizers and plant protection chemicals for day to day maintenance adversely affected healthy environment of gardens. In order to keep the garden free from pollution and at the same time to provide eco-friendly manure for the health of the plants, Garden Unit has established vermi culture compost units in the TB Dam Garden. The establishment and production of vermi culture compost unit has resulted in beneficial use of garden waste as well as other biologically degradable waste from TB Dam colony.

7.7 IMPLEMENTATION OF 'SWACHH BHARAT ABHIYAN'

As part of 'Swachh Bharat Abhiyan' a Nationwide programme, the Garden Wing has taken up 'Cleanliness Campaign' at regular intervals in and around TB Dam with the active participation of the TB Board staff with the objective to promote the cleanliness awareness among the public.

7.8 PUBLIC AMENITIES TO VISITORS

Tungabhadra Dam, being 6 km away from the Taluk headquarters Hosapete, is well connected by rail and road. The National Highways 13 and 63 pass through TB Dam. In addition to the Vaikunta Guest House and Inspection Bungalow maintained by the Board, dormitory accommodation is provided in M.S Tirumala Iyengar Hall for the visitors. Further, there is accommodation provided by Karnataka State Tourism Development Corporation. The Board for the benefit of common visitors provided a free tourist shelter at the main entrance of TB Dam with facilities like canteen, cloak room, beverages / bakery items and bath & toilets rooms etc. The salubrious climate, beautiful surroundings, variety of attractions including amenities available in the gardens and parks attract the visitors and they happily pay repeated visits year after year.

7.9 MINI BUS FACILITY

Mini Bus facility has been provided to the tourists to enable them to enjoy stress free journey in the site seeing, the beauty of the TB Dam, Gardens and places like Vaikunta Guest House, Dam Model house,

Boating Pond area at a cost of Rs.20/- for adults and Rs.10/- for children.

7.10 ENTRY FEE FOR GARDENS/ VEHICLE PARKING

The Board in its 215th meeting held on 15th February 2020, decided to enhance the entry fee for gardens and vehicle parking fee with effect from 01.04.2020 at the following rates

I) Entry Fee for Gardens

Sl.No	Garden Entrance fee	Existing Rates (Rs.)	Enhanced rates (Rs.)
1	Adults	20.00	25.00
2	College Students (PUC and above) Visiting on education tour	10.00	15.00
3	Children above 5 years and below 15 years	10.00	10.00
4	Children below 5 years of age and the primary school children visiting the Garden sunder "Chinnara Karnataka Darshan" programme as per the GO of GoK.	No Entry fee	No Entry fee

II) Vehicle Parking fee

Sl. No	Category of Vehicle (PerDay)	Existing Rates (Rs.)	Enhanced rates (Rs.)
1	Bus,Truck,Mini Bus, Van and such other heavy vehicles	40.00	60.00
2	Tractor, Car, Jeep and other such other light Vehicles	20.00	30.00
3	Auto Rickshaw	10.00	20.00
4	Two wheeler	10.00	10.00
5	Cycle	2.00	free

7.11 REVENUE FOR THE LAST SEVEN YEARS FROM GARDEN UNIT

Year	Amount (in Rs.)
2014-15	57,11,888
2015-16	1,00,27,796
2016-17	1,02,98,577
2017-18	1,13,71,380
2018-19	1,40,83,091
2019-20	1,68,66,086
2020-21	77,37,703

7.12 SOURCE OF REVENUE GENERATED DURING 2020-21

Sl. No	Particulars of source of revenue	Amount In Rs.
1	Garden entry fee from Tourists.	29,75,001
2	Garden Entry fee collected by TB Board	16,04,550
3	Vehicle parking fee from Tourists.	5,01,990
4	Mini Bus Service to the Tourists.	8,47,500
5	Kiddy hand pedal boating in Japanese garden.	85,554
6	Boating facility by using pedal Boats for Tourists.	90,000
7	9D VR cinema show in Japanese Garden.	8,058
8	Canteen in TB Dam Japanese Garden Near musical Dancing Fountain and Fish Aquarium.	33,340
9	Shop for selling of Bakery items and chats etc., near main entrance left side Public Amenity Building TB Dam.	2,600
10	Canteen to Sell refreshment items in children's pedal boating premises.	4,040
11	BMI Electronic Weighing Machine Near Fish Aquarium.	5,500
12	Coin operated weighing machine near Aquarium and Public Amenity Centre at Main entrance gate.	8,050
13	Amusement Park for children	6,04,800
14	Dashing car	6,04,800
15	Water park in vacant place of Garden	3,61,920
GRAND TOTAL		77,37,703

GARDEN ATTRACTIONS

GARDEN ATTRACTIONS

DASHING CARS AND AMUSEMENT PARK DEVELOPED ON PPP MODEL

BOATING FACILITY AT TB DAM GARDENS

ACTIVITIES OF SWACH BHARAT ABHYAAN

ACTIVITIES OF SWACH BHARAT ABHYAAN

A VISIT TO AQUARIUM "PARNAJA"
BY SRI JAGMOHAN GUPTA, JS & FA, MEMBER, GoI.

VISIT TO TB DAM PARKS AND GARDENS BY SRI JAGMOHAN GUPTA, MEMBER, GoI.

PLATATION AT TB GARDEN BY
SRI JAGMOHAN GUPTA, MEMBER, GoI.

PLATATION AT TB GARDEN BY
SRI NAGAMOHAN, SECRETARY, TB BOARD

SECURITY SYSTEM

8

8.1 INTRODUCTION

The Security Section is in charge of the overall security of various structures, installations, canals and colonies maintained by the Board. Even though the Board has the status of a State Government with regard to the operation and maintenance of the project within the limits of the Board, it has no police staff of its own to deal with the law breakers, criminals, etc. Also, it has no judicial powers to punish anyone taking water without authorization either from the reservoir or all along the canals maintained by the Board. For these matters, the local revenue and police authorities of Karnataka assist the Board.

8.2 ORGANIZATION

The Secretary, Tungabhadra Board is also designated as Chief Security Officer and the Assistant Secretary as Security Officer. The Security Section functions under the direction of Chief Security Officer. Four Assistant Security Officers and four Head Constables assist the Security Officer. These posts are filled through deputation from the Police Department, Government of Karnataka.

The Board in its 213rd meeting held on 27.12.2018 at Hyderabad decided to go for the Karnataka State Industrial Security Force (KSISF) for Tungabhadra Dam, Power Houses (TB Dam & HPC), Dam Gate, & Canals (HLC & LLC). Tungabhadra Board had requested to deploy 52 personnel initially (i.e., PSI 02, HC 10 & PC 40) for an initial period of five year under phase-I. Accordingly 33 Nos., of KSISF personnel have joined in Tungabhadra Board.

Subsequently, the 29 Nos ., of DAR Police and 08 Nos., Civil Police were relieved and repatriated to Office of the Superintendent of Police, Ballari on 30.04.2021. In addition to the above, Private Security Agency is entrusted with watch & ward of vulnerable areas on the Canals, Office premises, Board Colonies etc.

The Organization Chart of Security Section is at **Annexure 8.1**.

8.3 FUNCTIONS

The Security staff has been assigned with the following duties:

- To check entry of visitors in the restricted areas.
- To perform day and night patrolling duties.
- To carryout night checking of security guards, night watchmen and private security guards.
- To collect intelligence information regarding activities against the interest of the Board.

- To take part in prevention of TB Board land encroachment / unauthorized occupations etc., in the Board's colonies.
- To carryout special work of investigation on complaints.
- To render assistance to the Officers in the issue of passes for vehicles, visitors, tourists, etc and
- To perform any other duties assigned by the Chief Security Officer.

8.4 SECURITY OF DAM AND POWER HOUSES

The Dam and the Power Houses situated on the right and left banks of the river and at Hampi have National importance. Realizing the need to provide security at these places, GoK approved Industrial Security Scheme covering this installation vide Order No HD 68 SGD 63 dated 10.05.1963. This scheme has laid down detailed security instructions. The then Sub-Station at Bellary also came under the Industrial Security Scheme since 1973 vide GoK Order No HDIS/SCD 73 dated 27.09.1973. This was completely revised and a fresh Scheme was approved by GoK vide their Order No HD 779 SST 81 dated 25.11.1981. The Dam, the three power houses and the Sub-Station at Bellary have been declared as prohibited places by the GoK. Under the Industrial Security Scheme, five security posts have been established at the following locations:

- Left Bank gate of Dam
- Right Bank gate of Dam
- Left Bank Power House, Munirabad
- Right Bank Dam Power House
- Right Bank Hampi Power House

The Left Bank gate of Dam security post is manned by the personnel of the District Armed Reserve (DAR) guards, who are deputed by the Superintendent of Police, Koppal, GoK and the expenditure for their deployment at the Left bank gate of the Dam is borne by the KNNL, Munirabad.

The Right Bank gate of Dam security post is manned by the personnel of KSISF, who are deputed from Government of Karnataka. The expenditure for their deployment at the Right bank gate of the Dam, Right bank Dam Power House and Hampi Power House and canals (HLC & LLC) is borne by the TB Board. For the left bank power house, the expenditure is directly paid by KPCL to the Police Department.

8.5 SECURITY OF CANALS

Many a times farmers resort to forcible excess drawals of canal water and also damage Board's properties, thereby disturbing water management and disrupting the entire irrigation system. To prevent such activities and also to give protection to its staff in safeguarding various structures on the canals from vandalism and damage, Government of Karnataka and Andhra Pradesh were requested by the Board to declare certain areas around these structures as prohibited areas. Government of

Karnataka vide their notification No. HD/268/ SST/95 dated 17.10.1997 has declared 140 such structures falling within the territory of Karnataka as prohibited areas. Arrangements are already made to restrict the movement of general public in these prohibited areas.

The number of KSISF Personnel were proposed to deploy on different security posts as below.

Security Post	PSI	HC	PC
A) TB Dam Dam/DPH/HPH/Colonies/HLC Km. 0 to km. 40 & Power canal	01	05	20
B) Bellary HLC Km. 40 to km.105 LLC Km. 0 to km. 250 & Colonies	01	05	20

8.6 OTHER SECURITY INTERESTS

Government of Karnataka has established a regular police station at TB Dam under the control of one Sub-Inspector, which is catering to the requirement of the Board and its employees living in the colonies at TB Dam.

The Board in its 135th meeting held on 06.05.1989 decided to entrust the job of watch and ward of vulnerable areas, office premises, stores, etc., to private security agency as the watchmen employed by the Board were insufficient. Accordingly, a private security agency M/s Professional Security Service, Bangalore was engaged for the security of the drainage gallery, office premises, rounding Official colony, rounding Hampi camp colony etc., with effect from 16th January, 1997. During the year 2019-20, a private security agency M/s. Security & Intelligence Service (India Limited), Hosapete has engaged 89 male security guards, 2 women Security guards, 2 Security Supervisors and 2 Security Drivers. As advised by Central & State Intelligence Bureau, 22 Cameras were installed at vulnerable / sensitive places and also Hand Held Metal Detector (HHMD) & Door Frame Metal Detectors are provided for the safety & security of the vital installations and monitored daily by Security Section of Tungabhadra Board.

8.7 FINANCIAL PERFORMANCE

The Budget of the Security Section is included in the Irrigation Branch grant. Irrigation wing of the Board will fix-up the private security agency once in two years by calling open tenders and the total expenditure is initially borne by Irrigation wing of the TB Board. Later on the expenditure incurred is shared between the Irrigation wing and TBHES wing of TB Board appropriately. The expenditure of Security Section (excluding the expenditure of Private Security Agency) incurred during the year 2020-21 is Rs. 72.99 lakhs.

8.8 PHYSICAL PERFORMANCE

The routine duties assigned to the Security staff were accomplished. Vigilance to safeguard the properties of the Board was increased. As advised by the Police Department, Government of Karnataka the movement of vehicles nearer to the Dam has been stopped and pedestrian visitors were only allowed to go near the Dam.

DEPLOYMENT OF KSISF PERSONNEL ON TB DAM

DEPLOYMENT OF KSISF PERSONNEL ON TB DAM

COMPREHENSIVE DAM SAFETY PROGRAMME 9

9.1 Latest Dam Safety Review Panel Inspection.

The Government of Karnataka has reconstituted the Dam Safety Review Panel (DSRP) vide GO No:WRD:10:DSP:2011 Bangalore dated 27.04.2012 to evaluate the safety of existing large Dams of Major, Medium and Minor Irrigation Projects of the State of Karnataka once in 10 years for effective monitoring of safety aspects of large dams in operation.

The State DSRP team headed by Sri. S.B Koimattur, Vice Chairman, DSRP has inspected the Tungabhadra Dam on 20th February 2015. The Review and recommendations of DSRP and follow-up action by the Project authority is as given below.

Sl.No	Review and Recommendations of DSRP	Follow-up action by the project authorities
3.3.5		
1	Obtain approval of CWC, New Delhi for the PMF discharge of 29600 Cumecs (10.45 Lakh Cusecs) as the design discharge for providing the capacity of surplussing works.	Chief Engineer, SPMU-DRIP, Bangalore requested to CWC, Hydrology (DSR), New Delhi to review the Revised Design flood (PMF) of TB Dam. Once it is received it will be sent for the approval of CWC, New Delhi.
2	Plan out an integrated strategy of structural and non-structural measures for negotiating the revised design flood before finalizing the auxiliary spillway capacity and additional bays required.	Detailed Project report on comprehensive safety of Tungabhadra Dam submitted by M/S Aarvee Associates Architects Engineers & Consultants Pvt. Ltd., Hyderabad includes integrated strategy of structural and non-structural measures for negotiating the revised design flood. The above issues are discussed in the 207th Tungabhadra Board meeting held at Hyderabad on 01.08.2015 and decided as follows "The issue of providing additional spillway can be taken up separately at a later date as such a construction will require a substantial time and farmers may not be ready to compromise without water for two crop seasons. Respective State Governments may come up with the consent on the issue of construction of additional spillway and the cost and time factor as per

		the provisions in the project report prepared by consultant. Till such time, essential repairs and non-structural measures may be put in place by way of forecasting of inflows and also pre depletion of reservoir as per the requirements. Secretary informed that the DPR has been examined by the CWC including Hydrology expert of CWC. CWC is of the opinion that since the health of the dam is good as such regular maintenance should be focused upon. There is no need for any comprehensive repairs".
3	Develop Rule curves, taking into consideration loss of storage owing to sedimentation in the reservoir, for reservoir operation during significant floods including HOF and PMF by routing of these floods without exceeding MWL 497.74 m (1633 ft)	Presently gate operation is being carried out as per the CWC Operation schedule. The KERS, KRS has prepared & submitted the Rule curve of TB Dam considering the 2008 Survey Report of TB Reservoir.
4	Determine maximum Free-board required of the dam adopting Saville's method of analysis and provide top level of dam accordingly.	The preparation of DPR of Tungabhadra Dam was entrusted to M/S Aarvee Associates Architects Engineers & Consultants Pvt. Ltd., Hyderabad. The agency has analyzed free board based on design wind velocity of 65kmph with no rise in MWL and found that present top level of masonry dam is adequate. For additional flood due to PMF, auxiliary spillway is a better solution since with no rise in MWL, the present top level of masonry dam is adequate, Composite dam raised by 0.950 m. if auxiliary spillway is located at the site of the present earth dam, shortage of free board for earth dam is not a consideration, since earth dam will be removed and replaced by spillway. The above issues were discussed in the 207th Tungabhadra Board meeting held at Hyderabad dated 01.08.2015 and decided as mentioned at Sl.No.2 above.

5	Carryout Hydrographic surveys (Integrated Bathymetry system) of the reservoir periodically for determination of extent of reservoir sedimentation in dead and live storage portions to assess the extent of loss of storage and consequent reduction in the annual benefits to help formulate schemes for minimization of rate of sedimentation such as adoption of watershed management techniques like contour bunding, provision of gully traps, anti soil erosion measures, etc.	Topographical survey was carried out in the year 2016 by M/S Aarvee Associates Architects Engineers & Consultants Pvt. Ltd., Hyderabad and submitted the report. The outcome of the survey is 105.788TMC with an increase in the storage capacity against previous Hydrographical Survey of 100.855TMC. The same was discussed in the 213th, 214th, 215th, 216th, Board meetings & Members of three states are given their opinions and approval is awaited from TB Board.
6	The reservoir operation schedules should be developed for the existing capacity of the reservoir after siltation and adopting the procedure outlined in IS 7323-1994 or its latest version.	Presently gate operation is being carried out as per the CWC Operation schedule. Reservoir operation schedule will be developed after above siltation studies are finalized. Recently TB Board has addressed a letter to CWC requesting to prepare the Flood operation Schedule considering the present storage capacity.
7	The department should prepare Emergency Action Plan including suitable communication system of flood forewarning to the habitants living downstream of the dam within the zone prohibited for dwelling. For this purpose, the department should prepare necessary inundation map of the downstream valley showing flood contours of different intensities duly demarcating "Prohibited Zone", "Restricted Zone" and "Caution Zone" to avert possible hazards to life and property during release of floods over the spillway.	The KERS, KRS prepared & issued a Report of Dam Break Analysis & Inundation Maps of Tungabhadra Dam and Preparation of Emergency Action Plan is under progress and it will be submitted shortly for the approval.

3.5.8.

1	Carryout dam stability analysis adopting in situ density and strength of in situ masonry after grouting and actual uplift developed after grouting of foundation rock both under seismic and non seismic conditions of loading stipulated in IS 6512 and IS 1893- "Seismic Resistant design of Structures" and evolve safe and stable sections after strengthening as required.	The M/s Aarvee Associates Architects Engineers and Consultants Pvt. Ltd. Hyderabad carried out the stability analysis and submitted the Report.
2	Assess strength of in stone masonry and of the mortar used in the construction of the masonry dam by extracting cores of masonry in the zones of maximum stress at few critical locations in the dam body and at interface of masonry and foundation by core drilling of required size for tests.	The M/s Aarvee Associates Architects Engineers and Consultants Pvt. Ltd. Hyderabad carried out the stability analysis and submitted the Report.
3	Grout the dam masonry wherever high permeability exists and sweating & isolated patches of seepage are visible. In addition, carryout grouting of foundation rock wherever high uplift pressures are developing to minimize uplift pressures.	Included in the DRIP-II estimate under package-I of Right Side of TB Dam.
4	Undertake grouting of the masonry dam body covering the area where water is seen seeping on the downstream face. Before undertaking grouting work, it is necessary to create a grout cap in the entire area on the upstream face in the zone to be grouted. This treatment consists of deep raking of the joins to a depth	Included in the DRIP-II estimate under package-I of Right Side of TB Dam.

	of at least 38 mm and same thoroughly cleaned by compressed air jet. There after the joints shall be filled with epoxy mortar under pressure using mortar guns to effectively seal the joints.	
5	Check the stability of composite dam both under seismic and non-seismic conditions of loading creating soil structure simulation using Non-linear Finite element model.	The M/s Aarvee Associates Architects Engineers & Consultants Pvt. Ltd., Hyderabad carried out the stability analysis and submitted the Report & this portion is pertains to Tungabhadra Dam Left side, KNNL, Munirabad.
6	The stability and strengthening of spillway piers should be finalized in consultation with CWPRS, Pune considering unsymmetrical transfer of load to the adjacent NOF monoliths due to their eccentricity with spillway blocks.	The M/s Aarvee Associates Architects Engineers and Consultants Pvt. Ltd. Hyderabad carried out the stability analysis and submitted the Report. Further Studies will be done in consultation with CWPRS, Pune and for this studies Lump sum provision is made in the DRIP-II estimate.
7	Undertake hydraulic model studies of the existing spillway energy dissipating device to assess its efficacy to dissipate the energy content of flow by hydraulic jump particularly in the end bays having higher apron levels. If found unsuitable evolve efficient energy dissipating device like flip bucket etc, for end bays, with provision of required height of guide walls separating adjacent bays	Hydraulic model studies will be done in consultation with CWPRS, Pune and for this studies Lump sum provision is made in the DRIP-II estimate.
8	Water was seen sprouting on the downstream face through the contraction joint at the junction of dam masonry blocks 40 and 41 at ch.5585 ft. The water path should be identified and if it is caused due to opening of	This is looked after by KNNL. Even though the jurisdiction comes under KNNL this work has been carried out by TB Board itself as this is an emergency work. After grouting and PICC pointing work was carried out, now almost all leakages were stopped.

	water stopper provided near the upstream face the same should be plugged by grouting with epoxy mortar under pressure.	
9	The source from where the water is finding access into the dam in the vicinity of PH 118 at Ch 5585 ft is to be determined and the same should be stopped by sealing the gap in the contraction joint upto upstream face	This is looked after by KNNL. Even though the jurisdiction comes under KNNL this work has been carried out by TB Board, as this is an emergency work. After grouting and PICC pointing work was carried out now almost leakages were stopped.
10	Commence collection of data of leaching of lime from tests of seepage water at least once in a fortnight and determine extent of lime leached from the mortar used in the dam construction periodically to assess loss of strength of mortar and increase in the permeability of existing masonry to help undertake rectification measures.	As recommended action has been taken up to collect the data of leaching of lime from the tests of seepage water periodically.
11	Detailed soil structure simulation using non finite element model as recommended by consultants CWC, New Delhi as well as the DSRP in their previous inspection in May 1998 should be immediately taken up to study the effects of development of tensile stresses on the safety of composite dam.	Consultancy studies for detailed soil structure simulation will be done in consultation with CWPRS, Pune and for this studies Lump sum provision is made in the DRIP-II estimate.
12	Seepage measurements should be commenced henceforth on the V-notches provided in the toe drain of the earthen dam constructed downstream of composite masonry dam. Measurements should be analyzed and assess the stability of dam.	A Small pond is existing below the toe of composite dam, the water level of this pond is higher than the toe drain level where V-notches were provided to measure seepages. Due to this variation in levels, seepage measurements could not be taken since the water is entering reversely into the toe drain. To overcome this situation, it is proposed to close the pond in DRIP-2. Once it is closed the seepage can be measured and assess the stability of dam based on the above measurements.

13	The efficacy of the pointing done to entire height of the masonry wall on the upstream face of the composite dam should be monitored and if seepage persists, it may be necessary to treat the upstream face of the masonry by deep raking of the joints and re-pointing using epoxy mortar under pressure by using mortar guns. Included in the DRIP-II estimate under package-I of Right Side & Left Side of TB Dam Respectively.	Included in the DRIP-II estimate under package-I of Right Side & Left Side of TB Dam Respectively.
14	The proposals of the consultants to replace the Coursed Rubble Stone (CRS) masonry by reinforced concrete up to elevation RL 1631.15 ft (about 2 ft below the top of gate) with vertical anchors for the safety of piers need to examined from structural considerations particularly in view of un-symmetrical loadings about the centre line of the blocks. In this context the panel recommends to consult CWPRS, Pune where extensive photo elastic model studies have been carried out to arrive at structural details for pier embedment based on stress distribution under unsymmetrical loadings.	Consultancy studies for photo elastic model studies will be done in consultation with CWPRS, Pune and for this studies Lump sum provision is made in the DRIP-II estimate.
15	Almost all the vertical body drain holes are not functioning although these holes are reported to have been reamed in the year 2012. It is necessary to test whether the holes are clear of obstructions as suggested in the concerned para dealing with drainage of masonry dam.	Included in the DRIP-II estimate under package-I of Left Side of TB Dam.
16	Clear the foundation drainage holes which are not functioning possibly due to blocking by reaming.	Included in the DRIP-II estimate under package-I of Left Side of TB Dam.

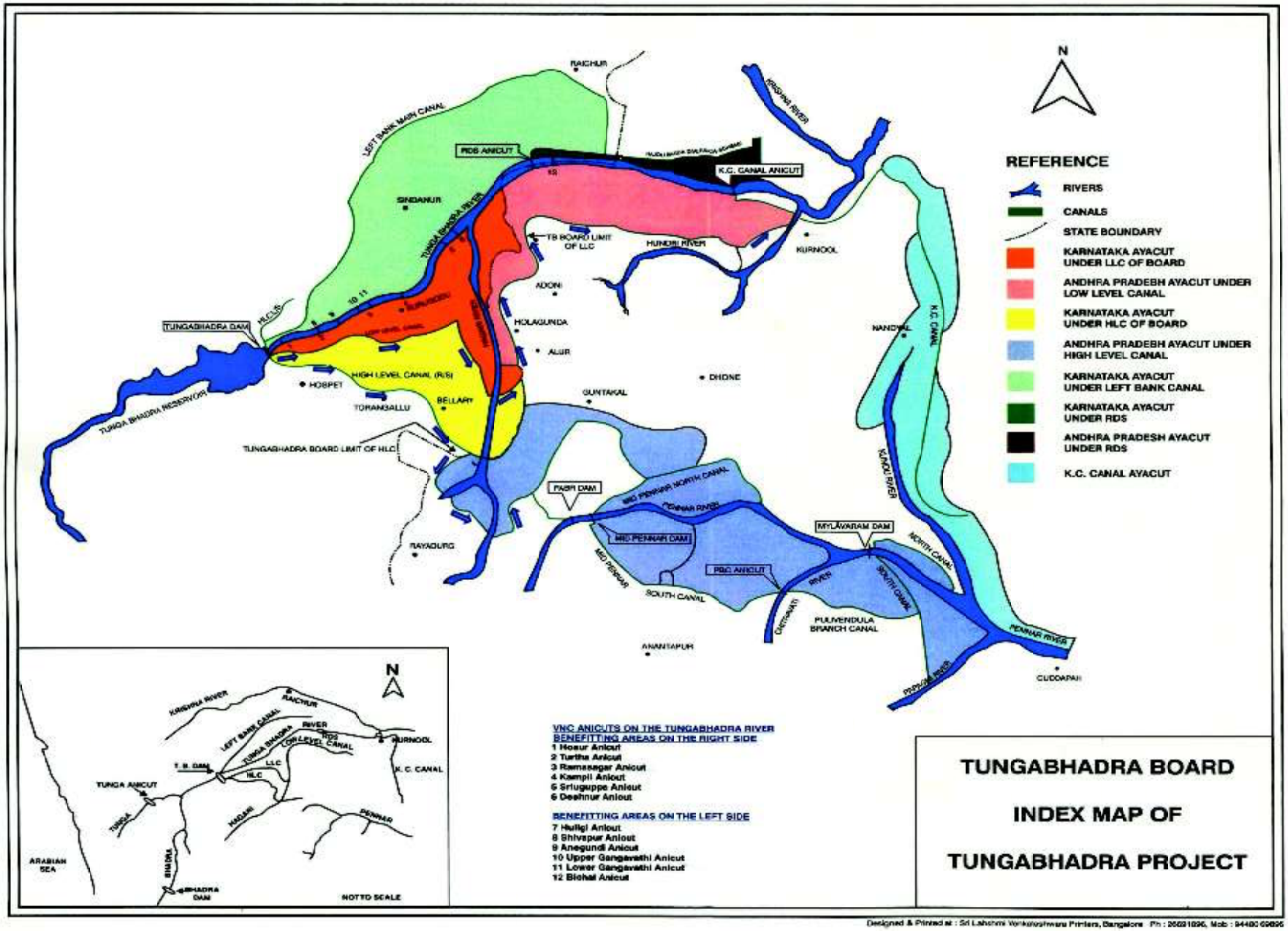
17	Necessary handrails should be provided in the adit passage for safe access into the drainage gallery.	Included in the DRIP-II estimate under package-I of Left Side of TB Dam.
18	Reasons for excess uplift pressure registered on the foundation drainage hole at Ch 1039 ft under full reservoir conditions should be investigated and stability analysis verified. Strengthening measures should be initiated if warranted.	The detailed report on comprehensive safety review of TB dam received from CWC in 2/2000 vide its Annexed report of GSI reveals that the foundation drainage hole at Ch 110'and 1040' show a pressure of 1.60 Kg / sqcm and maximum of 2.70 Kg /sqcm at FRL respectively and that they nearly correspond to the full water head in the reservoir at FRL indicates that, there is no uplift pressure. Curtain grouting work is included in the DRIP-II estimate under package-I of Right Side of TB Dam.
19	All the recommendations made by the Dam safety Review panel inspection during February 1998, summarized in the Para 3.1.4 as well as by CWC in their report of February 2000 should be implemented in a time bound manner by drawing up action plan	Based on the previous recommendations of 1998 & 2000 major works are proposed in DRIP-II under Package-I of Left side & Right Side of TB Dam Respectively.
20	Curtain grouting of the foundation rock in the reaches where high uplift pressures are recorded may be carried out. If the situation does not improve even after grouting then it is necessary to consider actual uplift pressure developed at the line of drains in stability calculations and the adequacy of the same to be determined for deciding the strengthening measures.	Curtain grouting work is included in the DRIP-II estimate under package-I of Right Side of TB Dam.

21	The DSRP during previous inspections in May 1998 had observed erosion of end sills, concrete apron floor of stilling basin, pitting of spillway bucket etc, and the same should be repaired adopting high strength M50 A20 silica fume concrete as per design mix finalized by CSMRS New Delhi.	All the major works are Included in the DRIP-II estimate under package-I & Package 2 of Right Side & Left Side of TB Dam Respectively.
22	In respect of maintaining uniform floor levels of stilling basin the Panel recommends for filling up all the eroded portions of the stilling basin by high strength M50 A20 silica fume concrete to achieve uniform level as per standards as per the design mix finalized by CSMRS, New Delhi which may be referred for details. The Panel also recommends that incase the existing floor level of stilling basin has to be maintained without any modifications then it is considered expedient to carry out hydraulic model studies afresh and modifications to the extent required may be carried out.	Repairs to the eroded portions of stilling basin is included in DRIP-II estimate Package-I of Left Side of TB Dam and CWPRS, Pune will be consulted to assess the floor levels of stilling basins for this Lump sum provision is made in the DRIP-II estimate
23	The erosion damages occurred (i) in the divide wall between Gate numbers 25 and 26 and (ii) at the toe of spillway bays of 22, 23, 24, 25 and 28 should be repaired by adopting high strength fiber reinforced M60 grade concrete.	Included in DRIP-II estimate under package-I of Left Side of TB Dam.
24	All the works mentioned under SI No.10 in Para 3.5.7 above should be examined by the project Engineers in detail under dry conditions of the stilling basing and necessary repair works should be taken up. The erosion	Included in DRIP-II estimate under package-I of Left Side of TB Dam.

	damage listed at items © & (d) in Para 3.5.7 above shall be repaired by adopting high strength fiber reinforced M 60 grade concrete duly anchored to the existing masonry with 20 mm anchor bars.	
25	Cover the exposed reinforcement of the spillway bridge beams supporting the road slab above by epoxy mortar to the required thickness.	Included in DRIP-II estimate under package-I of Left Side of TB Dam.
26	Examine and raise the height of divide wall between spillway bays 18 and 19 to the required height determined from hydraulic model studies to be undertaken afresh as recommended at item 7 above using high strength fiber reinforced concrete duly anchored to the supporting masonry below with 20-25 mm steel anchor rods.	Determination of divide wall height from hydraulic model studies will be done in consultation with CWPRS, Pune for this studies Lump sum provision is made in the DRIP-II estimate.
27	Damage to pointing done to the joints in the nappe concrete portion in spillway bays No.16 to 33 should be repaired by deep raking of joints and plugging with epoxy mortar under pressure using mortar guns.	
3.6.5		
1	The performance and efficacy of the existing spillway stilling basin with floors at different levels may be checked by carrying out hydraulic model studies once again in consultation with KERS, KRS and in case the present arrangement of varying floor levels in the stilling basin and apron is not suitable then it is recommended that the model studies with flip bucket for the extreme ten end bays covering gate numbers 1 to 8 on the right bank and gate numbers 32 and 33 on the left bank may be tried and if suitable can be adopted.	

2	The divide wall separating the bays 31 and 32 from the adjoining bay should be extended suitably to avoid cross flows and the same may be proposed by model studies.	
3	Extent to raise the height of divide wall between spillway bays 18 and 19 shall be determined from model studies and provided accordingly using high strength concrete duly anchored to the supporting masonry below with 20-25 mm steel anchor rods as already recommended in Item 26 of para 3.5.8.	CWPRS, Pune will be consulted to assess the floor levels of stilling basins, for this studies Lump sum provision is made in the DRIP-II estimate
3.7.4		
1	The gates and hoists should be operated and maintained in accordance with the standards brought out in IS 7718-1991in respect of "Fixed wheel and slide gates" in this connection it is mandatory also to follow the recommended guidelines for inspection brought out by the Water Resource Department of Government of Karnataka. In addition, it is also necessary to follow guidance and recommendations contained in the operation and maintenance manuals by the manufacturers of gates and hoists.	The TB Board is following recommended guidelines of the operation and maintenance manuals by the manufacturers of gates and hoists. Maintenance has been carried out during the year 2020-21 like cleaning, oiling, greasing, welding and checked all the gates for their good condition. This year Rubber seals have been replaced with new Rubber seals for all the 33 Spillway gates and proposed sandblasting & Painting works for gates 1 to 11.
2	The operating condition of gates and hoists shall be checked periodically and more often during monsoon months when severe floods are expected to enter the Reservoir.	
3	Rubber seal of Gate No.23 may be examined and repaired or replaced if necessary, to stop leakage.	

ANNEXURES



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ANNEXURE 1.1

Annexure 1.2

SALIENT FEATURES OF TUNGABHADRA PROJECT

1. LOCATION

River	Tungabhadra
Village	Mallapuram
Taluk	Hospet
District	Bellary
State	Karnataka
Longitude	76° – 20' – 10" E
Latitude	15° – 15' – 19" N

2. RESERVOIR

Catchment area	28177 Sq Km (10880 Sq M)
Gross storage (1953)	3751.17 M Cum (132.471 TMC)
Live Storage (1953)	3718.34 M Cum (131.312 TMC)
Dead storage (1953)	32.83 M Cum (1.159 TMC)
Live storage (1993)	3157.53 M Cum (111.507 TMC)
Gross storage (1993)	3157.53 M Cum (111.507 TMC)
Dead storage (1993)	0
Live storage (2008)	2855.869 M Cum (100.855 TMC)
Gross storage (2008)	2855.869 M Cum (100.855 TMC)
Dead storage (2008)	0
Water spread	378.1 Sq Km
Length of reservoir	80 Km (50 M)
Estimated Annual yield (average)	11,528 M Cum (407.107 TMC)
75% Dependable Annual yield	7263.2 M Cum (256.50 TMC) (336 TMC – upstream abstractions of 79.50 TMC = 256.50 TMC)
Maximum observed flood discharge	10453 Cumecs (369152 cusecs) (Nov 92)
Designed flood discharge	18406 cumecs (650000 cusecs)
Villages affected in (1953)	90 Nos.
Population displaced in (1953)	54,452 Nos.

3. DAM

Length:	
a) Masonry Dam, including Spillway of 2300' (701 m)	1040 m (3412')
b) Composite Dam	546.8 m (1794')
c) Earthen Dam	152.4 m (500')
Average height above Foundation level	49.39 m (162')
Average height above river bed	35.37 m (116')
Average height of Composite Dam	21.34 m (70')
Average height of Earthen Dam	9.14 m (30')
Width of roadway on top of Dam	6.71 m (22')
Width of Dam at base	28.5 m (93.5')
Lowest foundation level	+450.50 m (1,478.00')
Sill of spillway crest gate	+491.64 m (1,613.00')
Full reservoir level	+497.74 m (1,633.00')

SALIENT FEATURES OF TUNGABHADRA PROJECT

Maximum Water level	+497.74 m (1633.00')
Top level of dam or road level	+499.88 m (1,640.00')
Number of spillways and size of each	33 Nos., 18.29 m x 6.10 m (60' x 20')

4. **SLUICES**

SLUICE (RIGHT SIDE)	Number	Size	Sill level
High level sluices	10	6'x12'	+1585'
24" dia pipe	1	24" dia	+1579'
Raya basava channel	1	6'x12'	+1550'
Hydro electric turbine pipes	4	11'dia	+1550'
Irrigation &River sluices	2	6'x12'	+1550'
SLUICE (LEFT SIDE)			
Irrigation &Hydro electric	Sluice 10	8'9"x11'6"	+1560'
24" diameter	1	24" dia	+1579'
High level sluices	2	4'x5'	+1585'

5. DAM POWER HOUSE - RIGHT SIDE

Head range	11.90 m to 25.90 m (39' to 85')
Number of Power Units	4 numbers 9,000 KW each
Installed capacity	36,000 KW
Energy per day	0.864 MU
Turbines	4 No's vertical Kaplan reaction type
Generators	4 No's of 9,000 KW each

Transformers:

a) 4 Numbers of 10,600 KVA step up transformers 11/66 KV
b) 2 Numbers of 1,500 KVA step down transformers 66/11 KV
c) 1 Number 1,000 KVA step down transformer 66/11 KV

6. HAMPI POWER HOUSE

Power canal (Head reach of RBLLC):

a) Length	Km. 20.20 (13 Miles 570 feet)
b) Capacity	70.79 Cumecs (2,500 cusecs)
No. of Power units	4 No's 9,000 KW each
Installed capacity	36,000 KW
Energy per day	0.480MU

Approach canal to forebay:

a) Length	301.8 m (3 Furlongs)
b) Width	13.41 m (44')
c) Velocity	1.20 m/Sec (4.01'/second)
c) Discharge	70.79 cumecs (2,500 cusecs)
d) Full supply depth	3.20 m (10.5')

Forebay:

e) Total Length	1,557.50 m (5,110')
f) Composite Dam	378.30 m (1,241')
g) Earthen Dam with puddle Core	1,100.95 m (3,612')
h) Earthen Dam with Masonry Core	78.33 m (257')
i) Maximum height of Dam	24.38 m (80')

(Contd.)

SALIENT FEATURES OF TUNGABHADRA PROJECT

Intake structure:	
j) Number of vents	2 No. each 5.49 m x 5.49 m (18’ x 18')
k) Sill of pipe	451.72 m (+1,482’)
Pipe Line:	
l) Length Low Pressure	797.98 m (2,618’)
m) Number of pipes	2
n) Internal diameter	5.49 m (18’ – 0") and 12 mm (½”) MS shell
o) Maximum discharge	63.71 cumecs (2,250 cusecs)
p) Maximum velocity	2.68 m/sec (8.8 ft per second)
Surge Tank:	Steel tank of the differential type
q) Shell	18.29 m internal diameter (60’)
r) Height	18.29 m (60’)
s) Port Holes	6 Nos. each 1.83 m x 1.45 m (6’-0" x 4’-9")
t) Riser	5.49 m (18’)
Penstock Pipes:	
u) Penstock pipes	4 Nos.
v) Penstock length	103.60 m (340’)
w) Penstock internal diameter	3.65 m (12’-0’) of 12 mm (½”) thick MS shell.
x) Penstock maximum discharge	31.90 cumecs (1,128 cusecs)
y) Penstock maximum velocity	About 3.04 m/Sec (10 ft/sec)
z) Gross head – range	31.70 m to 36.30 m (104’ to 119’)
Tail Race:	
aa) Pond Length	50.60 m (166’)
bb) Channel Length	967.50 m (3,174’)
cc) Bed width	50’ to 120’ (15.20 m to 36.60 m)
dd) Discharge – range	(70.70 - 118.90 cumecs) 2,500 - 4,200 cusecs
Turbines	4 Nos. vertical Francis reaction type
Generators	4 Nos. of 9,000 KW each
Transformers	4 Nos. of 10,600 KVA step-up transformer 11/66 KV 2 Nos. of 20,000 KVA step-up Transformer 66/132 KV.
Transmission lines:	
ee) 66 KV double circuit lines	20.86 Km (13 Miles) from Dam P.H to Hampi P.H,67.4 Km (42 Miles)
ff) 66 KV single circuit lines	From Dam Power House to Bellary Sub-Station.

SALIENT FEATURES OF TUNGABHADRA PROJECT (Contd)

Total Power Development:	
gg) Firm	32,000 KW
hh) Seasonal	58,300 KW

7. DAM POWER HOUSE - LEFT SIDE

Number of Twin Penstocks, Including one for irrigation	5 sets.
Size of each penstock	3.2m x 4.01m (10'-6" x 13'-2")
Approximate length of each penstock	23.41 m (77')
Maximum tail race level	+ 476.71 m (1,564')
Minimum draw down level	+ 482.20 m (1582')
Minimum tail race level	+ 477.32 m (1,566')
Maximum capacity of tail race channel	198.21 Cumecs (7,000 Cusecs)
Turbines Installed capacity	3 Nos. Kaplan type vertical27,000 KW
Generators	3 Nos. 9,000 KW vertical
Generator transformers	2 Nos.11 KV/110 KV/10,000KVA
Interconnecting transformers	2 Nos.15,000 KVA, 66 KV/110 KV/11 KV, 3 phase

Transmission lines	
a) 110 KV double circuit	304.90 Km (190 miles)
b) 33 KV	163.70 Km (102 miles)
c) 11 KV	401.20 Km (250 miles)
Number of Sub-Stations	8 Nos.

Annexure 2.1

CONSTITUTION OF TUNGABHADRA BOARD

(Extract of Notification No. DW VI 4 (9) dated 10.3.1955)

In pursuance of sub-section (4) of section 66 of the Andhra State Act, 1953 (30 of 1953), and in suppression of the Notification of the Government of India in the Ministry of Irrigation and Power dated the 29th September, 1953. the President hereby gives the following directions in regard to the Tungabhadra Project namely: -

1. There shall be established with effect from the 15th March 1955, a Board by the name of the Tungabhadra Board consisting of:

Chairman:
Nominated by the Government of India.

Members:

i. Representative of the Government of Andhra Pradesh
ii. Representative of the Government of Karnataka
iii. Representative of the Government of India

2. The Chairman, if present, shall preside over a meeting of the Board but if the Chairman is absent from any meeting of the Board the Members shall choose one of their members to preside.

3 (i) All matters relating to the project works of common interest to the States of Andhra Pradesh and Karnataka, brought before any meeting of the Board shall be decided by a majority of the Members of the Board present and voting at the meeting before which such matters are brought and the decision of the Board shall be final.

Provided that where with reference to any matter brought before the Board, the Chairman is satisfied that there is a difference of opinion among the Members on any question of policy or the rights of the States concerned involved in the consideration of such matter, the Chairman shall refer the matter to the Central Government whose decision thereon shall be final.

Explanations:

I. If any Member raises at any meeting of the Board any point as to whether a question is a question of policy or whether any rights of the States concerned are involved in the consideration of a matter before the Board, a decision on the points so raised shall be given by the Chairman.

II. (i) Where any Member dissents from any decision so given by the Chairman, it shall be lawful for the State Government, whose representative that Member is, to represent to the Government of India through the Chairman the matter on which a decision has been given by the Chairman and where this is so done, the Chairman shall refer the matter to the Central Government whose decision thereon shall be final.

(ii) Subject to the provisions of sub-paragraph (i), the Board may make rules for the conduct of its own business.

(iii) No act or proceedings of the Board shall be invalid merely on the ground of the existence of any vacancy in, or the absence of any member of, the Board.

4. (i) The Board shall take charge of, and deal with, all matters relating to works on, or connected with, the Tungabhadra Project which are common to both the States of Andhra Pradesh and Karnataka, but nothing in this sub-paragraph shall be deemed to authorize the Board to deal with any matter in respect of works which relate to only one of the States or in which only one State is interested.

(ii) In particular, and without prejudice to the generality of the foregoing powers, the functions of the Board shall include:-

(a) the completion of the construction of the sanctioned Tungabhadra Project;

(b) the regulation of supplies of water and power in accordance with such rules as may be made in this behalf by the Board;

(c) the maintenance of the main canal and of other works common to both the States of Andhra Pradesh and Karnataka.

(d) maintenance of the dam and reservoir of the Project;

(e) the granting of leases of fisheries in the reservoir and in the main canal;

(f) the proper utilization of land acquired for the purposes of the Project; and

(g) any other function incidental to, or connected with, the functions specified in clauses (a) to (f).

5. (i) For the efficient performance of its functions, the Board may appoint a whole-time Secretary and such other officers and servants as it considers necessary.

(ii) During any absence on leave of the Secretary, the Board shall appoint a person to act as Secretary and every person so appointed shall exercise the powers conferred and perform the duties imposed on the Secretary by or under this notification.

(iii) All orders and decisions of the Board shall be authenticated by the signature of the Secretary of the Board.

6. (i) The Government of Andhra Pradesh and Karnataka shall provide at all times the necessary funds for the construction and maintenance of the Tungabhadra Project:

Provided that the liability for the expenditure on the Tungabhadra Project shall be apportioned between the States of Andhra Pradesh and Karnataka in such proportion as may be agreed upon between the two state Governments, and in the absence of any such agreement, in such proportion as may be fixed in this behalf by the Central Government.

(ii) The Governments of Andhra Pradesh and Karnataka shall continue to give the same facilities to the Audit Officer of the Project and other officers engaged in connection with the Project for the payment of moneys into, and withdrawal of the moneys from, the treasuries and sub-treasuries located in their respective territories as were enjoyed by such officers immediately before the commencement of the notification.

7. The Board shall, in relation to the technical sanction, administrative approval, and other sanctions required for the construction and maintenance of the Tungabhadra Project, and in relation to any other administrative matters concerning the Project, exercise the powers of a State Government under the various Codes, Manuals, Rules, and Regulations, specified in the Schedule annexed hereto, as in force in the State of Madras immediately before the 1st day of October, 1953, and may adopt such of the amendments made thereto, or executive instructions, orders, and directions issued there-under, by the Government of Andhra Pradesh from time to time, which the Board considers necessary:

Provided that, in relation to administrative matters concerning the Government servants of the State of Andhra Pradesh employed by the Board in connection with the Project, the various Codes, Manuals, Rules and Regulations as in force in the Madras State immediately before the 1st October, 1953, and any amendments made thereto or any executive instructions, orders, and directions issued there-under by the Government of Andhra Pradesh from time to time after the said date shall apply:

Provided also that, in relation to administrative matters concerning the Government servants of States other than Andhra Pradesh employed by the Board in connection with the project, the corresponding Codes, Manuals, Rules, and Regulations as in force in the State concerned and any amendments made thereto or any executive instructions, orders, and directions issued there-under by the Government of the said State from time to time shall apply.

8. All contracts to be made in connection with the Tungabhadra Project shall be expressed to be made jointly by, and in the names of, the Governments of Andhra Pradesh and Karnataka and all such contracts shall be executed on behalf of the said Governments by the Secretary of the Board or such other officer as may be authorized by the Board in this behalf but neither the Secretary nor the authorized officer shall be personally liable in respect of anything under such contracts.

9. (i) The staff which immediately before the commencement of this notification was engaged in the construction and maintenance of the Tungabhadra Project shall, after such commencement, continue to be so employed by the Board in connection with the said Project but the Governments of Andhra Pradesh and Karnataka may, if they so think fit, replace any members of the existing staff by other persons in such manner and in such proportion as may be agreed upon between the said State Governments and in the absence of any such agreement as may be determined in this behalf by the Board:

Provided that all correspondence between the State Governments with respect to such agreements shall be carried on through the Chairman.

(ii) The staff for the time being employed in connection with the Project shall be deemed to be employed under the administrative control of the Board.

10. Plant, machinery, equipment and stores purchased for and in connection with the Tungabhadra Project shall be under the control of the Board and shall be used on the entire Project under the directions of the Board.

11. The Government of Andhra Pradesh and Karnataka may depute such persons as they may nominate or designate either generally or specially to inspect the works on or connected with the Tungabhadra Project which are common to both the States of Andhra Pradesh and Karnataka.

SCHEDULE

(See paragraph 7)

1. Madras Public Works Account Code with Appendices.
2. Madras Public Works Department Code.
3. Madras Detailed Standard Specifications.
4. Madras Account Code.
5. Madras Electricity Manual.
6. Madras Financial Code.
7. Madras Treasury Code.
8. Madras Budget Manual.
9. Fundamental Rules and Subsidiary Rules of the Madras Government.
10. Madras Manual of Special Pay and Allowances.
11. Madras Pension Code.
12. General Provident Fund (Madras) Rules.
13. Contributory Provident Fund (Madras) Rules.
14. Madras Contributory Provident Fund-Pension Insurance Rules, 1950.
15. Madras Security Rules 1937.
16. Madras Services Manual.
17. Madras Commercial Taxes Manual, Volume I to III.
18. Madras Port Manual.
19. Madras Stationery Manual.

Sd/- S. VENKATARAMAN, Dy. Secy.

Extract of Ministry of Water Resources Order, New Delhi, (F. No. 15/1/2014-E. IV), the 28th May, 2014.

In pursuance of sub-section (1) of section 91 of the Andhra Pradesh Reorganization Act, 2014(6 of 2014), the Central Government hear by makes the following further amendments in the notification of the Government of India in the erstwhile Ministry of Irrigation and Power notification No. D.W.VI-4(9), dated the 10th March, 1955 relating to composition of Tungabhadra Board, namely: -

2. In the said notification: -

(i) in paragraph 1, for the heading "Members" and the entries relating thereto, the following heading and entries shall be substituted, namely: -

"Members

(2) Engineer-in-Chief (Irrigation), Government of Andhra Pradesh;

(3) Engineer-in-Chief (Irrigation), Government of Telangana;

(4) Secretary, Water Resources Department, Government of Karnataka;

(5) Financial Advisor and Joint Secretary, Ministry of Water Resources, Government of India".

(ii) For the word "Andhra" wherever it occurs, the words "Andhra Pradesh and Telangana" shall be substituted.

3. This order shall come into force from the appointed day notified under the Andhra Pradesh Reorganization Act, 2014 (6 of 2014).

Sd/- AJAY KUMAR, Under Secy.

Annexure: 2.2

EXTRACT OF FINAL AWARD OF KRISHNA WATER DISPUTES TRIBUNAL (CLAUSE IX AND CLAUSE XVI)

Clause IX

(A) Out of the water allocated to it, the State of Maharashtra shall not use in any water year.

(i) More than 7 TMC from the Ghataprabha (K-3) sub-basin.

(ii) More than the quantity of water specified hereunder from the main stream of the river Bhima.

(a) As from the water year commencing on the 1st June next after the date of the publication of the decision of the Tribunal in the Official Gazette up to the water year 1989-90: 90 TMC.

(b) As from the water year 1990-91: 95 TMC.

(B) Out of the water allocated to it the State of Karnataka shall not use in any water year

(i) more than the quantity of water specified here under from the Tungabhadra (K-8) sub-basin.

(a) as from the water year commencing on the 1st June next after the date of the publication of the decision of the Tribunal in the Official Gazette up to the water year 1982-83: 295 TMC.

(b) as from the water year 1983-84 up to the water year 1989-90:

295 TMC plus a quantity of water equivalent of 7½ % of the excess of the average of the annual utilizations for irrigation in the Krishna River basin during the water years 1975-76, 1976-77 and 1977-78 from its own projects using 3 TMC or more annually over the utilizations for such irrigation in the water year 1968-69 from such projects.

(c) as from the water year 1990-91 up to the water year 1997-98:

295 TMC plus a quantity of water equivalent to 7½ % of the excess of the average of the annual utilizations for irrigation in the Krishna River basin during the water years 1982-83, 1983-84 and 1984-85 from its own projects using 3 TMC or more annually over the utilizations for such irrigation in the water year 1968-69 from such projects.

(d) as from the water year 1998-99 onwards: 296 TMC plus a quantity of water equivalent to 7½ % of the excess of the average of the annual utilizations for irrigation in the Krishna River basin during the water years 1990-91, 1991-92 and 1992-93 from its own projects using 3 TMC or more annually over the utilizations for such irrigation in the water year 1968-69 from such projects.

For the limited purpose of this sub-clause, it is declared that the utilizations for irrigation in the Krishna River basin in the water year 1968-69 from projects of the State of Karnataka using 3 TMC or more annually shall be taken to be 176.05 TMC.

Annual utilizations for irrigation in the Krishna River basin in each water year after this Order comes into operation from the projects of the State of Karnataka using 3 TMC or more annually shall be computed on the basis of the records prepared and

maintained by the State under Clause XIII.

Evaporation losses from reservoirs of projects using 3 TMC or more annually shall be excluded in computing the 7½ % figure of the average annual utilizations mentioned above.

(i) more than 42 TMC from the Vedavathi (K-9) sub-basin, and

(ii) more than 15 TMC from the main stream of the river Bhima.

(C) Out of the water allocated to it, the State of Andhra Pradesh shall not use in any water year:

(i) more than 127.5 TMC from the Tungabhadra (K-8) sub-basin and more than 12.5 TMC from the Vedavathi (K-9) sub-basin.

(ii) More than 6 TMC from the catchment of the river Kagna in the State of Andhra Pradesh.

(D) (i) The uses mentioned in sub-Clauses (A), (B) and (C) aforesaid include evaporation losses.

(ii) The use mentioned in sub-clause (C) (i) does not include use of the water flowing from the Tungabhadra into the river Krishna

(E) (1) The following directions shall be observed for use of the water available for utilization in the Tungabhadra Dam in a water year

(a) The water available for utilization in a water year in the Tungabhadra Dam shall be so utilized that the demands of water for the following projects to the extent mentioned below may be met :

i)Tungabhadra Right Bank Low Level Canal Water available for Tungabhadra Right Bank Low Level Canal shall be shared by the States of Karnataka and Andhra Pradesh in the following proportion: State of Karnataka : 22.50 State of Andhra Pradesh : 29.50	52.00 TMC
(ii)Tungabhadra Right Bank High Level Canal-Stage I & II: Water available for Tungabhadra Right Bank High Level Canal shall be shared by the States of Karnataka and Andhra Pradesh in the following proportions. State of Karnataka 17.50 State of Andhra Pradesh 32.50	50.00 TMC
(iii) Tungabhadra Left Bank Low Level and High Level canals	102.00 TMC
(iv) Raya and Basavanna Channels of the State of Karnataka	7.00 TMC
(v) Assistance by way of regulated discharges to Vijayanagar Channels other than Raya and Basavanna Channels of the State of Karnataka.	2.00 TMC
(vi) Assistance by way of regulated discharges to the Rajolibunda Diversion Scheme for use by the States of Karnataka and Andhra Pradesh in the proportion mentioned in Clause XI.	7.00 TMC
(vii) Assistance by way of regulated discharges to the Kurnool-Cuddapah Canal of the Stares of Andhra Pradesh.	10.00 TMC
	230.00 TMC

The utilizations of the Projects mentioned in Sub-Clauses (a) (i) (ii) and (iii) above include the evaporation losses in the Tungabhadra Dam, which will be shared in accordance with Clause XI (D).

(b) If, in any water year, water available for utilization in the Tungabhadra Dam is less than the total quantity of water required for all the Projects as mentioned above, the deficiency shall be shared by all the Projects proportionately. The proportions shall be worked out after excluding the evaporation losses.

(c) If, in any water year, available for utilization is more than the total quantity of water required for all the projects as mentioned above, the requirements for all the Projects for the month of June in the succeeding water year as estimated by the Tungabhadra Board or any authority established in its place shall be kept in reserve and the State of Karnataka shall have the right to utilize the remaining water in excess of such reserve in the Tungabhadra Dam for its Projects mentioned in Sub-Clauses (a)(i),(ii) and (iii) above drawing water from that dam even though thereby it may cross in any water year the limit on the utilization of water from Tungabhadra (K-8) sub-basin placed under Clause IX(B) of the Final Order but in no case such utilization shall exceed 320 TMC.

(d) The balance water, if any, shall be kept stored in the dam for use in the next year.

(2) The working tables for the utilization of the water in the Tungabhadra Dam shall be prepared as hitherto fore by the Tungabhadra Board or any other authority established in its place so as to enable the States of Karnataka and Andhra Pradesh to utilize the water available for utilization in the Tungabhadra Dam as aforesaid.

(3) If, in any water year either of the two States of Karnataka and Andhra Pradesh finds it expedient to divert the water available to it in the Tungabhadra Dam for any one of its Projects to any other of its Project or Projects mentioned above for use therein, it may give notice thereof to the Tungabhadra Board or any other authority established in its place and the said Board or authority may, if it is feasible to do so, prepare or modify the working table accordingly.

(4) The States of Karnataka and Andhra Prudish may use the water available in the Tungabhadra Dam in accordance with the aforesaid provisions and nothing contained in Clause V shall be construed as overriding the provisions of Clause IX (E) in the matter of utilization of the water available in the Tungabhadra Dam nor shall anything contained in Clause IX (E) be construed as enlarging the total allocation to the State of Karnataka or as enlarging the limit of acquisition of any right by the State of Andhra Pradesh in the waters of the river Krishna.

(5) The States of Karnataka and Andhra Pradesh may by agreement without reference to the State of Maharashtra alter or modify any of the provisions for the utilization of the water available in the Tungabhadra Dam mentioned above in any manner.

Clause XVI

In this Order

(a) Use of the water of the river Krishna by any person or entity of any nature whatsoever within the territories of a State shall be reckoned as used by that State.

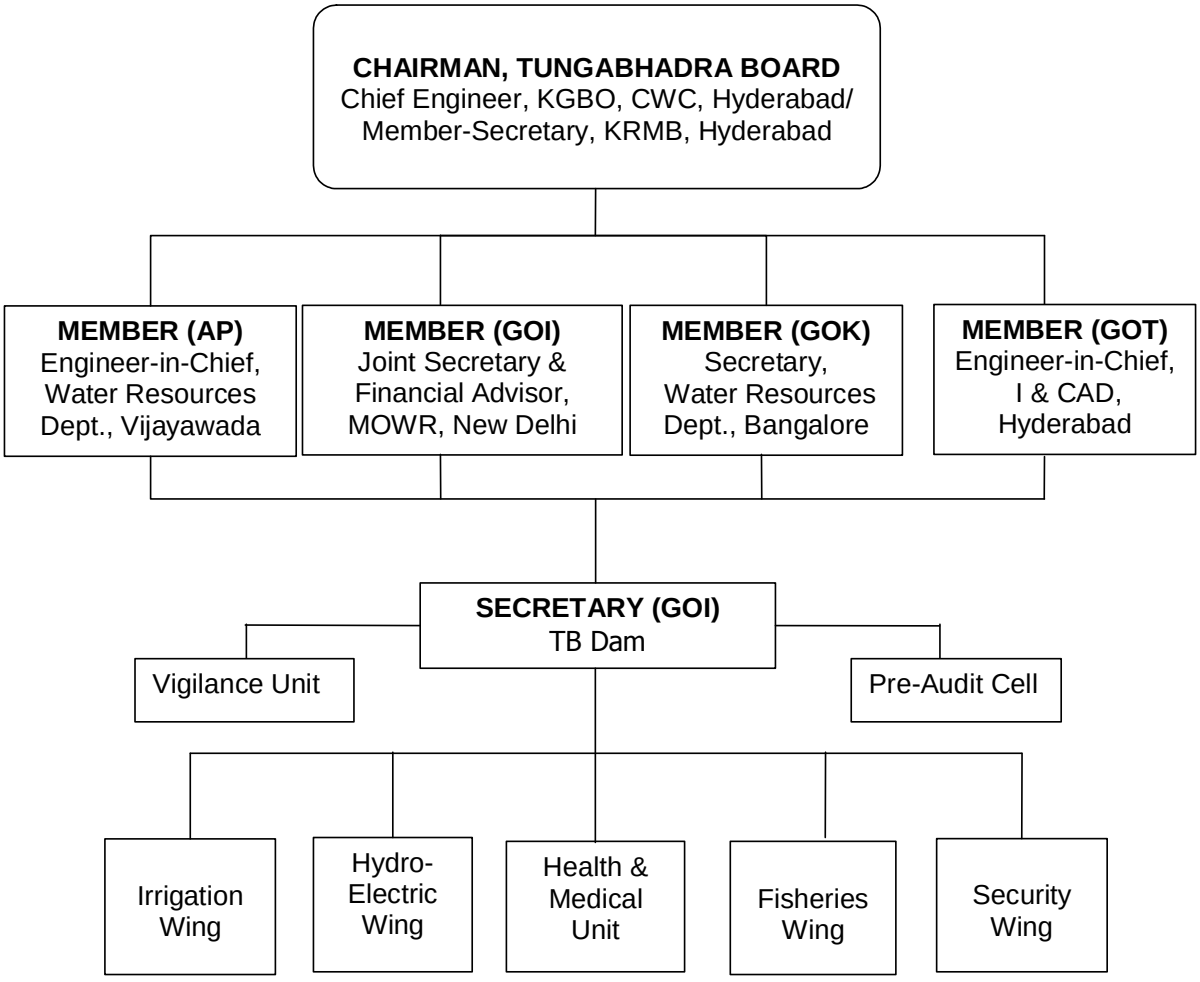
(b) The expression 'Water Year' shall mean the year commencing on 1st June and ending on 31st May.

(c) The expression 'Krishna River' includes the main stream of the Krishna River, all its tributaries and all other streams contributing water directly or indirectly to the Krishna River.

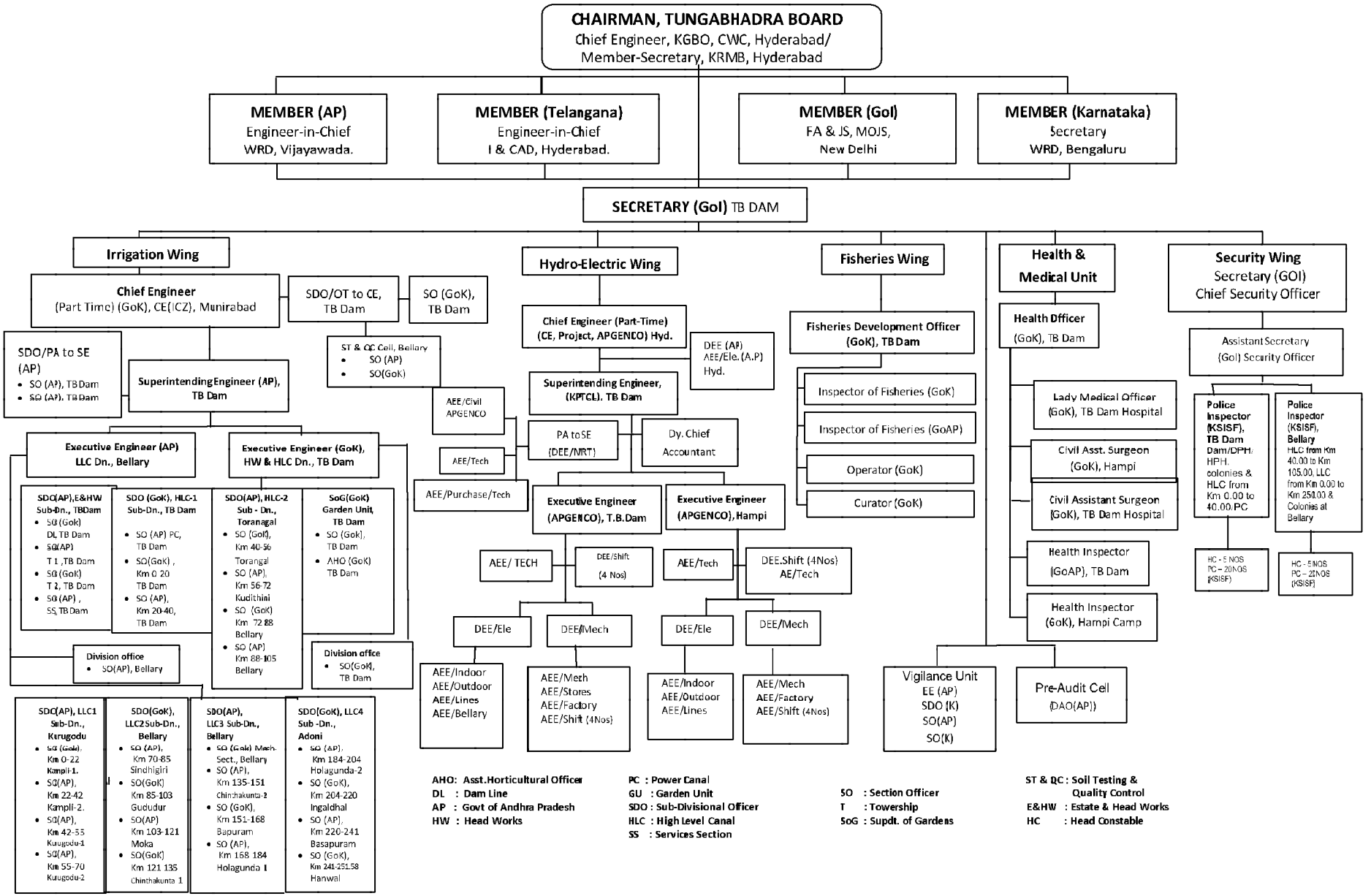
(d) The expression 'TMC' means Thousand million cubic feet of water.

Annexure 2.3

ORGANIZATION CHART OF TUNGABHADRA BOARD



DETAILED ORGANIZATION CHART OF TUNGABHADRA BOARD



AHO: Asst.Horticultural Officer
DL : Dam Line
AP : Govt of Andhra Pradesh
HW : Head Works

PC : Power Canal
GU : Garden Unit
SDO : Sub-Divisional Officer
HLC : High Level Canal
SS : Services Section

SO : Section Officer
T : Township
SoG : Supdt. of Gardens

ST & QC : Soil Testing & Quality Control
E&HW : Estate & Head Works
HC : Head Constable

Annexure 2.4

BOARD IN ITS 213TH MEETING HELD ON 27.12.2018 AT HYDERABAD REVIEWED THE GROUND RENT AS BELOW.

Category	DESCRIPTION	Ground rent per 100 Sqft per Annum		
		Enhanced during 2007 (implemented)	Enhanced during 2015 (not implemented)	Reviewed the enhancement of 2015 (after Agitation from Tungabhadra Horata Kriya Samithi) and implemented from 01.01.2019
1	2	3	4	5
1	Vacant land or with huts	Rs.40	Rs.900	Rs.200
2	Huts replaced with temporary construction residential use.	Rs.50	Rs.900	Rs.300
3	Huts replaced with permanent construction residential use (violation)	Rs.70	Rs.900	Rs.900
4	Huts replaced with temporary construction partly commercial and residential	Rs.70	Rs.900	Rs.900
5	D &O Traders and huts replaced with permanent construction partly commercial and residential (violation)	Rs.100	Rs.900	Rs.900
6	Worship Places 1)Less then 5000sqft 2) Above 5000 sqft	Rs. 500 Rs.1000 (per annum)	Rs. 500 Rs.1000 (per annum)	Exempted as per Municipal Act

Annexure 2.6

TRANSFER AND POSTING OF OFFICERS TO AND FROM THE BOARD DURING 2020-2021.

Sl.No.	Name of the Officer (S/Shri/Smt.)	Date of Joining in the Board	Date of Relief from the Board
1	D.Bhakathavatsala Reddy, SO	01.06.2020 FN	
2	M.K.Gopichand, SO	01.06.2020 FN	
3	M.Chinna Mastanwali, SO	01.06.2020 FN	
4	B.Umapathi Gowda, SO		01.06.2020 AN
5	G.Ramesh, SO		01.06.2020 AN
6	R.Ravi Kumar, SO		09.06.2020 AN
7	G.Prasad, SO		09.06.2020 AN
8	D. Somasekhar, SO	10.06.2020 FN	
9	B.Jagadeesh, SDO	10.06.2020 FN	29.08.2020 AN
10	S.Prasanna Kumar, FDO	11.06.2020 FN	
11	A.Venkateshulu, ADE, APGENCO		26.06.2020 AN
12	M.P.Ravi, EE, APGENCO	27.06.2020 FN	31.03.2021 AN
13	S.Venugopal, SO	29.06.2020 FN	
14	T.Vyasaraja,EE APGENCO	13.07.2020 FN	
15	T.Karthik, AEE APGENCO	15.07.2020 FN	
16	M.Ramalingappa, DEE APGENCO	17.07.2020 FN	
17	M.Srinivasulu, DEE APGENCO	17.07.2020 FN	
18	J.Rangaswamy, AEE APGENCO	23.07.2020 FN	
19	S.Venkatakrishna, AEE APGENCO	24.07.2020 FN	
20	T.Swathi Rani, SO		24.07.2020 AN
21	K.Ramakantha Rao, JE APGENCO		31.07.2020 AN
22	M.Sanjeeva Kumar, SO	15.08.2020 FN	
23	A. Sundarawadivelu, SO		31.08.2020 AN
24	H.B.Vasanthappa, Superintendent of Gardens		31.08.2020 AN
25	L.Sudhakar Reddy, SO	02.09.2020 FN	
26	G. Sudhakar, DEE	03.09.2020 FN	
27	S.Srinivasa Naik, SDO		05.09.2020 AN
28	K.Nagaraju, DAO		06.09.2020 AN
29	K.M.Ramesh, Superintendent of Gardens	24.09.2020 FN	
30	N.Venugopal, DEE	01.10.2020 FN	

31	K.Tejeswi, AEE,APGENCO	07.10.2020 FN	
32	M.Shantha Kumar, SDO	27.10.2020 FN	29.05.2021 AN
33	O. Purushothama Reddy, DAO	19.11.2020 FN	
34	Anand, AEE, KPTCL	07.12.2020 FN	
35	G.Sashi Rekha, AE, KPTCL	21.01.2021 FN	
36	Santhosi Bai, AEE, KPTCL	02.02.2021 FN	
37	M.Praveen Kumar, SDO		14.02.2021 AN
38	CH Srinivasa Raju, AEE, KPTCL	15.02.2021FN	
39	Mulla Baba Ajaad, AEE, APGENCO		02.03.2021 AN
40	Narayana Pawar, SO		05.03.2021 AN
41	M.Adiprakash, SDO	10.03.2021 FN	
42	S.H.Nagappa, KPTCL. Superintending Engineer, TBHES	19.03.2021 FN	
43	C.Gururaj, SDO	20.03.2021 FN	
44	M.Srinivasulu, SDO		20.03.2021 AN
45	P.Rajesh, AEE APGENCO		31.03.2021 AN
46	S.Prasanna Kumar, FDO		06.05.2020 AN
47	B.V.Kumar Swamy, FDO	17.05.2021 FN	
48	Dr.Kotha Neha, Civil Assistant Surgeon, TBP Hospital, TB Dam.	21.05.2021 FN	
49	K.Gnaneswar, SDO	26.05.2021 FN	
50	S.K.Hasan Basha, SDO	26.05.2021 FN	
51	G.Swetha, AEE, KPTCL		27.05.2021 AN

IRRIGATION BENEFITS OF TUNGABHADRA PROJECT

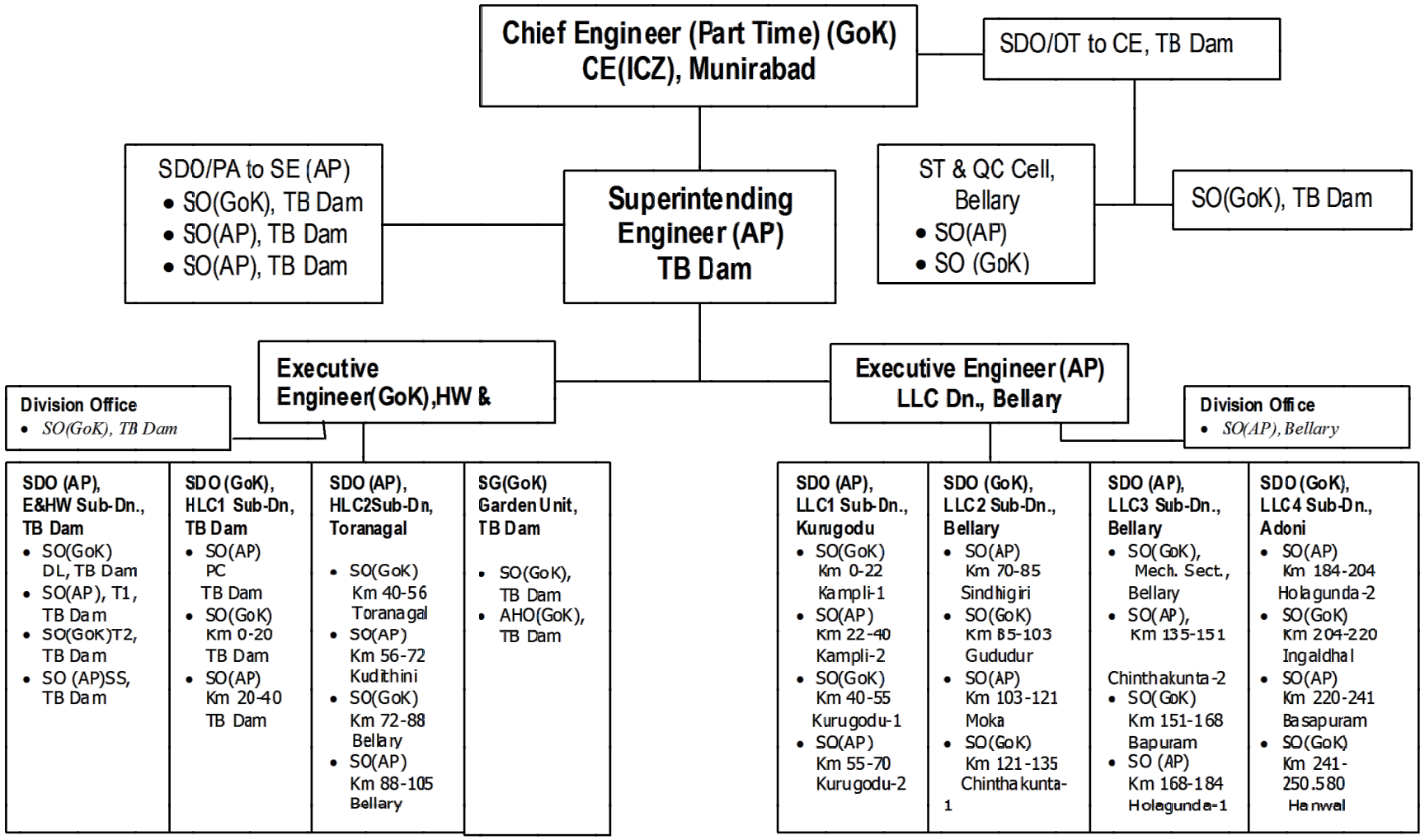
Sl No.	Canal System	Irrigation benefits (inacres)		
		Karnataka	Andhra Pradesh	Total
1	2	3	4	5
1	Right Bank Low Level Canal (RBLLC)	92,670	1,57,062	2,49,732
2	Right Bank High Level Canal (RBHLC)	1,99,920	*2,84,992	4,84,912
3	Left Bank Main Canal (LBMC)	6,02,706	-	6,02,706
4	Left Bank High Level Canal (LBHLC)	1,160	-	1,160
	Total	**8,96,456**	**4,42,054**	**13,38,510**
5	**EXISTING AREA BENEFITTED** Raya & Basavanna Channels (RBC)	7,468	-	7,468
6	Vijayanagar Channels other than RBC	17,000	-	17,000
7	Rajolibunda Diversion Scheme (RDS)	5,900	** 87,000	92,900
8	Kurnool–Cuddapah Canal System	-	2,78,000	2,78,000
	Total	**30,368**	**3,65,000**	**3,95,368**

* Reference - Annexure 3.15
** command falling under Telangana

Details of RDS Anicut and Sunkesula Anicut

Sl. No.	Description	Rajolibunda Diversion Scheme	Sunkesula Anicut (KC Canal)
1)	Length of Anicut	819.9 m (2690 ft)	1328.3 m (4358 ft)
2)	Catchment area	53,634 sq km (20719 sq miles)	64,083 sq km (24,985 sq miles)
3)	Crest level	Plus 332.2m (1090 ft)	Plus 288.650m (947.06 ft)
4)	Maximum Design Flood discharge	21,237 Cum (7,50,000 cusecs)	14.864 cum (5,25,000 cusecs)
5)	Year of completion	1958	1870

ORGANIZATION CHART OF IRRIGATION WING



AHO : Assistant Horticultural Officer
DL : Dam Line
AP : Govt. of Andhra Pradesh
GS : Garden Section
HW : Head Works
GoK : Govt. of Karnataka
SDO : Sub-Divisional Officer
HLC : High Level Canal
PC : Power Canal
SO : Section Officer
T : Township
SS : Services Section
ST & QC : Soil Testing & Quality Control
E&HW : Estate & Head Works
SG : Superintend Of Gardens

STATEMENT SHOWING THE HYDRAULIC DETAILS OF AYACUT AND DISTRIBUTARIES OF COMMON DISTRIBUTARIES OF RIGHT BANK LOW LEVEL CANAL.

Sl. No	Name of Sluices	Location	Length in Km	Scheduled discharge (C/s)						Ayacut in Acres.			Ayacut in Acres.		
				Khariff			Rabi			Khariff			Rabi		
				K.A	A.P	Total	K.A	A.P	Total	K.A	A.P	Total	K.A	A.P	Total
1	2	3		4	5	6	7	8	9	10	11	12	13	14	15
1	DP No 37A	131.810	3.20	-	-	-	0.47	1.20	1.67	--	--	--	76.00	143.00	219.00
2	DP No 44	154.000	1.64	-	1.00	1.00	2.75	2.70	5.45	85.00	63.00	148.00	104.00	213.00	317.00
3	DP No 45	154.837	0.70	-	4.00	4.00	0.80	4.00	4.80	15.00	271.00	286.00	76.00	774.00	850.00
4	DP No 60	191.540	1.00	-	1.00	1.00	1.00	--	1.00	--	58.00	58.00	160.00	--	--
5	Kotehal Distributory	193.820	2.50	24.14	-	24.14	24.00	--	24.00	1207.00	--	1207.00	3842.00	--	--
6	DP No 62	196.700	3.80	-	2.50	2.5	0.27	2.50	2.77	--	157.00	157.00	43.66	413.00	456.66
7	Hatcholli Distributory	205.267	10.80	53.66	2.50	56.16	52.90	5.20	58.10	2682.36	171.00	2853.36	8442.88	684.00	9126.88
8	DP No 65	206.980	21.00	4.93	5.00	9.93	6.40	4.50	10.90	241.51	215.00	456.51	1024.46	558.00	1582.46
9	DP No 72	240.388	7.50	-	6.00	6.00	2.05	4.00	6.05	--	359.00	359.00	328.54	560.00	888.54
10	DP No 73	247.972	3.00	1.89	4.00	5.89	6.49	--	6.49	94.53	237.00	331.53	1041.88	--	--
11	T.S. Distributory	250.530	17.80	27.69	22.00	49.69	35.15	16.50	51.65	1378.92	1298.00	2676.92	5605.51	2330.00	7935.51
	TOTAL		**72.94**	**112.31**	**48.00**	**160.31**	**132.28**	**40.60**	**172.88**	**5704.32**	**2829.00**	**8533.32**	**20744.93**	**5675.00**	**21376.05**

Annexure 3.4

	DRINKING WATER SCHEMES APPROVED BY BOARD			
Sl.No.	Description	Location	Rate of drawal in Cusecs	Quantum of Water in TMC
1	2	3	4	5
I	**TB RESERVOIR**			
	1. Water supply to the filter house for drinking to Right Bank official colony through 24" pipe from TBR	Chainage 590 of Dam	1.08	0.034
	2. Water supply to the filter house for drinking to Left Bank colonies through 24" pipe from TBR	Chainage 5700 of Dam	1.08	0.034
	3. Water supply to H.B.Halli, Kudligi, and Kottrur Town	Right side TBR	9.38	0.296
	4. Water supply to Koppal City	Left side TBR	10.50	0.330
	5. Water supply to Upananyakanahalli and other 20 villages Drinking Scheme	Right side TBR	8.73	0.138
	6. Water supply to Basarakodu & other 27 villages & sonna and other 22 villages Drinking Scheme	Right side TBR	2.5	0.041
	7.Water supply to Ankli & other 8 villages and kombli & other 10 villages Drinking Scheme	Right side TBR	1.44	0.023
	8. Kottinakal Drinking scheme	Right side TBR	1.44	0.015
	Total from Reservoir:		**36.15**	**0.911**
II	**POWER CANAL**			
	1. Water supply to Hospet Town	Km 5.334 (right side)	1.70	0.040
	2. Water Supply to P.K. Halli Village	Km 18.870 (right side)	4.00	0.093
	3. Water supply to A.B Vajpayee zoological park, Kamalapura	Km 18.900 (right side)	2.50	0.058
	4. Water supply to Hampi University	Km 19.000 (right side)	2.50	0.058
	5. Water supply to Kamalapur Town	Km 20.360 (left side)	4.00	0.093
	Total from Power Canal:		**14.70**	**0.343**
III	**RIGHT BANK LOW LEVEL CANAL**			
	1. Water supply to Pompa Vidya Peetha	Km 7.946	0.50	0.010
	2. Water Supply to KereKere and Kallukamba	Km 48.300	1.50	0.031
	3. Water Supply to Basavapura	Km 56.800	2.50	0.052
	4. Water Supply to Kurugodu Town	Km 58.600	7.50	0.156
	5. Water Supply to Karur Village & other	Km 70.645	2.00	0.042
	6. Water Supply to Sanavaspura and other villages	Km 76.700	3.00	0.062

	7. Water Supply to Sindhigeri and other villages	Km 83.800	20.00	0.415
	8. Water Supply to Korlagundi and other Villages	Km 99.200	3.00	0.062
	9. Water supply to Vanenur and other villages	Km 105.835	1.50	0.031
	10. Water Supply to Masidipur and other Villages	Km 107.070	1.60	0.033
	11. Water Supply to Gotur and other Villages	Km 110.698	1.50	0.031
	12 Water Supply to Moka and other Villages	Km 113.250	1.50	0.031
	13. Water supply to Bellary city	Km 115.800	58.00	1.200
	14. Water Supply to Byalachinta and other villages	Km 128.875	2.00	0.041
	15. Water supply to Chintakunta, Ramadurgam and other villages	Km 134.800	5.00	0.104
	16. Water supply to Jalihal village	Km 136.850	0.50	0.010
	17. Water supply to Bommanahal village	Km 139.700	0.26	0.005
	18. Water supply to M. Gonehal village	Km 143.500	0.26	0.005
	19. Water supply to Yerragudi village	Km 146.700	2.70	0.057
	20. Water supply to Bapuram village	Km 158.000	20.00	0.415
	21. Water supply to Virupapuram village	Km 167.800	2.00	0.041
	22. Water supply to Sammatageri tank for drinking water to 6 villages under CPWS scheme.	Km 176.100	1.50	0.032
	23. Water supply to Holagunda village	Km 191.600	10.30	0.214
	24. Water supply to Gajjahalli village	Km 197.100	0.26	0.005
	25. Water supply to Vandavagili village	Km 203.800	0.26	0.005
	25. Water supply to Saranala M.I. tank	Km 210.940	5.00	0.104
	26. Water supply to Hebbatam village	Km 218.400	3.00	0.062
	27. Water supply to Naganathahalli village	Km 231.000	10.60	0.220
	28. Water supply to Basapuram village	Km 233.100	3.50	0.070
	29. Water supply to Adoni Town	Km 235.600	58.00	1.202
	30. Water supply to Chinnaharivanam village	Km 239.700	1.50	0.030
	31. Water supply to madiri village	Km 242.200	1.00	0.021
	32. Water supply to Hanawal village	Km 249.000	1.50	0.031
	Total from RBLLC:		**233.24**	**4.830**
IV	**RIGHT BANK HIGH LEVEL CANAL**			
	1. Water supply to Sandur Town	Km 46.750 (DP 2A)	9.00	0.14
	2. Water supply - Release of water for Bellary city for drinking purpose.	Km 82.260	53.06	0.825
	Total from RBHLC:		**62.06**	**0.965**
	Grand TOTAL (I+II+III+IV):		**346.15**	**7.049**

INDUSTRIAL WATER USERS APPROVED BY BOARD

Sl.No.	Name of the Scheme	Source	Qty per Day in		Remarks
			Cusecs	MGD/TMC	
A	**From Left Bank of TB Reservoir**				
	i) M/sKirloskar Ferrous and iron Ltd.(KFIL)	Left bank of T.B Reservoir	3.71	2.00/0.117	
	ii) M/s Kalyani Steels Ltd.	-do-	9.29	5.00/0.293	
	iii) M/s HRG allies and steels Limited, Kasanakidi	-do-	0.73	0.39/0.023	
B	**FROM POWER CANAL**				
	i) M/s Jindal Vijayanagar Steel Ltd.	Power canal (ROFS)	55.3	29.76/1.29	
C	**From Right Bank of TB Reservoir**				
	i) M/s BMM Ispat Ltd,Danapur.	Right Bank of TB Reservoir	8.20	4.41/0.258	
	ii) M/s SLR Metalics Pvt Ltd.	-do-	8.21	4.42/0.259	
D	**Raya Basavanna channel**				
	i) M/s Sandur Manganese and Iron Ore Ltd	Raya Basavanna channel	6.20	3.34/0.196	
E	**RBHLC**				Temporary Approval given for BTPS during Drought years i.e., for 2016-17, 2017-18 & 2018-19 only
	i) Bellary Thermal Power Station	RBHLC KM 57/800	58.00	31.21/0.90	
F	**RBLLC**				
	i) Bellary Thermal Power Station	RBLLC KM 18/500	60.00	32.29/1.24	

STATEMENT SHOWING THE CANALWISE DRAWALS OF WATER AGAINST PRO-RATA ENTITLEMENT FOR THE WATER YEAR 2020-21 (INCLUDING CANAL TRANSMISSION LOSSES)

(All figures are in TMC.)

Sl. No.	Name of the Canal System	Allocation based on KWDT Award	Actual drawals during the period from 01/06/2020 to 31/05/2021	Pro-rata entitlement on KWDT award out of 170.800+1.100(BA) =171.900 TMC	Excess(-) / Less(+) drawals against pro-rata entitlement out of 171.900 TMC (Col. 5-4)
1	2	3	4	5	6
	KARNATAKA STATE				
1)	Right Bank Power Canal + Low Level Canal.	19.000	15.075	14.858	-0.217
2)	Right Bank High Level Canal	17.500	15.056	13.685	-1.371
3)	Raya Basavanna Channel	7.000	5.867	5.474	-0.393
4)	River Releases (VNC+RDS)	2.490 (2.000 + 0.490)	1.570	1.947	0.377
5)	Left Bank Main Canal + H.L.C. (L.B.)	93.000	74.226	72.725	-1.501
6)	Debit for lift Irrigation Schemes	0.000	2.000	2.000	0.000
7)	Debit for drawls by JVSL	0.000	0.813	1.290	0.477
	Sub-Total:	**138.990**	**114.607**	**111.979**	**-2.628**
8)	**Bhadra Assistance**			**1.100**	**1.100**
	Sub-Total:	**138.990**	**114.607**	**113.079**	**-1.528**
	ANDHRA PRADESH				
1)	Right Bank Low Level Canal	24.000	18.748	19.335	0.587
2)	Right Bank High Level Canal	32.500	26.184	26.184	0.000
3)	River Releases for KC Canal	10.000	8.057	8.057	0.000
	Sub Total:	**66.500**	**52.989**	**53.576**	**0.587**
	TELANGANA				
1)	River Releases for RDS	6.510	5.251	5.245	-0.006
	Sub Total:	**6.510**	**5.251**	**5.245**	**-0.006**
	Grand Total:	**212.000**	**172.847**	**171.900**	**-0.947**

NOTES:

1 The drawals in the canals are inclusive of prorata transmission losses.

2 The debit of 2 TMC is assumed towards drawals for L.I. Schemes situated on the periphery of the reservoir as per the decision taken in the 133rd meeting of the Board.

3 The debit of 1.290TMC is towards drawals for M/s JVSL. as per the decision taken in the 162nd meeting of the Board.

TUNGABHADRA RESERVOIR WATER ACCOUNT FOR THE WATER YEAR 2020-2021

	YIELD	TMC
i	Opening balance as on 01/06/2020 (as per Capacity Table of 2008 surveys)	6.350
ii	Inflows recorded at TB.Dam considering 2 TMC of water debited towards drawals by Karnataka State for Lift Irrigation Schemes on the periphery of Tungabhadra Reservoir for the water year 2020-21 and also 1.499 TMC of water released from Bhadra Reservoir an	299.533
	Total	**305.883**
	UTILISATION	
a)	Drawals for Irrigation by three States during the water year 2020-21.	172.847
b)	Spillway surplus	92.443
c)	Drawals for extra power generation during surplus period without jeoparadizing Irrigation interests	20.788
d)	System losses	4.474
e)	Reservoir evaporation losses.	6.646
f)	Closing balance i.e. residual storage as on 31/05/2021	8.685
	Total	**305.883**
	WATER YEAR 2020-21	
1	Actual quantum of water drawn by three States. during the water year 2020-21.	172.847
2	Actual Reservoir evaporation losses to be shared by three states	6.646
	Total	**179.493**

Annexure 3.8

UTILIZATION OF WATER DURING THE YEARS FROM 1976-77 TO 2020-2021

(in Tmcft)

Water Year	Inflow (June-May)	Total Utilisation (including evaporation)	Drawals for Irrigation				Drawals for Extra Power Gen.	Water let out over Spillway	Total River outflow	Reservoir evaporation losses	System losses	Remarks
			Karnataka	Andhra Pradesh	Telangana	Total						
1	2	3	4	5	6	7	8	9	10	11	12	13
1976-77	189.154	198.147	120.231	61.651	-	**181.882**	-	-	**-**	15.388	-	Capacities are as per 1972 surveys
1977-78	275.408	214.677	131.874	65.902	-	**197.776**	17.426	35.241	**52.667**	16.804	-	do
1978-79	558.775	216.916	134.483	66.391	-	**200.874**	47.093	300.809	**347.902**	15.637	-	do
1979-80	291.341	218.758	131.895	70.788	-	**202.683**	26.415	43.570	**69.985**	15.705	-	do
1980-81	553.100	231.383	140.367	76.279	-	**216.646**	42.194	292.187	**334.381**	14.711	-	do
1981-82	362.649	208.680	128.463	66.159	-	**194.622**	32.859	126.145	**159.004**	12.824	-	do
1982-83	369.482	216.660	132.363	72.205	-	**204.568**	22.726	130.462	**153.188**	12.062	-	Capacities are as per 1978 surveys
1983-84	316.253	206.149	125.182	68.412	-	**193.594**	25.373	82.426	**107.799**	12.422	-	Capacities are as per 1981 surveys
1984-85	303.183	200.562	122.098	63.570	-	**185.668**	40.485	66.000	**106.485**	12.446	-	do
1985-86	217.267	192.833	119.026	61.570	-	**180.596**	10.723	14.329	**25.052**	11.302	-	do
1986-87	243.331	207.841	128.359	67.228	-	**195.587**	8.261	27.041	**35.302**	12.163	-	do
1987-88	163.482	162.491	99.919	52.495	-	**152.414**	-	-	**-**	9.006	-	do
1988-89	248.134	178.113	109.565	55.373	-	**164.938**	23.876	52.180	**76.056**	11.045	-	do
1989-90	222.061	188.216	112.701	60.205	-	**172.906**	12.633	18.052	**30.685**	12.465	3.008	do
1990-91	314.036	191.300	115.183	60.599	-	**175.782**	17.473	102.163	**119.636**	12.518	3.000	do
1991-92	364.912	195.314	119.798	60.344	-	**180.142**	24.855	159.282	**184.137**	13.105	2.068	do
1992-93(*)	519.609	215.702	129.415	68.381	-	**197.796**	36.636	267.915	**304.551**	14.190	3.716	do
1993-94	307.868	206.305	127.795	64.717	-	**192.512**	15.811	90.141	**105.952**	9.700	4.093	do
1994-95	538.598	190.504	121.451	54.463	-	**175.914**	39.403	311.414	**350.817**	10.330	4.260	do
1995-96	176.307	179.767	110.532	56.575	-	**167.107**	0.434	-	**0.434**	9.232	3.428	Capacities are as per 1993 surveys
1996-97	211.524	166.394	101.508	54.899	-	**156.407**	12.960	28.704	**41.664**	9.987	2.830	do
1997-98	339.815	174.373	114.321	60.052	-	**174.373**	18.839	130.887	**149.726**	10.688	4.171	do
1998-99	323.181	191.742	117.320	62.582	-	**179.902**	35.485	85.597	**121.082**	11.84	4.911	do
1999-00	328.877	194.356	121.167	61.301	-	**182.468**	22.341	114.93	**137.271**	11.888	4.117	do
2000-01	322 254	184.832	117.378	56.978	-	**174.356**	35.495	96.642	**132.137**	10.476	5.489	do
2001-02	160.082	156.751	98.694	49.474	-	**148.168**	-	-	**-**	8.683	4.715	do
2002-03	126.371	122.660	75.909	39.766	-	**115.675**	-	-	**-**	6.985	3.581	do
2003-04	117.095	112.142	69.905	36.232	-	**106.137**	-	-	**-**	6.005	4.156	do
2004-05	171.145	136.353	84.560	43.571	-	**128.131**	6.768	23.1	**29.868**	8.22	4.846	Capacities are as per 2004 surveys
2005-06	316.786	160.799	99.918	51.583	-	**151.501**	30.435	119.411	**149.846**	9.298	5.294	do
2006-07	296.274	160.694	101.463	49.354	-	**150.817**	18.978	110.916	**129.894**	9.877	5.369	do
2007-08	476.018	166.231	104.149	52.025	-	**156.174**	41.706	252.121	**293.827**	10.057	5.393	do
2008-09	278.719	165.363	103.940	53.341	-	**157.281**	20.313	98.214	**118.527**	8.082	4.506	do
2009-10	366.598	164.383	102.098	53.432	-	**155.530**	27.819	169.983	**197.802**	8.853	4.329	do
2010-11	339.651	184.133	113.659	61.91	-	**175.569**	27.823	121.416	**149.239**	8.564	5.020	do
2011-12	292.089	161.373	100.615	52.232	-	**152.847**	26.679	99.605	**126.284**	8.526	4.618	Capacities are as per 2008 surveys
2012-13	153.252	131.180	81.616	42.094	-	**123.710**	5.769	13.948	**19.717**	7.47	5.817	do
2013-14	394.225	145.100	91.121	46.454	-	**137.575**	26.613	211.146	**237.759**	7.525	5.440	do
2014-15	348.04	143.387	89.045	46.934	4.176	**140.155**	21.136	181.287	**202.423**	7.408	4.742	do
2015-16	117.889	113.816	70.391	37.023	3.378	**110.792**	-	-	**-**	6.402	3.298	do
2016-17	85.719	83.710	56.062	23.786	1.638	**81.486**	-	-	**-**	3.862	2.249	do
2017-18	125.396	119.084	75.411	35.636	2.410	**113.457**	-	-	**-**	5.627	3.28	do
2018-19	357.662	159.587	100.930	46.873	4.628	**152.431**	17.38	177.593	**194.973**	7.156	4.586	do
2019-20	419.603	185.835	118.897	54.363	5.486	**178.746**	15.933	208.185	**224.118**	7.089	5.813	do
2020-21	299.533	179.493	114.607	52.989	5.251	**172.847**	20.788	92.443	**113.231**	6.646	4.474	do

(*) Heavy floods occurred in November 1992

Bhadra Assistance:1986-87 - 0.744 TMC, 1988-89-2.300 TMC, 1991-92-5.163 TMC, 1995-96-2.688 TMC and 1999-2000-3.731 TMC. 2000-2001=4.651 TMC, 2001-2002=0.746 TMC, 2005-2006 = 2.683 TMC, 2006-07=4.360 TMC, 2007-2008 = 2.300 TMC, 2008-09 = 2.359 TMC, 2019-20=1.615 TMC & 2020-21=1.100TMC.

Annexure 3.9

Statement showing the Pipings / Breaches occurred during the year 2020-21 (From 01-06-2020 to 31-5-2021).

Sl. No.	Name of the Canal	Piping / Breaches occurred at Km.	Date of occurrence	Date of closing
1	2	3	4	5
			NIL	NIL
I	**Power Canal**	**(a) Pipings**		
		Nil		
		(b) Breaches		
		Nil		
II	**RB HLC**	**(a) Pipings**		
		Nil		
		(b) Breaches.		
		Nil		
III	**RB LLC**	**(a) Pipings**		
		Nil		
		(b) Breaches.		
		Breaching occurred at Km 83/900 on Left side of LLC Main canal.	07.01.2021	09.01.2021

Annexure 3.9A

STATEMENT SHOWING MAX & MIN RESERVOIR LEVELS AND SPILLWAY DISCHARGES

Sl. No.	Year	Reservoir				Total Qty. Surplused		Max. Spillway Discharge	
		Maximum		Minimum		No. of Days	In TMC	Date	Discharge c/s
		Date	Level	Date	Level				
1	1960-61	13.11.60	1630.10	05.05.60	1607.70	241	257.163	20.09.60	1,33,620
2	1961-62	17.11.60	1630.50	15.05.61	1604.80	157	677.726	21.07.61	2,83,691
3	1962-63	01.11.62	1631.50	08.06.62	1610.30	171	321.978	0	0
4	1963-64	18.10.63	1632.80	11.06.63	1614.10	83	146.428	23.10.63	1,89,338
5	1964-65	19.11.64	1633.00	30.06.64	1600.60	92	249.545	10.08.64	1,50,229
6	1965-66	07.10.65	1631.90	19.06.65	1589.90	47	117.239	25.07.65	1,20,798
7	1966-67	19.10.66	1632.33	09.07.66	1580.80	2	0.302	23.08.66	2,915
8	1967-68	18.10.67	1633.00	02.07.67	1575.80	46	118.182	05.08.67	1,41,808
9	1968-69	29.09.68	1632.99	27.06.68	1584.32	34	70.804	19.08.68	75,705
10	1969-70	11.09.69	1633.00	16.05.69	1576.22	41	121.468	18.08.69	89,714
11	1970-71	20.08.70	1633.00	15.05.70	1599.76	73	214.510	25.08.70	1,18,829
12	1971-72	26.09.70	1633.00	15.05.71	1594.07	20	39.467	26.07.71	73,405
13	1972-73	18.09.72	1631.30	09.05.72	1575.53	0	0	0	0
14	1973-74	09.08.73	1633.00	08.05.73	1569.30	26	49.780	12.08.73	1,03,685
15	1974-75	16.08.74	1633.00	11.05.74	1568.10	32	63.304	14.09.74	1,61,262
16	1975-76	18.07.75	1633.00	08.05.75	1586.18	110	206.986	06.11.75	1,34,700
17	1976-77	17.09.76	1633.00	11.05.76	1599.26	0	0	0	0
18	1977-78	27.08.77	1633.00	15.05.77	1588.26	31	36.318	11.10.77	91,020
19	1978-79	08.09.78	1633.00	13.05.78	1593.75	76	300.809	28.08.78	1,77,696
20	1979-80	30.08.79	1633.00	13.05.79	1594.45	23	43.560	12.08.79	1,32,870
21	1980-81	07.09.80	1633.00	29.04.80	1593.32	78	292.192	06.07.80	1,96,139
22	1981-82	29.08.81	1633.00	27.04.81	1568.93	49	126.146	20.08.81	1,35,159
23	1982-83	11.08.82	1633.00	06.05.82	1568.06	34	130.463	06.08.82	1,63,655
24	1983-84	28.08.83	1633.00	27.04.83	1563.02	34	80.210	15.08.83	1,11,480
25	1984-85	28.09.84	1633.00	17.05.84	1576.61	52	66.000	05.08.84	1,16,777
26	1985-86	18.08.85	1632.62	15.04.85	1565.66	7	14.260	19.08.85	47,027
27	1986-87	14.08.86	1633.00	25.04.86	1561.70	9	27.040	15.08.86	1,05,999
28	1987-88	29.11.87	1618.43	16.05.87	1563.35	0	0	0	0
29	1988-89	15.09.88	1633.00	03.05.88	1569.80	40	52.117	15.08.88	1,05,680
30	1989-90	02.09.89	1633.00	22.04.89	1560.90	17	18.053	26.08.89	68,365
31	1990-91	16.08.90	1633.00	08.05.90	1574.00	30	102.163	17.08.90	1,31,161
32	1991-92	01.09.91	1633.00	24.04.91	1578.60	42	159.283	30.07.91	1,44,830
33	1992-93	14.09.92	1633.00	10.05.92	1574.08	71	267.916	18.11.92	3,69,152
34	1993-94	31.10.93	1632.95	14.05.93	1578.05	38	90.147	18.10.93	1,89,630
35	1994-95	26.10.94	1633.00	04.06.94	1573.84	73	311.416	17.07.94	2,64,140
36	1995-96	22.09.95	1633.00	25.04.95	1565.50	0	0	0	0
37	1996-97	01.09.96	1633.00	06.04.96	1569.50	26	28.704	06.09.96	96,920
38	1997-98	13.08.97	1633.00	15.05.97	1574.95	36	131.375	08.08.97	1,71,995
39	1998-99	15.08.98	1633.00	10.05.98	1574.64	55	85.597	15.09.98	1,05,680
40	1999-00	04.08.99	1633.00	23.04.99	1581.03	45	114.930	29.07.99	1,38,258
41	2000-01	10.08.00	1633.00	03.05.00	1574.37	55	96.642	26.08.00	72,976
42	2001-02	04.09.01	1631.78	25.05.01	1574.69	0	0	0	0
43	2002-03	18.09.02	1623.70	11.05.02	1563.13	0	0	0	0
44	2003-04	12.10.03	1622.93	26.06.03	1562.75	0	0	0	0
45	2004-05	06.08.20	1633.00	17.05.04	1566.55	11	23.100	15.08.04	97,106
46	2005-06	16.08.05	1633.00	18.04.05	1565.68	46	119.411	06.08.05	1,55,426
47	2006-07	01.08.06	1633.00	09.05.06	1570.20	32	110.916	15.08.06	1,70,569
48	2007-08	14.07.07	1633.00	19.04.07	1570.90	81	291.905	10.08.07	2,54,076
49	2008-09	12.08.08	1633.00	27.05.08	1592.86	24	137.543	15..08.08	2,22,654
50	2009-10	29.07.09	1633.00	24.04.09	1564.75	74	169.983	01.10.09	1,91,617
51	2010-11	22.08.10	1633.00	22.04.10	1571.36	58	121.416	05.10.10	94,054
52	2011-12	05.08.11	1633.00	09.05.11	1579.79	42	126.271	03.09.11	1,42,371
53	2012-13	09.09.12	1633.00	18.04.12	1575.16	9	13.947	03.09.12	45,710
54	2013-14	12.08.13	1633.00	25.05.13	1568.69	59	211.116	05.08.13	1,55,541
55	2014-15	14.08.14	1633.00	25.04.14	1573.29	44	173.640	03.08.14	1,90,602
56	2015-16	22.08.15	1626.40	29.04.15	1573.69	0	0	0	0
57	2016-17	24.08.16	1617.91	29.05.16	1570.08	0	0	0	0
58	2017-18	20.10.17	1630.22	13.06.17	1568.70	0	0	0	0
59	2018-19	31.08.18	1632.95	20.05.18	1575.20	43	177.592	16.08.18	2,16,040
60	2019-20	15.08.19	1633.00	15.06.19	1574.70	65	208.187	11.08.19	2,24,539
61	2020-21	24.08.20	1633.00	07.05.20	1577.16	52	92.444	19.08.20	1,10,160

CAPACITY OF TUNGABHADRA RESERVOIR (From 1953 To2016)

Year of Survey	Dead storage capacity		Live Storage (M. Cum)		Gross storage (M. Cum)		Annual rate of decrease in reservoir capacity (between successive surveys) (M. Cum)		Remarks
	M.Cum	TMC	M.Cum	TMC	M.Cum	TMC	M.Cum	TMC	
1953	32.83	1.159	3718.34	131.312	3751.17	132.473	-	-	Original survey
1963	7.04	0.249	3239.75	114.411	3246.79	114.660	50.438	1.7812	
1972	2.07	0.073	3246.53	121.007	3428.6	121.080	16.980	0.5995*	*To find annual rate of decrease in reservoir capacity for the year 1972, the original capacity of the reservoir in 1953 has been considered.
1978	-	-	3332.75	117.695	3332.75	117.695	15.980	0.5642	
1981	-	-	3275.68	115.680	3275.68	115.680	19.020	0.6717	
1985	-	-	3166.74	111.832	3166.74	111.832	27.240	0.9620	
1993	-	-	3157.53	111.50	3157.53	111.50	0.870	0.0415	
2004	-	-	2954.585	104.340	2954.585	104.340	18.450	0.652	
2008	-	-	2855.869	100.855	2855.869	100.855	24.679	0.871	
2016	-	-	2995.541	105.788	2995.541	105.788	7.023	0.248 **	Report is yet to be approved by the Board

Notes: 1. Dead storage is below RL 472.440 m
2. Live storage in between RL 472.440m and RL 497.738m.
** To find annual rate of decrease in Reservoir capacity for the year 2016, the original capacity of the Reservoir in 1993 has been considered. Capacity survey 2016 was done by M/s Aarvee Associates, Hyderabad.

TUNGABHADRA RESERVOIR PROJECT

TABLE - 3.2: WATER SPREAD AREAS AND CAPACITIES AT ONE FOOT INTERVAL - FOR CAPACITY SURVEY 2008

Sl. No.	Elevation		Contour interval Metres	Water Spread Area M Sqm.	Capacity Between Contours M Cum.	Cumulative Capacity M Cum.	Cumulative Capacity TMCft.
	Feet	Metres					
1	**1540.000**	**469.392**					0.000
2	**1550.000**	**472.440**	3.0480				0.000
3	**1555.000**	**473.964**	1.5240	**0.0008**	**0.000**	**0.000**	**0.000**
4	1556.000	474.269	0.3048	0.0019	0.000	0.000	0.000
5	1557.000	474.574	0.3048	0.2330	0.026	0.026	0.001
6	1558.000	474.878	0.3048	0.7824	0.147	0.173	0.006
7	1559.000	475.183	0.3048	1.9259	0.400	0.573	0.020
8	**1560.000**	**475.488**	0.3048	**3.1859**	**0.771**	**1.344**	**0.047**
9	1561.000	475.793	0.3048	4.5030	1.166	2.510	0.089
10	1562.000	476.098	0.3048	5.6610	1.546	4.056	0.143
11	1563.000	476.402	0.3048	6.9584	1.920	5.975	0.211
12	1564.000	476.707	0.3048	8.4757	2.348	8.324	0.294
13	**1565.000**	**477.012**	0.3048	**9.8713**	**2.793**	**11.117**	**0.393**
14	1566.000	477.317	0.3048	11.2357	3.214	14.332	0.506
15	1567.000	477.622	0.3048	12.8202	3.663	17.995	0.635
16	1568.000	477.926	0.3048	14.8783	4.217	22.212	0.784
17	1569.000	478.231	0.3048	16.6878	4.808	27.020	0.954
18	**1570.000**	**478.536**	0.3048	**18.1551**	**5.308**	**32.329**	**1.142**
19	1571.000	478.841	0.3048	19.6529	5.760	38.089	1.345
20	1572.000	479.146	0.3048	21.4612	6.264	44.353	1.566
21	1573.000	479.450	0.3048	23.3766	6.831	51.184	1.808
22	1574.000	479.755	0.3048	25.3898	7.430	58.614	2.070
23	**1575.000**	**480.060**	0.3048	**27.5772**	**8.070**	**66.684**	**2.355**
24	1576.000	480.365	0.3048	30.1176	8.790	75.474	2.665
25	1577.000	480.670	0.3048	32.4401	9.532	85.005	3.002
26	1578.000	480.974	0.3048	34.4064	10.186	95.191	3.362
27	1579.000	481.279	0.3048	36.6020	10.820	106.011	3.744
28	**1580.000**	**481.584**	0.3048	**38.9709**	**11.515**	**117.527**	**4.150**
29	1581.000	481.889	0.3048	41.4093	12.248	129.775	4.583
30	1582.000	482.194	0.3048	43.9299	13.004	142.779	5.042
31	1583.000	482.498	0.3048	46.5943	13.794	156.573	5.529
32	1584.000	482.803	0.3048	49.1560	14.591	171.163	6.045
33	**1585.000**	**483.108**	0.3048	**51.9896**	**15.413**	**186.576**	**6.589**
34	1586.000	483.413	0.3048	55.1295	16.323	202.898	7.165
35	1587.000	483.718	0.3048	58.4508	17.307	220.206	7.776
36	1588.000	484.022	0.3048	61.9570	18.348	238.553	8.424
37	1589.000	484.327	0.3048	65.6226	19.440	257.994	9.111
38	**1590.000**	**484.632**	0.3048	**69.3094**	**20.561**	**278.555**	**9.837**
39	1591.000	484.937	0.3048	73.3275	21.735	300.290	10.605
40	1592.000	485.242	0.3048	77.6079	22.999	323.289	11.417
41	1593.000	485.546	0.3048	81.9009	24.306	347.595	12.275
42	1594.000	485.851	0.3048	86.1029	25.601	373.196	13.179

43	**1595.000**	**486.156**	0.3048	**90.4067**	**26.897**	**400.094**	**14.129**
44	1596.000	486.461	0.3048	94.9337	28.243	428.337	15.127
45	1597.000	486.766	0.3048	99.5274	29.633	457.970	16.173
46	1598.000	487.070	0.3048	104.3273	31.065	489.035	17.270
47	1599.000	487.375	0.3048	109.3943	32.568	521.603	18.420
48	**1600.000**	**487.680**	0.3048	**114.8482**	**34.171**	**555.774**	**19.627**
49	1601.000	487.985	0.3048	120.6461	35.886	591.660	20.894
50	1602.000	488.290	0.3048	126.3723	37.642	629.302	22.224
51	1603.000	488.594	0.3048	132.1583	39.397	668.699	23.615
52	1604.000	488.899	0.3048	138.1941	41.198	709.897	25.070
53	**1605.000**	**489.204**	0.3048	**144.4713**	**43.075**	**752.971**	**26.591**
54	1606.000	489.509	0.3048	150.7212	44.984	797.955	28.180
55	1607.000	489.814	0.3048	157.0968	46.908	844.864	29.836
56	1608.000	490.118	0.3048	163.9230	48.920	893.783	31.564
57	1609.000	490.423	0.3048	170.7960	51.008	944.791	33.365
58	**1610.000**	**490.728**	0.3048	**177.8007**	**53.123**	**997.913**	**35.241**
59	1611.000	491.033	0.3048	184.0812	55.148	1053.061	37.189
60	1612.000	491.338	0.3048	191.7839	57.278	1110.339	39.211
61	1613.000	491.642	0.3048	198.6240	59.495	1169.834	41.312
62	1614.000	491.947	0.3048	205.6441	61.607	1231.442	43.488
63	**1615.000**	**492.252**	0.3048	**212.8283**	**63.772**	**1295.214**	**45.740**
64	1616.000	492.557	0.3048	220.3185	66.008	1361.222	48.071
65	1617.000	492.862	0.3048	227.7614	68.284	1429.506	50.483
66	1618.000	493.166	0.3048	235.7629	70.638	1500.144	52.977
67	1619.000	493.471	0.3048	242.5029	72.885	1573.029	55.551
68	**1620.000**	**493.776**	0.3048	**251.9472**	**75.350**	**1648.379**	**58.212**
69	1621.000	494.081	0.3048	260.0748	78.029	1726.408	60.968
70	1622.000	494.386	0.3048	268.5920	80.565	1806.973	63.813
71	1623.000	494.690	0.3048	277.3769	83.202	1890.175	66.751
72	1624.000	494.995	0.3048	286.2312	85.890	1976.066	69.784
73	**1625.000**	**495.300**	**0.3048**	**294.1436**	**88.446**	**2064.512**	**72.908**
74	1626.000	495.605	0.3048	301.6550	90.797	2155.309	76.114
75	1627.000	495.910	0.3048	308.7987	93.031	2248.340	79.399
76	1628.000	496.214	0.3048	315.8174	95.189	2343.530	82.761
77	1629.000	496.519	0.3048	322.9969	97.353	2440.883	86.199
78	**1630.000**	**496.824**	**0.3048**	**330.4654**	**99.585**	**2540.468**	**89.716**
79	1631.000	497.129	0.3048	338.4071	101.934	2642.402	93.316
80	1632.000	497.434	0.3048	347.7040	104.560	2746.962	97.008
81	**1633.000**	**497.738**	0.3048	**367.1100**	**108.924**	**2855.887**	**100.855**

F.R.L. & M.W.L. = 497.738 m (1633 ft) Dead Storage Level= 472.440 m (1550 ft)
Crest Level = 491.642 m (1613 ft)
Note: 1. The Water spread areas for the elevations upto 1632 ft. is generated using Surfer Software.
Note: 2. The Water spread areas at 1633 ft is reckoned from Satellite Imagery extract furnished by NRSA, Hyderabad.
Note: 3. Capacities between 1555 ft and 1624 ft contours are computed using Prismoidal Formula.

STATEMENT SHOWING THE DETAILS OF AYACUT AND DISCHARGES OF DP'S & DISTRIBUTARIES OF RIGHT BANK LOW LEVEL CANAL UP TO BOARD LIMIT

Sl. No.	Name of Sluices	Location KM.	Schedule Discharge (C/s.)						Ayacut in Acres.					
			Khariff			Rabi			Khariff			Rabi		
			K.A	A.P	TOTAL	K.A	A.P	TOTAL	K.A	A.P	TOTAL	K.A	A.P	TOTAL
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Rajan Sluice	10.262	28.00	---	28.00	28.00	---	28.00	150.00	---	150.00	450.00	---	450.00
2	Gowramma Tank	15.260	15.00	---	15.00	15.00	---	15.00	150.00	---	150.00	450.00	---	450.00
3	Sanapura Distributory	18.842	52.00	---	52.00	52.00	---	52.00	2944.00	---	2944.00	896.00	---	896.00
4	Muddapura No.1	21.364	39.00	---	39.00	39.00	---	39.00	2307.45	---	2307.45	528.83	---	528.83
5	D.P.No.1	24.100	4.75	---	4.75	4.75	---	4.75	279.20	---	279.20	191.43	---	191.43
6	D.P.No.2	26.733	12.00	---	12.00	12.00	---	12.00	732.86	---	732.86	0.00	---	0.00
7	D.P.No.3	29.848	3.00	---	3.00	3.00	---	3.00	187.82	---	187.82	0.00	---	0.00
8	Muddapura No.2	32.064	15.00	---	15.00	15.00	---	15.00	752.75	---	752.75	2412.83	---	2412.83
9	D.P.No.4	33.595	1.00	---	1.00	1.00	---	1.00	50.24	---	50.24	162.38	---	162.38
10	D.P.No.5	35.834	---	---	0.00	0.80	---	0.80	---	---	0.00	129.85	---	129.85
11	D.P.No.6	41.112	1.70	---	1.70	1.70	---	1.70	88.18	---	88.18	268.29	---	268.29
12	Sugur Distributory	43.025	41.00	---	41.00	41.00	---	41.00	2065.05	---	2065.05	6612.97	---	6612.97
13	Nadavi Distributory	44.964	20.00	---	20.00	23.93	---	23.93	1152.51	---	1152.51	3680.45	---	3680.45
14	D.P.No.7	47.776	1.40	---	1.40	1.40	---	1.40	70.04	---	70.04	223.90	---	223.90
15	D.P.No.8 & 9	49.886	5.22	---	5.22	4.61	---	4.61	240.76	---	240.76	759.97	---	759.97
16	D.P.No.10 & 11	52.817	1.80	---	1.80	1.80	---	1.80	90.02	---	90.02	288.35	---	288.35
17	D.P.No.12	55.819	1.52	---	1.52	1.41	---	1.41	70.11	---	70.11	224.21	---	224.21
18	D.P.No.13	54.892	---	---	0.00	1.00	---	1.00	---	---	0.00	159.88	---	159.88
19	D.P.No.14	56.783	0.41	---	0.41	0.41	---	0.41	20.96	---	20.96	67.25	---	67.25
20	D.P.No.15	58.417	1.81	---	1.81	---	---	0.00	90.61	---	90.61	---	---	0.00
21	D.P.No.16	59.612	0.85	---	0.85	---	---	0.00	42.73	---	42.73	---	---	0.00
22	D.P.No.17	61.868	1.40	---	1.40	1.85	---	1.85	70.17	---	70.17	223.77	---	223.77
23	D.P.No.17.(A)	63.463	2.63	---	2.63	3.45	---	3.45	131.52	---	131.52	421.30	---	421.30
24	Muddatanur R.S	64.967	13.75	---	13.75	13.51	---	13.51	671.28	---	671.28	2127.00	---	2127.00

Sl. No.	Name of Sluices	Location KM.	Schedule Discharge (C/s.)						Ayacut in Acres.					
			Khariff			Rabi			Khariff			Rabi		
			K.A	A.P	TOTAL	K.A	A.P	TOTAL	K.A	A.P	TOTAL	K.A	A.P	TOTAL
25	Bagewadi R.S	68.293	138.60	---	138.60	138.00	---	138.00	7907.51	---	7907.51	6430.74	---	6430.74
26	D.P.No.18	70.645	8.20	---	8.20	8.33	---	8.33	410.00	---	410.00	1312.00	---	1312.00
27	D.P.No.19	73.710	3.86	---	3.86	3.70	---	3.70	191.26	---	191.26	589.05	---	589.05
28	D.P.No.20	74.271	4.82	---	4.82	4.71	---	4.71	241.46	---	241.46	767.93	---	767.93
29	D.P.No.21	79.663	4.09	---	4.09	3.91	---	3.91	199.02	---	199.02	641.09	---	641.09
30	D.P.No.22	87.020	8.53	---	8.53	8.50	---	8.50	426.61	---	426.61	1363.24	---	1363.24
31	D.P.No.23	89.336	3.62	---	3.62	5.00	---	5.00	250.00	---	250.00	800.00	---	800.00
32	D.P.No.24	92.480	1.28	---	1.28	1.20	---	1.20	60.22	---	60.22	192.54	---	192.54
33	D.P.No.25	97.050	2.00	---	2.00	1.64	---	1.64	100.00	---	100.00	317.02	---	317.02
34	Kuriganur Distributory 26 & 27	102.635	70.19	---	70.19	71.87	---	71.87	4248.35	---	4248.35	1800.92	---	1800.92
35	D.P.No.28	104.341	1.17	---	1.17	0.80	---	0.80	40.74	---	40.74	128.39	---	128.39
36	D.P.No.29	105.835	3.19	---	3.19	2.90	---	2.90	145.46	---	145.46	464.39	---	464.39
37	D.P.No.30 (A)	109.750	1.10	---	1.10	1.87	---	1.87	55.00	---	55.00	300.00	---	300.00
38	D.P.No.30	110.698	2.10	---	2.10	1.33	---	1.33	160.02	---	160.02	513.46	---	513.46
39	D.P.No.31	113.280	3.00	---	3.00	2.93	---	2.93	150.22	---	150.22	480.00	---	480.00
40	D.P.No.32	116.688	1.42	---	1.42	1.40	---	1.40	70.10	---	70.10	224.83	---	224.83
41	D.P.No.33 L.S	118.021 LS	13.06	---	13.06	14.00	---	14.00	653.00	---	653.00	226.50	---	226.50
42	D.P.No.34 R.S	118.021 RS	3.47	---	3.47	3.47	---	3.47	174.00	---	174.00	555.00	---	555.00
43	D.P.No.35	120.05	11.65	---	11.65	11.65	---	11.65	582.55	---	582.55	582.55	---	582.55
44	D.P.No.36	128.728	7.36	---	7.36	6.32	---	6.32	368.43	---	368.43	1013.28	---	1013.28
45	D.P.No.37	130.921	1.16	---	1.16	---	---	---	58.20	---	58.20	41.36	---	41.36
46	D.P.No.37 (A)	131.810	---	---	---	0.47	1.20	1.67	---	---	---	76.00	143.00	219.00
47	D.P.No.38	137.080	5.94	---	5.94	---	---	0.00	278.93	---	278.93	---	---	0.00
48	D.P.No.39	139.905	0.33	---	0.33	0.33	---	0.33	16.50	---	16.50	46.22	---	46.22
49	D.P.No.40	145.050	3.33	---	3.33	---	---	0.00	166.71	---	166.71	---	---	0.00
50	D.P.No.41	146.640	1.40	---	1.40	1.40	---	1.40	70.43	---	70.43	217.86	---	217.86
51	D.P.No.42	149.880	1.02	---	1.02	0.91	---	0.91	40.00	---	40.00	117.53	---	117.53
52	D.P.No.43	151.880	1.20	---	1.20	1.18	---	1.18	60.37	---	60.37	190.29	---	190.29
53	D.P.No.44	154.000	---	1.00	1.00	2.75	2.70	5.45	85.00	63.00	148.00	104.00	213.00	317.00
54	D.P.No.45	154.837	---	4.00	4.00	0.80	4.00	4.80	15.00	271.00	286.00	76.00	774.00	850.00
55	D.P.No.46	157.750	---	1.00	1.00	---	1.20	1.20	---	68.00	68.00	---	144.00	144.00
56	D.P.No.47	161.574	---	1.50	1.50	---	1.50	1.50	---	107.00	107.00	---	187.00	187.00

Sl. No.	Name of Sluices	Location KM.	Schedule Discharge (C/s.)						Ayacut in Acres.					
			Khariff			Rabi			Khariff			Rabi		
			K.A	A.P	TOTAL	K.A	A.P	TOTAL	K.A	A.P	TOTAL	K.A	A.P	TOTAL
57	D.P.No.48	165.590	---	3.50	3.50	---	5.50	5.50	---	255.00	255.00	---	742.00	742.00
58	D.P.No.49	168.549	---	1.00	1.00	---	2.00	2.00	---	86.00	86.00	---	272.00	272.00
59	D.P.No.50 (A)	171.70	---	5.00	5.00	---	---	0.00	---	250.00	250.00	---	---	0.00
60	D.P.No.50	173.100	---	4.00	4.00	---	6.00	6.00	---	469.00	469.00	---	1305.00	1305.00
61	D.P.No.51	175.419	---	1.50	1.50	---	2.00	2.00	---	100.00	100.00	---	240.00	240.00
62	D.P.No.52	178.225	---	0.90	0.90	---	1.00	1.00	---	59.00	59.00	---	100.00	100.00
63	D.P.No.53	180.525	---	0.90	0.90	---	3.50	3.50	---	56.00	56.00	---	539.00	539.00
64	D.P.No.54	182.386	---	1.00	1.00	---	1.30	1.30	---	67.00	67.00	---	189.00	189.00
65	D.P.No.55	183.728	---	2.00	2.00	---	2.30	2.30	---	148.00	148.00	---	288.00	288.00
66	D.P.No.56	185.044	---	1.50	1.50	---	1.50	1.50	---	96.00	96.00	---	192.00	192.00
67	D.P.No.57	187.051	---	5.00	5.00	---	5.00	5.00	---	305.00	305.00	---	787.00	787.00
68	D.P.No.58	188.293	3.40	---	3.40	3.40	---	3.40	170.15	---	170.15	543.08	---	543.08
69	D.P.No.59	190.112	1.59	---	1.59	1.59	---	1.59	79.89	---	79.89	255.43	---	255.43
70	D.P.No.60	191.540	---	1.00	1.00	1.00	---	1.00	---	58.00	58.00	160.08	---	160.08
71	D.P.No.61	192.209	---	0.50	0.50	---	0.50	0.50	---	21.00	21.00	---	48.00	48.00
72	Kote Ial Distributory	193.820	24.14	---	24.14	24.00	---	24.00	1205.84	---	1205.84	3842.99	---	3842.99
73	D.P.No.62	196.70	---	2.50	2.50	0.27	2.50	2.77	---	157.00	157.00	43.66	413.00	456.66
74	D.P.No.63	198.830	---	1.00	1.00	---	0.60	0.60	---	67.00	67.00	---	66.00	66.00
75	D.P.No.64	199.358	---	0.30	0.30	---	0.30	0.30	---	22.00	22.00	---	34.00	34.00
76	□atc□olly Distributory	205.267	53.66	2.50	56.16	52.90	5.20	58.10	2682.36	171.00	2853.36	8442.88	684.00	9126.88
77	D.P.No.65	206.980	4.93	5.00	9.93	6.40	4.50	10.90	241.51	215.00	456.51	1024.46	558.00	1582.46
78	D.P.No.66	212.186	---	3.50	3.50	---	5.00	5.00	---	264.00	264.00	---	611.00	611.00
79	D.P.No.67	213.714	---	2.50	2.50	---	2.00	2.00	---	163.00	163.00	---	210.00	210.00
80	D.P.No.68	222.044	---	2.50	2.50	---	3.00	3.00	---	136.00	136.00	---	321.00	321.00
81	D.P.No.69	225.117	---	2.50	2.50	---	4.00	4.00	---	152.00	152.00	---	536.00	536.00
82	D.P.No.70	234.397	---	3.00	3.00	---	4.00	4.00	---	210.00	210.00	---	531.00	531.00
83	D.P.No.71	238.256	---	1.50	1.50	---	1.50	1.50	---	80.00	80.00	---	203.00	203.00
84	D.P.No.72	240.388	---	6.00	6.00	2.05	4.00	6.05	---	359.00	359.00	328.54	560.00	888.54
85	D.P.No.73	247.972	1.89	4.00	5.89	6.49	---	6.49	94.53	237.00	331.53	1041.88	---	1041.88
86	T.S.Distributory	250.530	27.69	22.00	49.69	35.15	16.50	51.65	1378.92	1298.00	2676.92	5605.51	2330.00	7935.51
	TOTAL		**687.63**	**94.10**	**781.73**	**701.24**	**94.30**	**795.54**	**35436.55**	**6010.00**	**41446.55**	**61139.36**	**13220.00**	**74359.36**

Annexure 3.13

STATEMENT SHOWING THE DETAILS OF AYACUT OF DP'S & DISTRIBUTARIES OF TUNGABHADRA PROJECT LOW LEVEL CANAL (TBPLLC) BEYOND BOARD LIMIT				
SL.No.	**DP/ Distributary No.**	**Ayacut (Acres) Kharif**	**Ayacut (Acres) Rabi**	**Ayacut (Acres)**
1	2	3	4	5
1	D.P 74 of L.L.C	161.16	429.84	591.00
2	D.P 75 of L.L.C	397.80	1367.72	1765.52
3	Kowthalam Major	954.24	2603.28	3557.52
4	Madhavaram Major	3226.32	8432.94	11659.26
5	Chagi Major	1200.16	3297.62	4497.78
6	Kattododdi Major	686.26	1584.59	2270.85
7	Halvi Major	1042.19	2794.34	3836.53
8	Naranapuram Major	782.82	1911.43	2694.25
9	DP .76 of LLC	209.61	484.62	694.23
10	Sugur major	2390.70	3731.11	6121.81
11	DP .77 of LLC	90.93	211.83	302.76
12	DP .78 of LLC	86.64	68.74	155.38
13	Gangavaram Major	3041.66	6430.59	9472.25
14	Nandavaram Major	831.93	2243.44	3075.37
15	C.K. Major	2986.69	6050.14	9036.83
16	DP 79 of TBP LLC	388.82	429.55	818.37
17	DP 80 of TBP LLC	596.73	1339.65	1936.38
18	MSP Major	1169.32	3313.96	4483.28
19	D.P 81 of LLC	137.72	569.44	707.16
20	D.P 82 of LLC	299.21	973.23	1272.44
21	D.P 83 of LLC	89.54	171.53	261.07
22	DP 86 of LLC	303.43	824.60	1128.03
23	P.D Major	1067.45	2993.87	4061.32
24	MLSP	1382.76	3998.13	5380.89
25	Kurnool Branch Canal	4778.10	14468.64	19246.74
26	Gorantla Major	1400.89	3634.06	5034.95
27	Gundrevula	2653.17	6977.62	9630.79
28	L Polur Dist	3385.72	9004.23	12389.95
29	G.Sinavaram	1657.03	3992.97	5650.00
	Total	**37399.00**	**94333.71**	**131732.71**

Annexure 3.14

STATEMENT SHOWING THE DETAILS OF AYACUT AND DISCHARGES OF DP'S & DISTRIBUTARIES OF RIGHT BANK HIGH LEVEL CANAL UP TO BOARD LIMIT

Sl No.	Name of Sluice	Location in Km	Scheduled Discharge in(cusecs)	Ayacut in Acres.
1	2	3	4	5
1	Distributory No. 1	9.293	6.00	852.00
2	Distributory No. 1B (Allikere Tank)	17.840	2.00	383.00
3	Distributory No. 1A	21.221	6.40	900.00
4	Distributary	23.485	1.00	200.00
5	Distributory No. 2	33.523	42.02	6100.00
6	Distributory No. 2A1	37.440	19.00	2515.26
7	Distributary No. 2A2	44.740	5.00	461.66
8	Distributary No. 3A (Daroji Tank)	53.922	80.00	3222.73
9	Distributary No. 3	54.982	46.00	6560.00
10	Distributary No. 4	56.615	5.00	647.00
11	Distributary No. 5	59.600	5.00	679.00
12	Distributary No. 6	62.545	40.00	5709.00
13	Distributary No. 7	63.900	399.00	47050.00
14	Distributary No. 8	65.776	6.00	790.00
15	Distributary No. 9	66.123	29.00	4214.00
16	Distributary No. 10	70.411	25.00	3594.00
17	Distributary No. 11	75.114	34.00	4854.00
18	Distributary No. 12	77.110	53.00	7661.00
19	Distributary No. 13	79.700	158.00	22750.00
20	Distributary No. 14	82.702	243.00	34984.00
21	Distributary No. 14A	91.900	7.50	613.86
22	Distributary No. 15	93.455	113.00	16300.00
23	Distributary No. 16	101.170	90.00	14950.00
24	Distributary No. 16A	103.700	26.00	3867.00
		TOTAL	**1440.92**	**189857.51**

Annexure 3.15

STATEMENT SHOWING THE DETAILS OF AYACUT OF MAIN CANAL AND BRANCH CANAL OF RIGHT BANK HIGH LEVEL CANAL BEYOND BOARD LIMIT

Sl. No.	Name of the Canal / Branch Canal		Ayacut in acres			Entitled water out of 32.50 TMC as per KWDT
		Number of Distributaries	WET	ID	Total	
A. T.B.P HLC STAGE - I						
1	High Level Main Canal	15	28488	7053	35541	7.32
2	Mid Pennar North Canal	19	4438	8887	13325	1.87
3	Mid Pennar South Canal	29	8290	24886	33176	4.32
4	Tadipatri Branch Canal	13	8821	22310	31131	3.70
B. T.B.P HLC STAGE - II						
5	Guntakal Branch Canal	23	10446	5346	15792	2.77
6	Gooty Sub Branch Canal	2	0	16271	16271	1.75
7	Alur Brach Canal	19	7861	6394	14255	2.37
8	Mylavaram North Canal	8	0	47214	47214	2.66
9	Mylavaram South Canal	15	0	22708	22708	1.34
10	Pulivendula Branch Canal	33	0	55579	55579	4.40
	Total :	**176**	**68344**	**216648**	**284992**	**32.50**

Annexure 3.16

STATEMENT SHOWING THE DETAILS OF AYACUT AND DISCHARGES OF DISTRIBUTARIES OF LEFT BANK MAIN CANAL (LBMC)				
Sl. No.	Name of Distributary	Location in Kms	Design Discharge in cusecs	Ayacut in Acres (Kharif / Rabi)
1	2	3	4	5
1	Distributary No.1	0.803	27.97	675.16
2	Distributary No.2	4.620	15.64	523.14
3	Distributary No.3A	6.870	25.00	799.37
4	Distributary No.5	9.060	4.12	129.26
5	Distributary No.6	11.580	5.62	251.02
6	Distributary No.7	12.000	6.62	234.36
7	Distributary No.8	12.990	20.45	683.24
8	Distributary No.9	15.090	25.12	674.02
9	Distributary No.10	17.040	12.53	183.13
10	Distributary No.10A	18.120	20.00	558.19
11	Distributary No.11	25.290	34.72	1504.34
12	Distributary No.11A	27.150	3.67	287.12
13	Distributary No.12 Extra Sluice	23.250	1.95	122.20
14	Distributary No.13	32.130	15.26	902.01
15	Distributary No.14	33.000	10.56	742.36
16	Distributary No.15	34.590	2.75	116.01
17	Distributary No.16	36.660	13.37	684.18
18	Distributary No.17	39.450	93.03	9773.00
19	Distributary No.18	42.930	3.92	100.00
20	Distributary No.19	43.650	27.00	1685.00
21	Distributary No.20	46.050	4.00	287.00
22	Distributary No.21	47.910	61.18	4706.00
23	Distributary No.22	49.380	3.00	419.00
24	Distributary No.23	50.940	3.00	168.00
25	Distributary No.23A	51.840	15.49	458.00

26	Distributary No.25	55.410	172.26	18516.00
27	Distributary No.27	58.410	16.90	1230.00
28	Distributary No.28	58.650	14.84	1511.00
29	Distributary No.29	62.250	10.64	1274.00
30	Distributary No.30	64.950	22.30	1339.00
31	Distributary No.31	68.070	280.00	43305.00
32	Distributary No.32	69.960	175.00	24687.00
33	Distributary No.33	71.670	2.80	358.00
34	Distributary No.34	74.160	2.80	358.00
35	Distributary No.36	75.660	208.00	44963.30
36	Distributary No.37	78.300	8.86	1589.32
37	Distributary No.38	79.500	2.80	621.22
38	Distributary No.40	83.430	68.00	14249.27
39	Distributary No.41	85.785	2.00	498.09
40	Distributary No.42	87.300	6.40	1460.11
41	Distributary No.44	89.070	1.83	245.30
42	Distributary No.45	91.410	44.42	9551.08
43	Distributary No.46	92.550	34.80	4283.07
44	Distributary No.48	94.950	19.56	4152.20
45	Distributary No.49	98.460	8.20	1542.00
46	Distributary No.51	101.100	1.12	218.10
47	Distributary No.52	102.900	5.15	1173.14
48	Distributary No.54	103.860	379.00	87085.17
49	Distributary No.55	106.680	81.24	16022.16
50	Distributary No.56	107.280	5.05	1030.22
51	Distributary No.62	117.600	10.37	2105.09
52	Distributary No.65	122.700	56.30	7859.10
53	Distributary No.66	124.200	16.33	3241.26
54	Distributary No.69	128.700	16.27	3409.18
55	Distributary No.71/A	134.250	14.21	3049.22
56	Distributary No.73	137.208	22.54	3106.28

57	Distributary No.74	138.120	5.13	766.28
58	Distributary No.76	141.180	428.30	57878.38
59	Distributary No.78	143.880	16.30	2051.07
60	Distributary No.79	144.780	10.24	1130.11
61	Distributary No.81	149.190	3.59	612.28
62	Distributary No.82	152.190	73.03	9602.20
63	Distributary No.84	154.770	24.00	2327.34
64	Distributary No.85	156.000	240.40	25739.10
65	Distributary No.87	159.120	7.08	1419.18
66	Distributary No.89	159.990	244.90	33254.18
67	Distributary No.90	163.620	40.34	3595.21
68	Distributary No.91	164.970	12.48	1134.12
69	Distributary No.92	166.710	80.00	11582.38
70	Distributary No.94	170.070	3.86	540.29
71	Distributary No.95	178.155	28.94	7479.10
72	Distributary No.96	179.640	32.08	4496.65
73	Distributary No.98	193.781	175.86	31958.18
74	Distributary No.98A	190.620	4.89	368.35
75	Distributary No.98B	191.910	8.03	461.07
76	Distributary No.99	193.110	135.06	15305.34
77	Distributary No.99A	193.410	10.01	1243.21
78	Distributary No.100	198.660	52.05	5242.76
79	Distributary No.102	204.960	110.20	17065.08
80	Distributary No.102A	206.070	74.58	14100.73
81	Distributary No.103	211.740	11.27	2130.24
82	Distributary No.104	217.950	23.28	5323.19
83	Distributary No.104ABC	218.340	9.27	1987.29
84	Distributary No.105	221.910	3.98	794.11
85	Distributary No.106	232.000	66.95	12407.63
	Total		**4102.06**	**602692.04**

STATEMENT SHOWING THE DETAILS OF AYACUT AND DISCHARGES OF LEFT BANK HIGH LEVEL CANAL (LBHLC) AND RAYA BASAVANNA CANAL				
Sl. No.	Name of the Canal	Design Discharge in cusecs	Ayacut in Acres	
			Kharif	Rabi
1	2	3	4	5
1	LBHLC	33.00	1160.00	0.00
2	*Raya Basavanna canals*			
A	Raya Canal	170.00	5110.00	5110.00
B	Basavanna Canal	80.00	2358.00	2358.00
	TOTAL	**250.00**	**7468.00**	**7468.00**

Annexure 3.18

Details of Telemetry locations installed in TB Project Canals

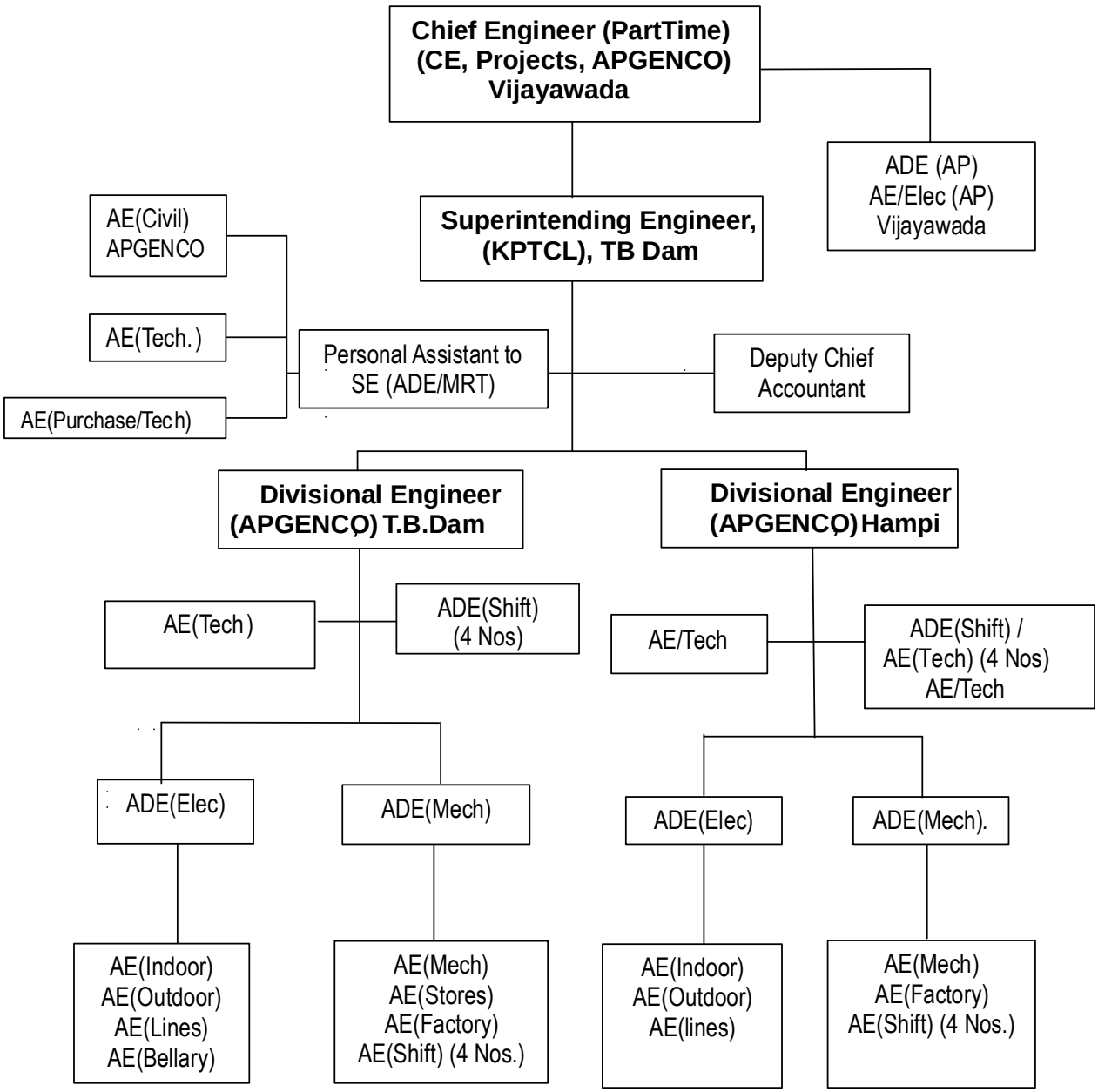
S.No	Name of Telemetry Station	Telemetry Location			Type of Sensor
		On	Longitude	Latitude	
	A. RBHLC				
1	RBHLC At KM 2.483	Main Canal	76° 21' 40.788"	15° 15' 38.5596"	Side Looking Doppler flow sensor
2	RBHLC At KM 45.00	Main Canal	76° 38' 32.629"	15° 12' 55.5084"	
3	DP 3A of RBHLC At KM 53.922	Distry. Head	76° 41' 27.960"	15° 13' 31.1808"	
4	DP3 of RBHLC At KM 54.982	Distry. Canal	76° 68' 62.880"	15° 22' 58.0280"	
5	D7 of RBHLC At KM 63.900	Distry. Head	76° 45' 25.992"	15° 14' 15.9972"	
6	D11 of RBHLC At KM 75.114	Distry. Canal	76° 83' 43.840"	15° 21' 24.0210"	
7	D12 of RBHLC At KM 77.175	Distry. Head	76° 50' 47.364"	15° 11' 57.5520"	
8	D13 of RBHLC At KM 79.702	Distry. Head	76° 51' 45.954"	15° 11' 05.5068"	
9	D14 of RBHLC At KM 82.000	Distry. Head	76° 52' 38.470"	15° 09' 57.3696"	
10	D15 of RBHLC At KM 93.465	Distry. Head	76° 55' 07.500"	15° 05' 42.6000"	
11	D16 of RBHLC At KM 101.000	Distry. Canal	76° 57' 54.205"	15° 02' 59.5320"	
12	D16 -A of RBHLC At KM 103.000	Distry. Head	76° 58' 29.827"	15° 01' 54.5736"	
13	AP Border At KM 104.787	Main Canal	76° 58' 31.512"	15° 01' 24.0276"	
	B. Power canal				
14	Power Canal At Km 0.500	Main Canal	76° 20' 35.282"	15° 16' 03.9504"	Side Looking Doppler flow sensor
	C. Raya Basavanna Canal				
15	Raya Basavanna Canal At KM.0.200	Main Canal	76° 20' 29.760"	15° 15' 47.0502"	Side Looking Doppler flow sensor
	D. TLBC				
16	TLBC Ch. 28	Main Canal	76° 19' 51.001"	15° 16' 30.0004"	Side Looking Doppler flow sensor
17	TLBC Mile 10	Main Canal	76° 22' 11.704"	15° 20' 52.2708"	
18	TLBC Mile 19	Main Canal	76° 28' 55.819"	15° 23' 29.3748"	
19	TLBC Mile 24	Main Canal	76° 28' 08.112"	15° 26' 59.5536"	
20	TLBC Mile 36	Main Canal	76° 32' 33.009"	15° 34' 21.0008"	
21	TLBC Mile 46	Main Canal	76° 36' 13.003"	15° 40' 52.0001"	
22	TLBC Mile 60	Main Canal	76° 36' 55.098"	15° 51' 17.9892"	
23	TLBC Mile 69	Main Canal	76° 39' 42.426"	15° 57' 00.5688"	
24	TLBC Mile 90	Main Canal	76° 51' 52.052"	16° 04' 25.5504"	
25	TLBC Mile 104	Main Canal	76° 00' 57.146"	16° 12' 13.2552"	

	E. LBHLC				
26	LBHLC @ Km 0.5	Main Canal	76˚ 19' 19.300"	15˚ 16' 42.4344"	Side Looking Doppler flow sensor
	F. RBLLC				
27	RBLLC Head @ LLC km 2.842	Main Canal	76˚ 31' 22.066"	15˚ 20' 04.9146"	Side Looking Doppler flow sensor
28	Sanapura Dy. At LLC Km 18.846	Distry. Head	76˚ 40' 56.028"	15˚ 25' 54.0000"	
29	Muddapura No.1 @ LLC Km 21.356	Distry. Head	76˚ 37' 36.984"	15˚ 21' 24.0084"	
30	LLC Km 23.100	Main.Canal	76˚ 64' 07.087"	15˚ 35' 22.0099"	Side Looking Doppler flow sensor
31	LLC Km 40.00	Main.Canal	76˚ 73' 63.053"	15˚ 34' 48.0052"	
32	Sugur Dy. @ LLC Km 43.019	Distry. Head	76˚ 44' 49.848"	15˚ 21' 36.0378"	
33	Nadavi Dy. @ LLC Km 44.964	Disrty. Canal	76˚ 45' 31.068"	15˚ 22' 22.0098"	
34	Bagewadi Dy. @ LLC 68.293	Distry. Head	76˚ 52' 56.776"	15˚ 25' 29.2404"	
35	LLC Km 70.00	Main Canal	76˚ 53' 43.728"	15˚ 25' 48.6264"	
36	LLC Km 85.00	Main.Canal	76˚ 93' 84.078"	15˚ 36' 16.0047"	
37	Kuriganur Dy. @ LLC Km 102.60	Distry. Head	77˚ 00' 28.003"	15˚ 17' 57.0008"	
38	LLC Km 103.00	Main.Canal	77˚ 00' 93.510"	15˚ 29' 89.0069"	
39	LLC Km 121.00	Main.Canal	77˚ 05' 87.090"	15˚ 19' 77.0033"	
40	LLC Km 133.700	Main Canal	77˚ 07' 52.000"	15˚ 13' 56.0000"	
41	LLC Km 184.00	Main Canal	77˚ 02' 11.256"	15˚ 29' 20.4432"	
42	Kotehal Dy. At LLC Km 193.800	Disty. Canal	77˚ 03' 08.061"	15˚ 32' 05.0055"	
43	Hatcholli Dy. @ LLC Km 205.250	Distry.Canal	77˚ 04' 58.436"	15˚ 34' 16.8096"	
44	T.S. Dystry @ Km 250.580	Distry. Head	77˚ 08' 52.003"	15˚ 41' 01.0007"	
45	AP Border @ Km 251.100	Main.Canal	77˚ 08' 52.003"	15˚ 41' 01.0007"	

NOTE: The above Telemetry locations details are available in TB Board Official Website: www.tbboard.gov.in or www.tbbliveflow.com or by installing the TBPLIVE app from Google Play Store in android mobiles.

Annexure 4.1

ORGANIZATION CHART OF HYDRO-ELECTRIC WING



POWER GENERATION AND UTILISATION (Million Units)

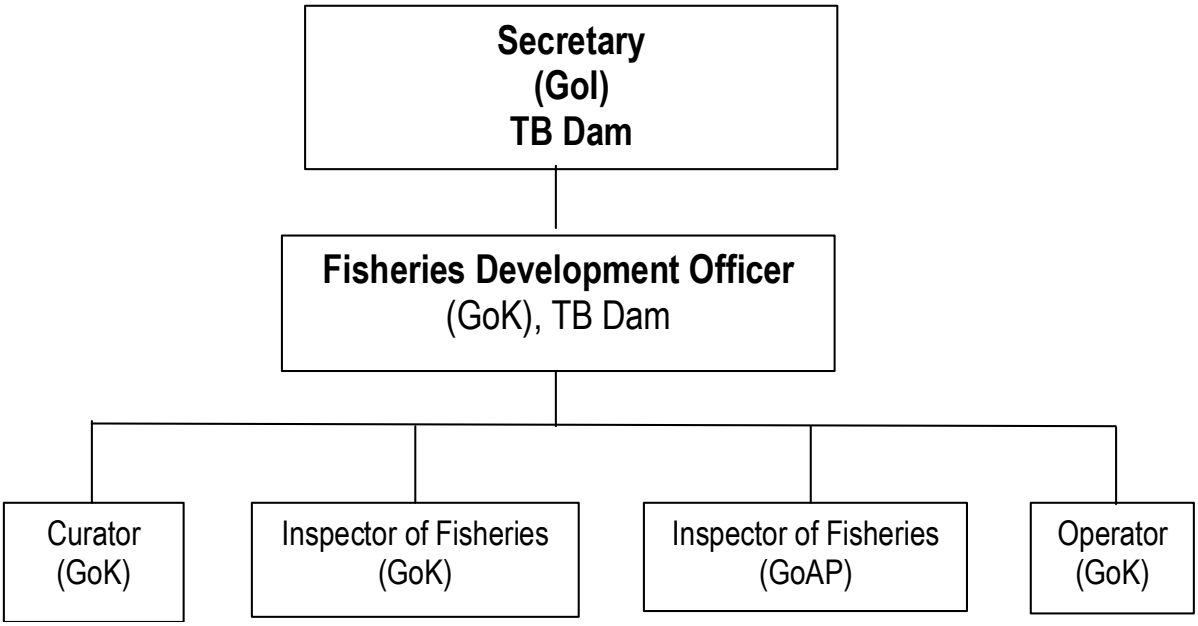
Sl.No.	Description	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
1	POWER GENERATION														
	i. Dam Power House	124.622	97.940	96.120	98.388	100.977	59.721	81.245	73.130	49.927	30.030	32.707	60.059	77.526	76.448
	ii. Hampi Power House	99.515	107.690	93.941	86.424	87.163	68.364	93.709	91.148	66.748	50.335	54.617	74.616	99.447	96.670
	iii. Ncl Mini Hydel Power House	27.830	21.650	25.408	26.268	24.687	20.128	25.567	26.919	12.891	3.432	12.972	20.369	27.717	26.069
	iv. Khandaleru Power House	--	--	--	--	--	--	4.182	6.759	5.044	3.391	3.794	7.000	6.364	6.325
	TOTAL	251.967	227.281	215.470	211.080	212.827	148.213	204.703	197.957	134.611	87.188	104.090	162.044	211.054	205.512
2	AUXILIARY CONSUMPTION (Consumption of common loads including station auxiliary)	7.031	7.147	6.960	7.321	7.816	7.204	7.119	7.084	6.809	6.203	6.387	6.053	5.766	5.801
3	POWER GENERATED FOR SHARING	244.935	220.133	219.074	203.759	205.011	141.009	197.584	190.874	122.276	78.461	93.419	148.991	197.678	193.386
4	IMPORT OF POWER														
	i. Govt. of Andhra Pradesh	2.709	0.659	2.133	2.654	1.169	2.523	1.017	1.954	2.153	1.900	1.033	0.982	0.782	1.246
	ii. Govt. of Karnataka	0.359	1.125	1.870	0.770	1.467	0.648	1.445	0.293	0.881	1.994	1.514	0.751	1.263	0.552
	iii. Total	3.068	1.784	4.002	3.424	2.636	3.171	2.462	2.247	3.034	3.894	2.547	1.733	2.045	1.798
5	GOVT. OF KARNATAKA														
	i. Share in Generation	47.975	42.718	40.334	39.405	39.678	27.873	43.856	43.600	24.726	16.905	19.680	25.373	40.388	38.715
	ii. Utilisation	53.922	40.252	41.221	41.059	35.569	24.499	42.841	42.191	24.444	13.935	20.524	27.054	38.421	43.383
6	GOVT. OF ANDHRA PRADESH														
	i. Share in Generation	191.902	170.873	161.336	157.619	158.711	111.491	153.953	148.175	97.534	61.543	73.720	99.470	157.280	153.882
	ii. Utilisation	185.956	173.340	160.450	155.965	162.820	114.865	154.967	149.585	97.816	61.514	72.882	97.790	159.796	149.214
7	TOTAL UTILISATION	239.878	213.591	201.671	197.024	198.389	139.364	197.810	191.776	122.261	78.449	93.406	124.844	198.217	192.597
8	System losses	5.892	8.326	6.361	7.486	7.263	2.269	2.183	1.332	3.517	3.027	3.038	5.509	3.292	2.592
9	% System losses	2.27%	3.75%	3.01%	3.49%	3.37%	1.50%	1.05%	0.67%	2.55%	3.32%	2.85%	3.36%	1.55%	2.27%

GENERATION COST PER UNIT

Sl.No	Year	Water utilization TMC	Power generated M.Units	*Rupees in lakhs*				Cost of generation (paise)
				Direct expenditure	Indirect expenditure		Total expenditure	
					Depreciation	Interest on Capital		
1	2	3	4	5	6	7	8	9
1	2004-05	39.200	148.521	599.670	2.290	34.190	636.150	42.83
2	2005-06	61.363	205.221	597.890	2.290	34.190	634.370	30.91
3	2006-07	50.820	196.874	975.410	2.290	34.190	1011.890	51.40
4	2007-08	57.858	224.137	846.480	2.290	34.190	882.960	39.40
5	2008-09	54.08	205.630	848.430	2.290	34.190	884.910	43.03
6	2009-10	57.828	190.061	952.580	2.290	34.190	989.060	52.04
7	2010-11	62.533	184.812	849.040	1.900	34.190	885.130	47.89
8	2011-12	67.17	188.140	1555.030	1.900	34.190	1591.120	84.57
9	2012-13	42.748	128.085	1527.350	1.900	34.190	1563.440	122.06
10	2013-14	50.438	174.955	1688.870	1.900	34.190	1724.960	98.59
11	2014-15	81.163	164.278	1849.810	0	22.310	1872.120	113.96
12	2015-16	56.274	116.676	2006.180	0	0	2006.180	171.94
13	2016-17	39.86	80.365	2353.380	0	0	2353.380	292.84
14	2017-18	32.752	87.325	2549.440	0	0	2549.440	291.95
15	2018-19	47.604	134.670	2438.137	0	0	2438.137	181.05
16	2019-20	55.688	176.973	2000.000	0	0	2000.000	113.01
17	2020-21	53.425	173.118	2188.910	0	0	2188.910	126.44

Annexure 5.1

ORGANIZATION CHART OF FISHERIES WING

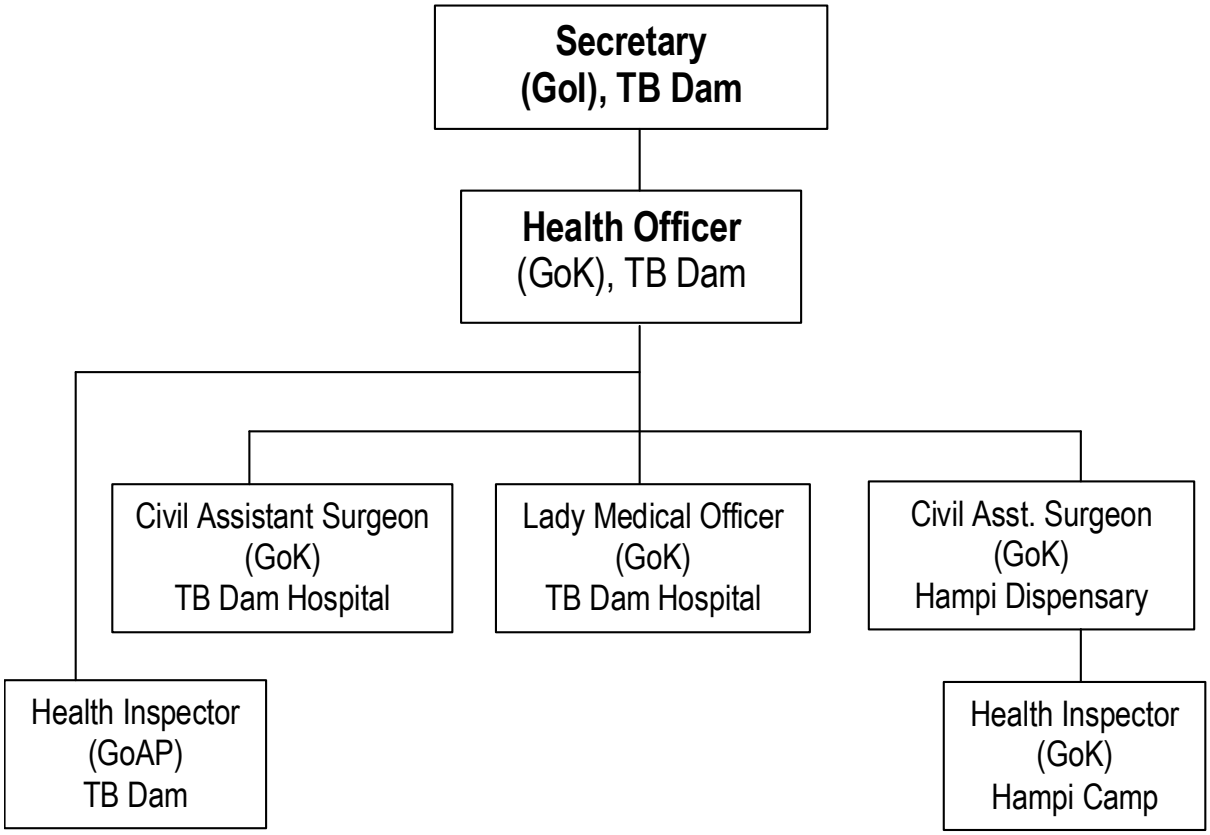


Annexure 5.2

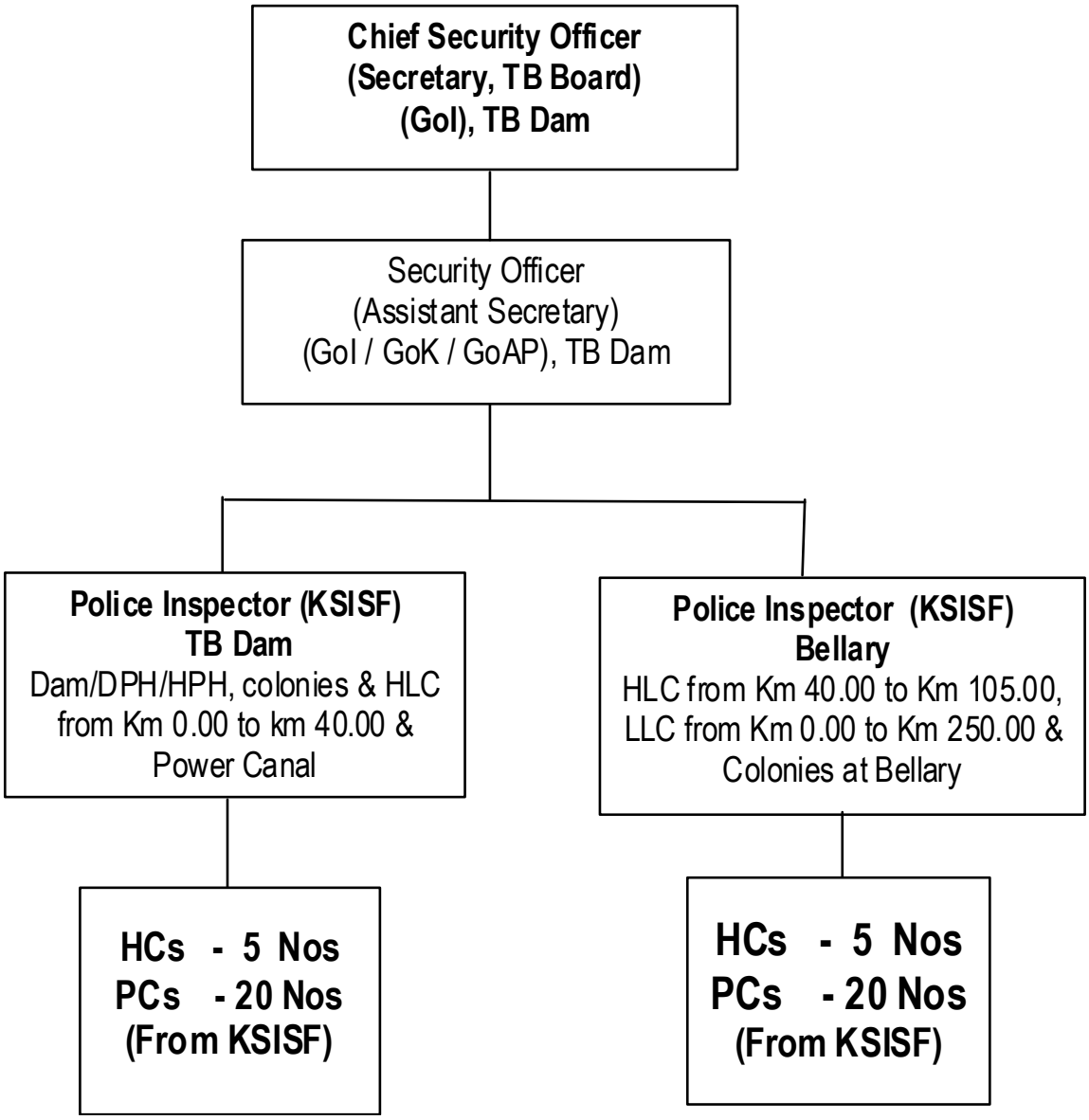
PHYSICAL PERFORMANCE OF FISHERIES WING

Period	Fish Farm Unit		Reservoir Unit			Ice cum Cold storage plant
	Production of spawn (lakhs)	Supply of fish seed (lakhs)	Area of Pens erected (ha.)	Spawn (lakhs)	Direct stocking of finger lings. (lakh)	Production of ice (Tonnes)
1	2	3	4	5	6	7
2007-2008	477.30	268.00 Spawn 36.90 Fry 28.49 Fingerlings	3	240	11.42	2118.55
2008-2009	315.85	130.35 Spawn 27.34 Fry 26.26 Fingerlings	3	114	11.62	2483.65
2009-2010	527.40	301.40 Spawn 30..67 Fry 35.52 Fingerlings	3	231	9.89	2702.30
2010-2011	615.90	454.85 Spawn 12.02 Fry 33.56 Fingerlings	3	223	11.00	2447.05
2011-2012	649.25	480.10 Spawn 12.40 Fry 35.92 Fingerlings	3	265	14.12	2823.45
2012-2013	494.98	330.00 Spawn 7.77 Fry 43.56 Fingerlings	5	190	15.97	2358.95
2013-2014	659.95	447.90 Spawn 10.63 Fry 45.71 Fingerlings	5	230	24.85	2236.33
2014-2015	569.00	322.84 Spawn 2.73 Fry 56.54 Fingerlings	5	259	28.94	2069.30
2015-2016	465.10	247.50 Spawn 2.06 Fry 52.82 Fingerlings	1	66	30.43	1707.65
2016-2017	444.87	151.80 Spawn 2.65 Fry 47.90 Fingerlings	-	-	35.15	1305.55
2017-2018	503.89	349.50 Spawn 0.00 Fry 44.73 Fingerlings	-	-	26.71	1631.55
2018-2019	450.13	235.40 Spawn 0.00 Fry 31.49 Fingerlings	-	-	34.50	792.35
2019-2020	507.00	262.00 Spawn 4.66 Fry 31.28 Fingerlings	-	-	31.09	1915.90
2020-2021	676.00	419.00 Spawn 0.00 Fry 60.29 Fingerlings	-	-	35.94	1687.75

ORGANIZATION CHART OF HEALTH AND MEDICAL UNIT



ORGANIZATION CHART OF SECURITY SECTION



ABBREVIATIONS

AP	Andhra Pradesh
APERL	Andhra Pradesh Engineering Research Lab
APGENCO	Andhra Pradesh Generation Corporation
APTRANSCO	Andhra Pradesh Transmission Corporation
BOOT	Built Own Operate and Transfer
CEA	Central Electricity Authority
Cumecs	Cubic Metre per second
Cusecs	Cubic feet per second
CWC	Central Water Commission
CWPRS	Central Water and Power Research Station
FFU	Fish Farm Unit
FNMP	Fish Net Making Plant
FRL	Full Reservoir Level
Ft.	Feet
FW	Fisheries Wing
GESCOM	Gulbarga Electricity Supply Company
GoAP	Government of Andhra Pradesh
GoK	Government of Karnataka
GoT	Government of Telangana
GU	Garden Unit
ha	Hectare
HC	Head Constable
HEW	Hydro Electric Wing
ICZ	Irrigation Central Zone
IW	Irrigation Wing
KC Canal	Kurnool Cuddapah Canal
KERS	Karnataka Engineering Research Station
KGBO	Krishna Godavari Basin Organization
KRMB	Krishna River Management Board
Km	Kilometer
KPCL	Karnataka Power Corporation Limited
KPTCL	Karnataka Power Transmission Corporation Limited
KV	Kilo Volt
KWDT	Krishna Water Disputes Tribunal
m	Metre
M. Cum	Million Cubic Metre
mm	Millimeter
MOWR	Ministry of Water Resources
MW	Mega Watt.
MWL	Maximum Water Level
O&M	Operation & Maintenance
RBHLC	Right Bank High level Canal
RBLLC	Right Bank Low Level Canal
RDS	Rajolibanda Diversion Scheme
RM & U	Renovation Modernization & Up-gradation
RU	Reservoir Unit
RWT	Revised Working Table
Sq. Km	Square Kilometer
TB Dam	Tungabhadra Dam
TBHES	Tungabhadra Hydro Electric Scheme
TMC	Thousand Million Cubic feet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