

PREFACE

It is a matter of great satisfaction to present the revised and updated Detailed Project Report (DPR), November, 2017 of Ujh Multipurpose Project in the state of Jammu & Kashmir. The project has been planned to utilize water resource potential of river Ujh, a tributary of River Ravi, which is one of the three eastern Rivers of Indus Basin system.. The Project has been declared as a National Project as it allows India to utilize its share of Indus River system as per provisions of Indus Water Treaty between India and Pakistan. The project entails not only hydro power generation in power-deficit region but also catering to the drinking water requirement as well as meeting the irrigation demand of the area, and thus, will pave the way for overall socio-economic development of the region.

After extensive field surveys & Investigation the DPR of the Project was initially submitted by CWC in September, 2013.

The DPR was taken up in 131st meeting of the Advisory Committee for consideration of Techno-Economic viability of Major & Medium Irrigation, Flood Control and Multipurpose Project proposals of MoWR, RD & GR, held on 16-11-2016. Considering the importance of the Project being a National Project, it was agreed "In Principle" by the Advisory Committee. However, it was decided that "a team consisting of concerned officers from CWC and other experts shall visit the project site/area and explore the alternate options with reduced submergence/displacement along with minimum loss of power and irrigation benefits, so that the potential of east flowing river may be utilized, as envisaged in Indus Water Treaty." Based on the recommendations given by the visiting team led by Chief Engineer, IBO, the FRL has been decided to be reduced from 614m to 608m in order to reduce the submergence from 41 sq.km to about 34.5 sq.km. Accordingly, the DPR has been modified.

The project envisages construction of 116m high Concrete Face Rockfill Dam (CFRD) across the river Ujh, a power house of installed capacity 186 MW (3x62MW) and dam toe power house of 26 MW (1x2MW + 1x24MW) and a barrage 11.5 km downstream of the dam. The irrigation benefits will comprise of annual irrigation to area of 31380 ha besides the drinking water supply to the region. The estimated cost of the project is Rs. 4750 Crores. The implementation of the project deserves consideration for serving local as well as regional requirements.

The field investigation and preparation of DPR was carried out in close coordination with specialized Directorates of CWC, Central Electricity Authority(CEA), Geological Survey of India(GSI), Central Soil and Material Research Station(CSMRS), Central Water and Power Research Station(CWPRS) and other Agencies. The painstaking efforts put forth by different units of CWC viz.,

Hydrology(N), Embankment(N&W) , Hydel Civil Design(N&W), Concrete and Masonry Dam Design(N&W), Barrage and Canal Design(N&W), Gates(N&W), Irrigation Planning (N), CMC, Cost Appraisal and Instrumentation Dte. are praiseworthy.

The Director M&A Dte., CWC, Jammu, Executive Engineer, Chenab Division, CWC and their support group deserves all appreciation for their diligence and hard work in bringing out this DPR. The vital supportive role of State Government of J&K in the development of this report is deeply appreciated.

(Atul Jain)

Chief Engineer

OFFICERS / OFFICIALS INVOLVED

CHIEF ENGINEERS

- | | |
|----|-----------------|
| 1. | Sh. Atul Jain |
| 2. | Sh. Y. K. Handa |
| 3. | Sh. Vinay Kumar |
| 4. | Sh. H. K. Verma |

DIRECTORS

- | | |
|----|--------------------|
| 1. | Sh. Yoki Vijay |
| 2. | Sh. Vivek Tripathi |
| 3. | Sh. R. K. Gupta |

EXECUTIVE ENGINEERS/DEPUTY DIRECTORS

- | | |
|----|--------------------|
| 1. | Sh. Kamlesh Jain |
| 2. | Sh. Hradesh Kumar |
| 3. | Sh. A. K. Shukla |
| 4. | Sh. Abhishek Sinha |
| 5. | Sh. Anuj Kanwal |

A.E.E. / SUB-DIVISIONAL ENGINEERS

- | | |
|----|------------------|
| 1. | Sh. Rakesh Gupta |
| 2. | Sh. Rishi Kumar |
| 3. | Sh. Shiv Ram |
| 4. | Sh. Nabendu De |
| 5. | Sh. Parmjit |

JUNIOR ENGINEERS AND OTHER OFFICIALS

- | | |
|----|----------------------------------|
| 1. | Sh. V.K. Pandita (Sr. Draftsman) |
| 2. | Sh. Vishal Anand (J.E.) |
| 3. | Sh. Govinder Singh (J.E.) |
| 4. | Sh. Ankush Kumar (J.E.) |
| 5. | Sh. Brij Bhushan Kardam (J.E.) |
| 6. | Sh. Amit Kumar (J.E.) |
| 7. | Sh. Trilok Singh (J.E.) |
| 8. | Sh. Kennedy Singh (J.E.) |
| 9. | Sh. S.K. Singh (J.E.) |

DETAILED PROJECT REPORT
LIST OF VOLUMES

Volume	Title
Volume – 0	Executive summary
Volume –1A	Project Engineering Chapter 1- Introduction Chapter 2-Justification from Power Supply Angle Chapter 3- Physical Features Chapter 4- Interstate/International Aspects Chapter 5-Survey and Investigation Chapter 6-Geological and Seismic Studies Chapter 7- Infrastructure facilities Chapter 8- Hydrology Chapter 9- Property Survey Chapter 10- Power Potential
Volume –1B	Project Engineering Chapter 11-Irrigation Planning Chapter 12-Design of Civil Structures Chapter 13-Electro-Mechanical Works Chapter 14-Construction Equipment Planning Chapter 15-Ecology Chapter 16- Project Management Chapter 17-Cost Estimate Chapter 18- Economic and Financial Evaluation
Volume – 2	Cost Estimate
Volume – 3A	Drawings {Design and other miscellaneous drawings}
Volume – 3B	Drawings {Barrage and Canal}
Volume – 3C	Drawings {Command Area Drawings}
Volume – 4A	Geological Report and Design Memorandums
Volume – 4B	Material Testing Report
Volume – 5	Hydrology and Hydrological meteorological data
Volume – 6	Drilling and Drifting Data

CHECK LIST

**UJH MULTIPURPOSE PROJECT, JAMMU & KASHMIR
DETAILED PROJECT REPORT**

SECTION – I

Check list

I		GENERAL DATA	
	1	Name of the Project	UJH Multipurpose Project
	2	Location	
	a	State(s)	Jammu & Kashmir
	b	District(s)	Kathua
	c	Taluka(s)/Tehsil(s)	Billawar & Kathua
	d	Longitude/Latitude	
		Longitude	Between 75 ⁰ 5'E to 75 ⁰ 35' E.
		Latitude	Between 32 ⁰ 33'E to 32 ⁰ 40' E.
	e	Survey of India Topographical Map Reference No.(s)	43 P, 43/P/6,7,10,11
	f	Earthquake Zone	Zone- IV (As per IS 1893-1984)
	g	Complete address for Correspondence along with Pin Code/e-mail	Chief Engineer (IBO), CWC, Block IV, 6 th Floor, Kendriya Sadan, Sector-9, Chandigarh-160009. ceibo-cwc@nic.in
	3	Category of the Project	
	a	Irrigation/Multipurpose	Multipurpose
	b	Storage/Diversion	Storage
II		PLANNING	
	4	Has the Master Plan for overall development of the river basin prepared and stages of basin development discussed?	No

UJH MULTIPURPOSE PROJECT

	5	Have the alternative proposals (including set of smaller developments viz-a-viz a single large development) been studied and their merits and demerits discussed?	Yes
	6	Does the scheme fit in the overall development of the river basin and has its priority in the overall development of the basin been discussed?	Yes
	7	Have the other Departments concerned with the development been informed?	Yes
	8	Is the present scheme proposed to be executed in stages? If so, are its various stages of execution and development discussed in the report?	No, the scheme is proposed to be executed in one stage.
	9	Are the effects of the scheme on the riparian rights & existing upstream and downstream projects etc. discussed?	Yes
	10	Has the provision for municipal and industrial water supply been made?	Yes
III		INTERSTATE AND INTERNATIONAL ASPECTS	
	11	Are there any International/ Interstate issues involved? If so, have these issues been identified and present status of agreement or tribunal decision indicated specially in respect of	No international/ interstate aspect involved.
	a	Sharing of water	No interstate aspect involved.
	b	Sharing of cost	No interstate aspect involved.
	c	Sharing of benefits (irrigation, flood control, power etc.)	No interstate aspect involved.

UJH MULTIPURPOSE PROJECT

	d	Acceptance of the submergence by the upstream State(s)	No interstate aspect involved.
	e	Acceptance by the upstream state(s) of compensation of land coming under submergence	No interstate aspect involved.
	f	Settlement of oustees	No interstate aspect involved.
	g	Any other	No
IV		SURVEYS	
	12	Have the detailed topographical surveys been carried out for the following items and maps prepared as per prescribed scales	
	a	River surveys	Yes
	b	Reservoir surveys	Yes
	c	Head-works surveys (dam(s), dyke(s), barrage(s), weir(s) etc. and auxiliary components) and auxiliary components)	Yes
	d	Plant and Colonies sites	Yes
	e	Canal (s), branch canal(s) and water distribution system	Yes
	f	Major canal structures	Yes
	g	Power house, switch-yard, surge shaft, tailrace	Yes
	h	Tunnel(s), adit (s), penstocks etc.	Yes
	i	Surveys (detailed and sample) of areas of the command for OFD and drainage works	Yes
	j	Soil surveys	Yes
	k	Surveys for soil conservation	Will be done at Pre-construction Stage
	l	Any other surveys i.e. archaeological, right of way, communication etc.	Yes

UJH MULTIPURPOSE PROJECT

V	GEOLOGICAL INVESTIGATIONS		
	13	Have the geological surveys for the following items been carried out and report on geology of the following appended?	
	a	Region as a whole	Yes
	b	Reservoir	Yes
	c	Headwork and energy dissipation area	Yes
	d	Power house and appurtenances	Yes
	e	Intakes and regulators	Yes
	f	Major canal structures	Yes
	g	Tunnel(s), Penstock(s), hill(s) etc.	Yes
	h	Communication routes	Yes
	i	Any other	
VI	SEISMIC INVESTIGATIONS		
	14	Has the seismicity of the region been studied and co-efficient of vertical/ horizontal acceleration for the various structures discussed?	The region falls in Zone-IV. The designs have been done accordingly. The study of site specific seismic spectra will be carried out shortly.
	15	Has the approval of the Standing Committee for recommending design of seismic coefficients for River Valley Project been obtained?	
	16	Is there possibility of liquefaction of foundations? If so whether liquefaction studies been carried out?	No
VII	FOUNDATION INVESTIGATIONS		
	17	Have the detailed foundation investigations (including in-situ tests and laboratory tests) for the following structures been carried out and detailed report(s) appended?	
	a	Earth and rock fill dam(s)	Yes

UJH MULTIPURPOSE PROJECT

	b	Masonry/concrete dam(s)	Not applicable
	c	Barrage(s)/Weir(s)/head regulators) etc.	Yes
	d	Canal(s) & Canal Structures	Will be done at Pre-construction stage
	e	Power house(s), tunnel (s),' transformer cavern(s), desilting chamber (s), surge tank(s)/shaft(s), intake(s).	Yes
	f	Pump House(s)	Yes
	g	Any other	Complete foundation investigation for CFRD was done
	18	Are there any special features affecting the designs?	No
VIII		CONSTRUCTION MATERIAL SURVEYS	
	19	Have the surveys and laboratory tests for the following construction materials been carried out and report(s) appended?	
	a	Soils for impervious, semi-previous and previous zones of earth and rock-fill dam(s)	Yes
	b	sand	Yes
	c	Rock and coarse aggregates	Yes
	d	Bricks and tiles	Standard Items will be used
	e	Pozzolona	Standard Items will be used
	f	Cement and lime stone	Standard Items will be used
	g	Steel	Standard Items will be used

UJH MULTIPURPOSE PROJECT

	h	Any other	Survey and laboratory tests for rock fill material has been done
	20	Have the sources for each of the above material been identified and need etc. indicated?	Yes
	21	Have the proposals for procurement of scarce materials been indicated?	No such item
IX		HYDROLOGICAL AND METEOROLOGICAL INVESTIGATIONS	
	22 (a)	Have the hydrological and meteorological Investigations been carried out and status of following data discussed in report?	
	i	Rainfall	Yes
	ii	Temperature	Yes
	iii	Sunshine	No
	iv	Gauge & Discharge	Yes
	v	Sediment	Yes
	vi	Water quality	Yes
	vii	Evaporation	Yes
	22 (b)	Has the above data been collected & appended?	Yes
X		HYDROLOGY	
	23	Is the hydrology dealt with in detail in a separate volume? Have its brief details been included in this Report?	Yes
	24	Have an index map and bar chart showing locations of various hydro-metric, climatic and rainfall stations existing/ongoing/planned water resources projects and the data availability at those stations been attached?	No
	25	Have required detail note about project specific hydro-meteorological data	Yes

UJH MULTIPURPOSE PROJECT

		observatories been attached.	
	26	Have required detail in case of Himalayan rivers, if project being planned in upper reaches, the satellite imageries of project catchment especially one during snowmelt period (March-May) and one during monsoon (June-September) period been attached?	Not Applicable
	27	Are detail notes about quality, consistency, Processing and gap filling of the data included.	Yes
	28	Have hydrological studies been carried out for the following:	
	a	To establish the availability of water for the benefits envisaged?	Yes
	b	To determine design flood for the various structures (spillway, barrage etc.)	Yes
	c	Sediments storage	Yes
	d	Design flood for diversion during construction	Yes
	e	Tail water rating curve	Yes
	f	Evaporation rates from reservoirs/concerned area	Yes
	g	Command area rainfall	Yes
	29	Has the Ground Water Potential (existing use and additional availability) been indicated?	No
	30	Have the studies regarding reservoir sedimentation been carried out and revised elevation-area capacity curves been used in the simulation studies (Working Table)?	Yes
	31	Have the ecological requirements of water such' as low flow augmentation and water quality control etc. and water requirement for domestic, industrial use and power generation (thermal, hydel, nuclear) been	Yes

UJH MULTIPURPOSE PROJECT

		considered and included in the Project Report and incorporated in the simulation studies?	
	32	Have the details of the simulation studies (Working Tables) and conclusions arrived from the various alternatives explaining the factors and assumptions been included and discussed?	Yes
	33	Has the number of failures for different aspects been indicated?	Yes
	34	Have the likely desirable and undesirable changes in the hydrologic regime due to the project been brought out in the report?	Yes
	35	Is the criteria adopted for selection of the construction diversion flood discussed?	Yes
	36	Has the basis for determining the storage capacity been discussed?	Yes
	37	Have integrated working tables (for more than one reservoir in the system) been prepared?	Not applicable
	38	Has carry over storage been provided? If so, whether studies for most economic carry over storage been done?	Not applicable
	39	Have the flood routing studies been carried out?	Yes
	40	Have the back water studies been carried out?	Yes
XI		LAND ACQUISITION AND RESETTLEMENT OF OUSTEES	
	41	Have the type and quantum of land proposed to be acquired in the submerged area, project area, area coming under canals and distribution system area, required for rehabilitation of the oustees been detailed?	Yes
	42	Is the basis for provision for land compensation indicated?	No, will be taken at pre-construction stage

UJH MULTIPURPOSE PROJECT

	43	Have the rehabilitation measures, amenities and facilities to be provided to the Project affected Persons been discussed and whether their provisions included in the report? Are these in accordance State's policy/project, specific policy/draft national policy for rehabilitation and resettlement?	Yes
	44	Are the basis of land acquisition of the submerged area up to FRL/MWL etc. discussed	Yes
XII		DESIGNS	
	45	Does the State have established a Central Design Organization and State level multidisciplinary Advisory Committee and whether its' composition has been indicated in the report?	Not applicable, design is carried out by CWC.
	46	Has the selection of final location of the head works and appurtenances, in preference to the other sites investigated, been discussed?	Yes
	47	Have the layout of the project viz location of head works, workshop sheds; offices, colonies etc, been finalized and discussed?	Yes
	48	Has the layout of the various major components of the head works been discussed in the light of site features, geology, foundation characteristics etc?	Yes
	49	Have the detailed designs been prepared for the following components and got vetted by CDO?	
	a	Earth or rock fill dam, masonry or concrete dam; spillway, Barrage, weir etc. and appurtenances.	Detailed design is prepared by Design wing of CWC.
	b	Energy dissipation arrangements, training	

UJH MULTIPURPOSE PROJECT

		walls etc.	Detailed design is prepared by Design wing of CWC
	c	Openings through dams-galleries head regulators penstocks other outlets, sluices etc,	
	d	Regulators.	
	e	Canal and water conductor system	
	f	Canal structures	
	g	Pump house ,intake structures	
	h	Power House, tunnels, surge shaft	
	i	Instrumentation	
	j	Power evacuation arrangement		Prepared by CEA
	k	Design of Hydro Mechanical equipment's	Detailed design is prepared by Design wing of CWC
	50	Have the salient features of the above components and the assumptions made in the design of above components of the project been indicated and their basis discussed?	Yes
	51	Have any model studies been carried out for location of the dam, spillway and other appurtenances and checking the design profile of the spillway, energy dissipation arrangements location of outlets/ regulators etc?	Model studies will be carried out in Pre-- construction stage.
	52	Has the final alignment of canal(s) and branch canals(s) been discussed in the light of various alignments studied?	Yes
	a	Does the canal design provide for meeting requirements of rush irrigation?	Yes
	b	Have any intermediate storages and tail tanks been considered to reduce the canal capacities?	No

UJH MULTIPURPOSE PROJECT

	53	Are the canals and distribution system being lined and if so what is the minimum capacity of the channel proposed to be lined ?.	Yes, canal system is lined throughout its length.
	54	Is the location of canal structures on main and branch canals fixed after detailed surveys of the final alignments?	Yes
	55	Are the regulation arrangements of the off-taking channel both near and away from the cross regulators discussed?	Yes
	56	Are sufficient escapes including terminal escapes provided on the main/branch canal distributaries/minors?	Yes
	57	Have the basis for adopting water way for the cross drainage works been discussed?	Yes
	58	Have the proposals for rating the canal section by providing standing wave flumes, rating of the falls, broad crested weirs, V-notches etc. been discussed for the canal and distribution system?	No
	59	Have any model studies for major canal structure(s) been carried out and if so are the results discussed and incorporated in the design?	Model studies will be carried out in Pre-construction stage.
XIII		IRRIGATION AND COMMAND AREA DEVELOPMENT	
	60	Have the conveyance and field irrigation efficiencies for Paddy And upland crops during Kharif, Rabi etc. been indicated, discussed and justified?	Yes
	61	Have the 10-daily / monthly crop water requirements at the canal head been worked out?	Yes

UJH MULTIPURPOSE PROJECT

	62	Are there any proposals for introducing warabandi and if so have these proposals been discussed in the report and sample calculations for a typical distributaries/ minor/ sub-minor furnished?	No
	63	Has the present position of irrigation in the command through existing canals, tanks, lift schemes, wells etc. been brought out in the report?	At present the proposed command area is rain fed.
	64	Are the particulars of all irrigation projects (including minor schemes) existing/ proposed in the command been indicated ?	There is no existing irrigation project in proposed command
	65	Are there any potential areas, where ground water is available? If so, has the quantity and quality of the ground water been indicated?	NA
	66	Has the quantum of available ground water been assessed and plan for its conjunctive use with surface water been prepared and incorporated in the report?	NA.
	67	Have the semi-detailed soil surveys been carried out for the entire command? If not the extent of area surveyed may be indicated.	Yes
	68	Have soil and land irrigability classifications brought out in the report?	Yes
	69	Is the method used for determining the crop water requirements discussed?	Yes
	70	Has the pre-project cropping pattern and the proposed cropping pattern along with justification been furnished?	Yes

UJH MULTIPURPOSE PROJECT

71	Has the proposed cropping pattern been certified by Centre/State Agricultural Authorities giving the statement of having considered the soil characteristics and land irrigability characteristics of the command area in deciding the percentage of the command area falling under respective crops as suggested in DPR.	Yes
72	Whether drinking water needs of the population projected for the 25-30 years after construction of the project on enroute and that in the command of the project considered.	Yes
73	Whether the proposed G.W utilization is certified by CGWB and a statement furnished.	Not applicable
74	Are the areas and percentages of the CCA that will be irrigated during Kharif, Rabi, two seasonal, summer and perennial been indicated?	Yes
75	Is justification furnished for irrigating perennials and summer crops from the reservoir?	Not applicable.
76	Have the monthly reservoir operation studies been carried out at least for 20 years and summary on annual basis attached?	Yes
77	Have the number of blocks selected for detailed surveys for On Farm Development (OFD) works including drainage and total area covered by such blocks been indicated?	No, detailed survey for OFD will be carried out in Pre-construction stage.
78	Have the existing locations of the Trial cum Demonstration Farm input centres (seeds, fertilizer and insecticides) in the command been indicated and proposal to strengthen	No

UJH MULTIPURPOSE PROJECT

		the same discussed?	
	79	Have the arrangements for financing the OFD works and proposals, if any, for strengthening, the same been discussed?	No
	80	Have the agencies responsible for execution of OFD works been identified and simultaneous planning of execution of OFD works along with Engineering works discussed?	No
	81	Has the year-wise phasing of irrigation development as a result of the project been discussed?	No
	82	Is the existing communication system telephone, wireless and roads within command area sufficient to meet the requirement after full development of irrigation? If not, have the new proposals been planned and discussed?	Yes
	83	Is the adequacy of the marketing centres in the Command Area and new proposals to meet the requirements after full development of irrigation been discussed?	No
	84	Is there any stabilization of existing irrigation proposed?	No existing irrigation
XIV		FLOOD CONTROL AND DRAINAGE	
	85	Have the various flood control components of the multipurpose project been indicated?	Yes
	86	Have the damage areas in pre-project & post project situations been identified and flood intensities worked out at each of the damage center (s) which gets affected?	Yes
	87	Have the following flood aspects been discussed?	

UJH MULTIPURPOSE PROJECT

	a	Flood cushion in the reservoir	No
	b	Maximum moderated flood out flows over the spillway etc. and its frequency.	Yes
	c	Existing and proposed safe carrying capacities of the channel below the dam after construction of flood embankment, channel improvement, river diversion etc.	Yes
	d	Synchronized moderated peak floods due to release from the dam upstream and un-intercepted catchment up to the damage centres.	There is no dam in the upstream.
	e	Average annual expenditure incurred on flood relief works.	Yes
	f	Area and population affected/likely to be affected before/after the project.	No
	g	Estimated saving in annual loss of life, property, cattle, crops etc. (evaluated in terms of money) due to flood control.	Yes
	88	Have the following drainage aspects of command area been discussed?	
	a	Existing Surface and sub-surface drainage network and problems of the drainage, congestion, water logging, alkalinity/salinity If any.	Yes
	b	Studies on sub soil water table (pre-monsoon, post-monsoon etc.).	No
	c	Maximum intensity of 1, 2 and 3 day rainfall.	No
	d	Deficiencies in farm drains.	No
	e	Deficiencies in existing natural drains.	No
	f	Proposal for improvement of drainage/ water Logging / alkalinity/salinity of the area along with justification thereof.	Will be taken up at Pre-construction stage.

UJH MULTIPURPOSE PROJECT

	g	Identification of the area in Command which will get benefited due to execution of drainage network and benefits thereof in terms of relief from crop damage, increased yields etc.	Will be taken up at pre-construction stage.
XV.		NAVIGATION	
	89	Is the present scheme for remodelling of the existing facilities and/or extension of the navigable reach or establishing new navigable reach?	Not applicable.
	90	Is the existing inland transport system being fully utilized? If not, have the bottlenecks in its fully utilization been identified and discussed?	Not applicable.
	91	Have the surveys for goods and passenger traffic been carried out and discussed?	Not applicable.
	92	Is the extent of modification required in the existing system discussed and justified?	Not applicable.
	93	Do design for the canal section and structures take into account the navigation requirements?	Not applicable.
	94	Have the proposals to develop the new scheme and phases of development in the different reaches been discussed?	Not applicable.
	95	If the area is being served by inland water transport, have the following been discussed:	
	a	The existing toll rates and registration fees for the crafts (size wise).	Not applicable.
	b	Proposals for revision of tollage rates and fees, if any.	Not applicable.
	c	Concurrence of the competent authorities for revision of rates and fees.	Not applicable.
	d	Proposal to subsidies the tariff, tollage, craft	Not applicable.

UJH MULTIPURPOSE PROJECT

		registration fee, passenger fare etc. to attract traffic.	
	96	Has the State Inland Water Authority been Consulted while finalizing the scheme and its view point discussed?	Not applicable.
	97	Has economic justification and viability of the Navigation component of the multipurpose project been discussed?	Not applicable.
XVI.		POWER	
	98	Have the following points been discussed?	
	a	Availability of the power generating capacity in the state as well as in the region from different sources.	Yes
	b	Total energy available and peaking capacity of the system in the state as well as in the region from different sources.	Yes
	c	Integrated operation of the system and present status of utilization in the state as well as in the region.	Yes
	d	Surpluses and shortfalls in the system in the State as well as in the region.	Yes
	e	Future plans of power development from different sources in the State/ region.	Yes
	f	Fitment of the scheme in planning of power Development of the State/ region.	Yes
	g	Energy generated from the project firm power, seasonal power and total power.	Yes
	h	Proposal for transmission lines connecting to the existing system/ grid.	Yes
	i	Project cost per kwh installed and per kwh generated at bus bar as compared to the different hydro- electric, thermal generation and gas projects and different sources in the	Not available.

UJH MULTIPURPOSE PROJECT

		State as well as in the region to justify the Power component of the project.	
	j	Whether the proposed addition to the transmission system has been shown on a geographical map. Whether options considered for the proposed addition have been discussed with statement of justification for the selected option after carrying out supporting studies covering load flow studies, short-circuit studies (three phase and single phase and stability studies.	Yes
	k	*Whether sufficient 'Surplus off Peak power is available for pumping of water from lower to upper reservoir.	Not applicable
	l	*Actual off peak energy requirement of proposed scheme.	Not applicable
	m	*Cost of peak-and off peak energy (*for pumped storage schemes only)	Not applicable
XVII		CONSTRUCTION PROGRAMME AND PLANT AND MANPOWER PLANNING.	
	99	Are the major components of work proposed to be done departmentally or through contractor?	Through Contractors.
	100	Have the various alternative construction programme been studied and proper justification furnished for the final programmed adopted?	Yes
	101	Has the proposed construction programme been prepared and synchronized for timely completion of each of the major component of work including Command Area Development?	Yes
	102	Have the year-wise quantities of the following materials of construction been worked out for	Yes

UJH MULTIPURPOSE PROJECT

		various components of the project.	
	a	Excavation separately in soft and hard strata	Yes
	b	Earthwork in filling impervious, semi- pervious and pervious	Yes
	c	Rock fill for dam toe, riprap etc	Yes
	d	Stone for masonry	Yes
	e	Coarse aggregate for concrete	Yes
	f	Sand for filter, masonry/concrete	Yes
	g	Gravel for Filter	Yes
	h	Steel of various sizes and type	Yes
	i	Cement-normal, quick/slow setting with or without pozzolona, special types	Yes
	j	Lime-surkhi- pozzolona	Yes
	k	Scarce material-special steel	Yes
	l	Other material-fuel, electricity, explosive etc	Yes
	103	Have the year wise quantities to be executed by machine/ labour for each of the major component been worked out for each of the above material?	Yes
	104	Have the labour intensive items of the various major components of the project been identified and the quantities of such items worked out?	Yes
	105	Have PERT chart or CPM diagrams for Construction programme of various components been made and included in report? Has organizational set up and frequency for project monitoring been indicated in the Report?	Yes
XVIII		FOREIGN EXCHANGE	
	106	Have the details of the plant and machinery, spares, instruments and scarce materials to be imported worked out?	NA. All machineries and scarce materials are indigenous.

UJH MULTIPURPOSE PROJECT

	107	Has the phasing of imports and source (s) of Imports been discussed item wise?	Not applicable
	108	Are the imports to be affected under foreign Grants/credits or internal resources of the country?	Not applicable
	109	Is the scheme covered under State sector or Central sector?	Central sector
XIX		FINANCIAL RESOURCES	
	110	Has the concurrence of the State Finance Department been obtained?	Not applicable
	111	Is the scheme included in the Five Year/ Annual Plan? If not what is the present position regarding its inclusion in the plan?	Will be included at Appropriate stage.
	112	Whether the scheme has already been Started? If so, is the present stage of construction indicated?	No
	113	Have the year wise requirement of funds been indicated?	Yes
	114	Is the scheme covered or proposed to be covered under any foreign assistance/ aid agreement?	No
XX		ESTIMATE	
	115	Is the separate volume of estimate attached as appendix?	Yes
	116	Is the year to which the rates adopted in the estimate relate to indicated?	Yes
	117	Have the analysis of rates for various major items of work for the major components of the project been furnished and with basis of analysis described?	Yes
	118	Are the provision for the following items made on the basis of sample survey and sub-estimates:	

UJH MULTIPURPOSE PROJECT

	a	Distributaries, minor and sub-minors	Yes
	b	Water courses	Yes
	c	Drainage	Yes
	d	CAD Works	Yes
XXI		REVENUE	
	119	Are the basis for the following sources of revenues furnished?	
	a	Betterment levy and proposal for its recovery	Yes
	b	Irrigation cess	Yes
	c	Flood protection cess	Yes
	d	Crop wise water rates	Yes
	e	Sale of water for village/ city/industrial/ power/ water supply	Yes
	e	Miscellaneous	
	120	Have these rates been compared with the existing rates at the other projects in the State/ region?	Yes
	121	In case the rates are being enhanced, has the concurrence of the concerned department(s) been obtained?	NA
	122	Have the organizational set up for the collection of revenue been indicated?	No
XXII		B.C RATIO	
	123	Are the allocated cost for the following components of the multipurpose project worked out and basis therein furnished?	
	a	Irrigation	Yes
	b	Power	Yes
	c	Flood Control	Yes
	d	Navigation	Not applicable
	e	Water supply	Yes
	f	Any other	No

UJH MULTIPURPOSE PROJECT

	124	Have the various departments of the State/ Centre agreed to the sharing of the above allocated cost?	Will be taken up on the basis of this DPR
	125	Have the crop wise benefits been worked out for irrigated and un-irrigated crops being grown before project in consultation with the agriculture department and statement furnished?	Yes
	126	Have the crop wise benefits been worked out for proposed cropping pattern after the introduction of irrigation in consultation with the agriculture department and statement furnished?	Yes
	127	Is the B.C. ratio of Irrigation Projects acceptable or otherwise justified?	Yes
	128	Is the B.C. Ratio for Flood Control Projects acceptable or otherwise justified?	Not Applicable
	129	Is the B.C. ratio for power component of the project acceptable or otherwise justified?	Not Applicable
	130	Have the financial and economic return statements been furnished keeping in view the phasing of development?	Yes
	131	Are the benefits other than those considered in the B.C. Ratio and financial return statement been identified?	Yes
	132	Is the benefit from Gall per land, if proposed, based on lease rates admissible and statement from concerned Central/State authorities furnished?	Not applicable
	133	Are the benefits from fisheries, horticulture, if proposed, based on lease rates admissible and statement from concerned Central/ State authorities furnished.	Not applicable

UJH MULTIPURPOSE PROJECT

XXIII	ECOLOGICAL ASPECTS		
	134 a	Is the area likely to have any of the following environmental and ecological problems due to the altered surface water	
	i	Excessive sedimentation of the reservoir and the upper reaches of the river and its tributaries tailing into reservoir.	No
	ii	Water logging, salinity/ alkalinity	No
	iii	Quality of surface and ground water	Will not affect.
	iv	Ground water recharge	Will not affect
	v	Health hazards-water borne diseases, industrial pollution etc.	No
	vi	Submergence of important minerals	No
	vii	Submergence of monuments/ archaeological sites	No
	viii	Fish culture and aquatic life	Will improve
	ix	Plant life (flora)	Will not affect
	x	Wild Life	Will not affect
	xi	Migratory birds	Will attract
	xii	National parks and sanctuaries	Will not affect
	xiii	Seismicity due to filling of reservoir	Will not affect
	xiv	Likely change in the regime of the river	No
	xv	Any other	
	134 b	Have the environmental and forest clearances from MOE&F been obtained? If not what is status thereof?	Under process.
XXIV	COLONIES AND BUILDINGS		
	135	Has the planning of the colony/ building been done keeping in view the ultimate use for optimum utilization of investment?	Yes
	136	Has an estimate of the extent of higher cost involved been made and details discussed?	Not applicable

UJH MULTIPURPOSE PROJECT

	137	Are the permanent buildings being constructed required for maintenance of the project only?	Yes
	138	Can the buildings other than required for maintenance of the project being constructed be put to some other use after the completion of the project by the department or any other agencies?	Permanent colony has been planned based on the requirement of operation of the Project after execution and rest of the structures were planned as temporary and semi- permanent.
	139	Have the interested agencies been consulted in planning of the buildings to suit their requirements later on?	Will be consulted at pre-construction stage.
XXV		PUBLIC PARTICIPATION AND COOPERATION	
	140	Have the proposals for disposal of temporary buildings been discussed ?	Not applicable
	141	Are the possibilities of these been discussed In:	
	a	Planning	Will be discussed at pre-construction stage
	b	Construction	Will be discussed at pre-construction stage
	c	Improved agricultural practices	Will be discussed at pre-construction stage
	d	Any other	

UJH MULTIPURPOSE PROJECT

	142	Have-public debates about utility of projects been: held and the response there of outlined in the Report?	Will be done at pre-construction stage
XXVI		SOIL CONSERVATION	
	143	Is the need for soil conservation measures in the 'catchment of the project discussed?	Will be done at pre-construction stage.

SALIENT FEATURES

SALIENTFEATURES

1	Name of the project	UJH Multipurpose Project			
	Type of project	Multipurpose			
	Location	Kathua (J&K)			
2	River Basin				
	Name	UJH			
	Located in State(s):	J&K			
	i)Countries (if international river)	India, Pakistan			
	River/Tributary	UJH,			
		Tributaries - Sutra, Talyan, Bhini, Dunari			
3	State(s)/ District(s)/ Taluka(s) or Tehsils in which following are located		State	District	Blocks
		(a) Reservoir	J&K	Kathua	Billawar
		(b) Headwork	J&K	Kathua	Billawar Kathua
		(c) Command Area	J&K	Kathua	Hiranagar Samba Kathua
	(d) Power House	J&K	Kathua	Kathua	
3.1	Name of Village near the Head-Works	Village: Barbari Tehsil: Billawar			
3.2	Location of Head-Works				
		(a) Longitude	32 ⁰ 33 to 32 ⁰ 40'N		
		(b) Latitude	75 ⁰ 5' to75 ⁰ 35'E		
		(c) Seismic	ZoneIV		
3.3	Access to the Project	Name	Distance		
	Airport	Jammu	120 km		
	Rail Head	Jammu Kathua Pathankot	125 km 84 km 100 km		
	Road head (from Rajbagh)	NH-1	30 km		
4	International/Interstate aspects of the Project				
	Catchment area of the basin		854 sq. km (Whole in J&K)		
	Submergence due to projects	In J&K	34.50 sq. km (Whole in J&K)		
	Proposed annual utilization by the project	(i) Irrigation			
		a. Kharif	143.66 MCM		
		b. Rabi	19.75 MCM		
		Total	163.41 MCM		
		(ii) Drinking Water	18.92 MCM		

UJH MULTIPURPOSE PROJECT

	Minimum agreed/proposed flow in the river for maintaining ecology	2.06 Cumec.		
5	Estimated life of the project (years)	100 yrs.		
6	Irrigation (Ha.)			
	Area under irrigation (break up)			
	(i) Kharif	16743 hectare		
	(ii) Rabi	14637 hectare		
	District(s) benefited	Kathua & Samba		
7	Water supply	0.6Cumecs		
8	Hydrology			
	Name of Station(s) and period of record			
	Names		Period of Record	
			From	To
	Kathua		1983	2003
	Kishenpur		1983	1988
	Mandli		1983	1993
	Billawar		1983	2003
	Basoli		1987	2003
	Bakhta		2009	2012
	Nagrota		1960	1964
9	Data(averageof all stations in command area)			
			Maximum	Minimum
		(a) Air temp.(⁰ C)	45	05
		(b) Seismic Zone	Zone– IV	
		(c) Maximum probable flood	11400Cumec(m ³ /s)	
10	River flows (minimum observed)			
		(a)Water level (EI-m)	503.50m	
		(b) Discharge(m ³ /s)	0.97Cumecs (Feb)	
		(c) Months of 'nil' flow. If any	None	
11	Reservoir			
11.1	Water levels (EI-m)			
		(a) Maximum Water Level (MWL)	609.50m	
		(b) Full Reservoir Level (FRL)	608m	
		(c)Minimum Drawdown Level (MDDL)	564m	
		(d) Dead Storage Level	523.15m	
11.2	Outlet levels			
		(a) Irrigation	453.50m	
		(b) Power	550.35m	
11.3	Other parameters			
		(a) Free board	9.5 m from MWL	
		(b) Live storage	781 MCM	

UJH MULTIPURPOSE PROJECT

		(c) Gross storage	925 MCM
11.4	Sedimentation rate and levels		
		(a) Rate	0.33 mm/Year
		(b) New zero elevation after 50yrs.	514.63m
		(c) New zero elevation after 100yrs.	523.15m
12	Submergence		
12.1	Land and property submerged at MWL		
	(a) Revenue villages affected (no.)		
		(i) Fully	2
		(ii) Partially	10
	(b) Land affected (Sq. Km)		
		(i) Gross	34.50 Sq. Km
		(ii) Culturable	10.82 Sq. Km
		(iii) Irrigated	2.76 Sq. Km
		(iv) Forest	1.63 Sq. Km
		(v) Others	State Land:8.44 Sq. Km Barren: 5.1 Sq. Km Shamlot : 5.73 Sq. Km
	(c) Buildings/houses(No.)		
		(i) Houses	1698
		(ii) Govt.	15
		(iii) Temples	46
		(iv) Mosques	4
		(v) Govt/Pvt schools	24
		(vi) Cattle Shed	70
		(vii) Structure of cultural importance	5
		(viii) Lift Irrigation	1
	(d) Tube Wells/Bore Wells (No.)		5
	(e) Road(km) under submergence		9.50 Km
	(f) Transmission lines (km.) under submergence		25.6 Km
12.2	Total Population under Submergence		
			Persons
		(a) Total	8684
		(b) Scheduled Castes	2702
		(c) Scheduled Tribes	296
13	Head works		
13.1	Dam (Non-overflow section)		
		(a) Type of dam	Concrete Face Rock Fill Dam

UJH MULTIPURPOSE PROJECT

		(b) EL of top(m)	619m
		(c) Length at top(m)	420.0m
		(d) Length at the river bed(m)	56.0m
		(e)Width at top(m)	10.0m
13.2	Spillway(overflow section)		
		(a) Location of spillway	Saddle Spillway
		(b) Type of spillway	Chute
		(c) Length(m)	81m
		(e) Max height above the deepest foundation(m)	32 m
		(f) Crest level (EL-m)	595m
		(g) Number of gates	5
		(h) Type of gate	Radial
		(i) Size of gate	13m (W) x19.16m(H)
		(j) Maximum discharging capacity(m ³ /s) at	
		(i) FRL	6169.00 Cumec
		(ii)MWL	6902.43 Cumec
		(j) Tail water level (EL)	
		(i) Maximum	511.43m
		(ii) Minimum	500.00m
		(k)Type of energy dissipation arrangement	Ski-jump bucket
13.3	U/S Cofferdam		
		(a) Height of U/S coffer dam	21.13m
		(b) EL of top	536m
13.4	D/S Cofferdam		
		(a) Height of D/S coffer dam	8.3m
		(b) EL of top	517m
13.5	Diversion tunnels		
		(a) Total number of diversion tunnels	4
		(b) diameter of each diversion tunnels	12m
		(c) Length of diversion tunnels	
		(i) Tunnel no.1	529.5m
		(ii) Tunnel no.2	454m
		(ii) Tunnel no.3	413m
		(ii) Tunnel no.4	382m
13.6	Barrage		
		Location with respect to dam, if any	11.00 km
		Length	380m
		Details of bays	
		(a) Span of one bay	18.00m
		(b) No. of bays	16
		(c) No. of piers	15
		(d) Spillway pier width	4.50m
		(e) No. of double pier-	2
		(f)Total width of double piers	18.00m

UJH MULTIPURPOSE PROJECT

		(g) Central pier with Fish bay width	11.00m
		(h) Full pond level	
		(i) Maximum water level	458m
		(ii) Minimum water level	456m
		(i) Size of gates	18.00m x 6.50m
		(j) Type of hoisting arrangement	Twin cylinder hydraulic hoist
13.7	Head Regulator(s)	Left side	Right side
	(a) Total length	11.50m	15.50m
	(b) Height above deepest foundation	9.50m	9.50m
	(c) Length of bay(m)	3.00m (two nos.)	3.00m (three nos.)
	(d) Sill level (EL-m)	453.5m	453.5m
	(e) Number of gates	2 no.	3no.
	(f) Type of gates	Vertical lift	Vertical lift
	(g) Size of gate	3x2.3	3m x 2.3m
	(h) Type of hoisting arrangement		Rope drum hoist
14	Canal System		
	14.1 Main canal	Right and Left bank canal	
		14.1.1 Purpose of canal	Irrigation & water supply
		14.1.2 Type	
		(a) Flow/lift	Flow
		(b) Lined/unlined	Lined
		(d) Type of lining	150 mm thick M15 PCC
	14.2 Design data	Right Bank Canal	Left Bank Canal
	(a) Length (km)	36.628km	32.510km
	(b) Full supply level at head	455.80 m	455.80 m
	(c) Full supply depth at head	2.17m	1.36m
	(d) Side slope(EL-m)	1.5:1	1.5:1
	(e) Bottom width of canal upto spill channel	15m	8m
	(f) Maximum discharging capacity		
	(i) At head	38.37 cumec	9.65 cumec
	(ii) At tail	25.179 cumec	0.037 cumec

UJH MULTIPURPOSE PROJECT

	(m ³ /s)		
	(g) Total number of canal structures		
	(i) Aqueduct	17	07
	(ii) Bridge	6	6
	(iii) Super Passage	12	48
	(iv) Pipe and Box Culvert	12	03
15.	Cropping Pattern	Name of crop (season-wise)	Area (ha)
	(i) Kharif season	(a) Paddy	12390
		(b) Pulses	2323
		(c) Vegetables	2030
	(ii) Rabi Season	(a)Wheat	6054
		(b) Oil Seeds	432
		(c) Vegetables	6421
		(d) Barseem	1730
16.			
16.1	Power	Type	Conventional
		Installed capacity (MW)	186MW (3x62)
		Load factor	14.67%
		(a) Firm	27.28 MW
		(B) Total Annual energy	238.66 MU
16.2	Head Race Tunnel		
		(a) Length	2.474km
		(b) Shape	Circular
		(c) Size(m)	7.3 m dia
		(d) Rock type reach-wise-RMR/Q values	Sand Stone
		(e) Lining type	RCC &Steel
		(f) Designed discharge (m ³ /s)	153 Cumec.
		(g) Invert level at(EL-m)	550.35m
17			
17.1	Intake	(i) Type & size of intake	Bell mouth, 21.50x20.60m
17.2	Surge tank/shaft		
		(a) Nos. & location(HRT)	
		(b) Type, height, & size	Circular, 87m ht, 25m dia.
		(d) Top level (EL-m)	629.00m
		(e) Bottom level (EL-m)	542.00m
17.3	Penstocks/pressure shafts:		
		(a) Number, diameter &	One, 6.3m,

UJH MULTIPURPOSE PROJECT

		Length of Pressure Shaft	Vertical drop shaft= 85.35 m Horizontal Pressure shaft = 397.10m
		(b) Liner type	RCC Lining 450Th. M20
		(c) Grade of steel	ISHB150@1000 c/c
		(d) Bifurcation / trifurcation	Trifurcated into 3 penstocks of 4m dia each
17.4	Power House		
		(a) Type	Surface
		(b) Maximum head	150m
		(c) Minimum head	100m
		(d) Weighted avg net head	138m
		(e) Dimensions	72.25 (L) x 35.5 (W)
		(f) Unit capacity	62 MW
		(g) Installed capacity	186 MW
		(h) Type of turbine	Francis
		(i) Type of PH crane	Gantry Crane
		(j) Number and size of draft tube gates/bulk head and capacity of hoists	3 nos. 7.00m x 3.30m
17.5	Dam Toe Power House		
		(a) Type	Surface
		(b) Purpose	To generate power through environmental releases
		(f) Unit capacity	1x2MW + 1x24MW
		(g) Installed capacity	26MW
		(h) Type of turbine	Francis
17.6	Tail Race Channel		
		(a) Length	117m
		(b) Maximum tail water level	458m
		(c) Minimum tail water level	456m
		(d) Average tail water level (EL-m)	457
		(e) HFL of recipient river channel at outfall	454.00m
18	Total Project Cost in Crores		4750.00
19	BC Ratio (Irrigation, Drinking Water and Flood Control)		1.052

EXECUTIVE SUMMARY

UJH MULTIPURPOSEPROJECT

186MW (3 x 62) + 26MW (1x2 + 1x24)

DETAILED PROJECT REPORT (MODIFIED)

VOLUME: 0

EXECUTIVE SUMMARY

NOVEMBER, 2017

EXECUTIVE SUMMARY

CONTENTS

1. EXECUTIVE SUMMARY	1
1.1 INTRODUCTION	1
1.2 PROJECT ACCESSIBILITY	4
1.2.1 Approaches to Dam Site.....	4
1.2.2 Approaches to Power House and Barrage Site	5
1.3 PROPOSAL OF UJH MPP PROJECT	5
1.4 IMPORTANT PROJECT FEATURES.....	6
1.4.1 Concrete Face Rock Fill Dam.....	6
1.4.2 Cofferdams and Diversion Tunnels.....	6
1.4.3 Spillway	7
1.4.4 Water Conductor System and Power House	7
1.4.5 Dam Toe Power House	7
1.4.6 Barrage and Canal System	8
1.5 BENEFITS AND NEED OF UJH MULTIPURPOSE PROJECT.....	8
1.6 HISTORY OF THE PROJECT.....	9
1.6.1 Earlier proposals.....	9
1.6.2 Present Studies	11
1.7 STUDIES FOR THE BEST ALTERNATIVES	11
1.7.1 Type of Dam	11
1.7.2 Location of Barrage	12
1.7.3 Alternative Alignment of the Canals.....	12
1.8 GEOLOGY OF THE PROJECT AREA	13
1.8.1 Reservoir Area.....	13
1.8.2 Geology of the Spillway and Diversion Tunnel	14
1.8.3 Geology of Power House, Surge Shaft, Vertical Shaft and Penstock Area	15
1.8.4 Geology of Barrage Site	16
1.9 HYDROLOGY.....	17
1.9.1 Water Availability Studies	17

1.9.2	..... Design Flood Studies	19
1.9.3	..... Sedimentation Studies.....	18
1.10	..... POWER POTENTIAL STUDIES.....	19
1.10.1	..... Project planning.....	19
1.10.2	..... Selection of FRL & MDDL	19
1.10.3	..... Firm Power & Installed Capacity.....	20
1.10.4	..... Selection of Unit Size	21
1.10.5	..... Conclusion.....	22
1.10.7	..... Re-Regulating Barrage.....	23
1.11	..... POWER EVACUATION SYSTEM.....	23
1.12	..... CONSTRUCTION PROGRAMME.....	23
1.13	..... COST ESTIMATE.....	25
1.14	..... PROJECT COST.....	25
1.14.1	..... Construction Period and Phasing	25
1.14.2	..... Financing	26
1.14.3	..... Energy Benefits	26
1.14.4	..... Energy Sale Price	26
1.14.5	..... Annual Costs	26
1.14.6	..... Others	26
1.15	..... ECONOMIC AND FINACIAL EVALUATION.....	26
1.15.1	..... Cost of Power Generation	26
1.15.2	..... Irrigation and other Benefits	27
1.15.3	..... Benefit Cost Ratio for Irrigation Component.....	27
1.16	..... CONCLUSIONS	28
1.16.1	..... Power Benefits	28
1.16.2	..... Irrigation benefits.....	28
1.16.3	..... Drinking Water benefits	28
1.16.4	..... Flood Protection and other Indirect Benefits.....	28

ANNEXURES

Annexure - I.....	29
Annexure - II.....	60
Annexure - III.....	64
Annexure - IV.....	65
Annexure - V.....	66
Annexure - VI.....	67

TABLES

Table 1: Demand and Availability Scenario (Energy in MU) of J&K.....	7
Table 2: Demand and Availability Scenario (Peak Power - MW) of J&K.....	7
Table 3: Construction Schedule.....	23

1. EXECUTIVE SUMMARY

1.1 INTRODUCTION

The Ujh Multi-Purpose Project has been envisaged to utilise the water resource potential of River Ujh, a tributary of River Ravi, which is one of the three eastern Rivers of Indus Basin system. As per provisions of the Indus Water Treaty between India and Pakistan, India has the right to unrestricted use of all the waters of Eastern Rivers namely, Sutlej, Ravi and Beas. Ujh Multipurpose Project was declared as National Project in the year 2008.

The source of Ujh River is located in the Kailash Mountains at an elevation of 4300 m close to the Bhadarwah Mountains of Jammu division. The River after flowing 100 km stretch in Jammu Division and criss-crossing international border between India and Pakistan joins river Ravi at a Makora Patan in the state of Punjab. The main components of the Project are located in district Kathua of Jammu and Kashmir. River Ujh is joined by other four tributaries, viz., Sutarkhad, Dunarikhad, Bhini and Talyan at a place called Panchtirthi, the name derived from the confluence of these five streams. The proposed dam site is in the village Barbari about 1.6 km downstream of Panchtirthi. The Powerhouse site is approximately 9.5 km downstream of dam site near a village called Deoli. A Barrage has been proposed 1.5 km d/s of Power house which also lies in tehsil and district Kathua. Two canals, Right Main Canal (RMC) and Left Main Canal (LMC) will be emanating from the pond created by the barrage along the two banks of the River. From each of the canals ten cusec water has been earmarked for drinking water for the district Kathua.

The RMC will provide irrigation in tehsils Kathua, Hiranagar and district Samba while, the LMC will provide irrigation in district Kathua. The CCA of RMC is 5595 ha and CCA of LMC is 3053 ha. In addition to that, the RMC will irrigate an additional area of 8095 ha in Kharif season and 5989 ha in Rabi Season from Samba to Vijaypur in the command area of existing Ravi and Tawi canals.

Installed capacity of Ujh power plant has been proposed as 186 MW. In addition to that a dam toe powerhouse comprising of two units, one of 2 MW and another of 24 MW has been proposed to harness the hydro-electric potential of the water

UJH MULTIPURPOSE PROJECT

meant for mandatory environmental releases. The unit of 2 MW will run through the environmental releases in lean period as well as in monsoon period while the unit of 24 MW will run through the releases in the monsoon months of July, August and September.

The Detailed Project Report (DPR) of Ujh Multipurpose Project, J&K was initially prepared by Central Water Commission, Jammu after extensive field survey and investigations viz., topographical survey, command area survey, exploratory drilling and drifting etc. and submitted on 6th September, 2013 to National Projects-1 Directorate (NP-1) of Central Water Commission, New Delhi, for appraisal. In the DPR, the height of the dam was envisaged as 116 m (with Dam top level as 619 m) with FRL as 614 m. The Installed capacity of power house envisaged was of the order of 186 MW.

The DPR was considered in 131st meeting of the “Advisory Committee for consideration of techno-economic viability of Major, Medium Irrigation, Flood Control and Multipurpose project proposals” on 16th November, 2016. Considering the importance of the Project, this project was agreed to ‘In- Principle’ by the Advisory Committee of MoWR, RD & GR. However, due to the issue of large submergence of land measuring about 41 sq km, the Committee decided that a team comprising of concerned officers from CWC and other experts shall visit the project site/ area and explore the alternative options with reduced submergence/ displacement along with minimum loss of power and irrigation benefits, so that the potential of East flowing rivers may be fully utilized as envisaged in Indus Water Treaty. In view of this, a Committee was constituted by National Project-I Directorate of CWC vide letter No. 3/7/2016/NP-I/14-24 dated 16-01-2017.

The Expert Committee, after visiting the project site on 16th March, 2017, submitted its Report during May, 2017.. In its Report of May, 2017, it has been advised by the team of experts to construct the dam and other appurtenant structures with FRL of 608 m. The Report of Expert Committee is enclosed as **Annexure-I**. Extracts from the minutes of the 131st meeting of Advisory Committee form part of the Committee’s Report.

Later, vide letter dated 10-04-2017, J&K State Power Development Corporation (JKSPDC) also requested to restrict the FRL to EL 608 m. The decision of Govt. of Jammu and Kashmir regarding revision of DPR was also conveyed vide letter No. PW/Hyd/P&S/45/2017-18 dated 14-08-2017.

Subsequently, a meeting amongst officers of Design (N&W) Unit of CWC and officers from Indus Basin Organization, CWC was held in the chamber of Chief Engineer, Designs (N&W), CWC, New Delhi on 12th September, 2017 to finalize the modalities of modifying the DPR of Ujh Multipurpose Project (J&K), in light of the Report of the Committee (May 2017), and the decision of Govt. of Jammu and Kashmir. All the officers, present during the meeting, appreciated the need of fully utilizing water of eastern Rivers and its tributaries as per provisions contained in Indus Water Treaty. The minutes of meeting are enclosed as Annexure – II. After detailed deliberations, the following decisions were arrived at:

1. Considering the fact that the present site for the dam is an ideal site for locating the dam and no suitable site is available downstream on the Ujh River or downstream of its confluence, there is a need to utilize the present location to its utmost capacity. Keeping this in view, it was decided that the DPR should be modified by keeping the Dam height same, as originally envisaged in the DPR, prepared and submitted by Chenab Division under Monitoring & Appraisal Directorate, CWC, Jammu, during September, 2013 to National Projects-I Directorate of CWC, New Delhi. However, reservoir may be maintained at a lower level, so as to address the issue of submergence / displacement of people. This arrangement would provide an option to raise the storage capacity in future in view of growing demand of water
2. As recommended by Expert Committee, the Full Reservoir Level (FRL) may be brought down to 608 m to reduce submergence from 41 sq km to around 34.50 sq km. The Maximum Water Level (MWL) may be kept 1.5 m above the FRL i.e. 609.50 m. However, final MWL may be fixed based on routing studies. This will require re-designing the spillway arrangement and the design of gates. All other levels such as MDDL, TWL etc may be kept as same as envisaged originally in the DPR, submitted in September, 2013.

3. Design discharge for power generation may also be taken as same as what has been envisaged in the original DPR.

It was agreed that CEA may be requested to carry out the revised Power Potential studies based on the revised FRL of 608 m by keeping MDDL and TWL as same as envisaged in the original DPR. However, CEA may keep same number and size of the Generating unit to cater for future requirement.

Accordingly, the earlier DPR, which was submitted in September, 2013, has now been modified so as to address the concerns regarding submergence of land as well as to leave scope for future expansion of capacity. .

1.2 PROJECT ACCESSIBILITY

The dam site of the project is in the tehsil Billawar of the district Kathua of J&K. The proposed dam site is about 1.6 km downstream of Panchtirthi. The location of dam site is $32^{\circ} 33' 48''$ and $75^{\circ} 29' 16''$ E. The Powerhouse site is approximately 9.5 km downstream of dam site near a village called Deoli. Powerhouse site is located in tehsil and district Kathua. The coordinates of Power house are $75^{\circ} 27' 58.4''$ E and $32^{\circ} 32' 38''$ N. A Barrage has been proposed d/s of Powerhouse which also lies in tehsil and district Kathua and the coordinates of Barrage are $75^{\circ} 27' 31.1''$ E and $32^{\circ} 32' 1.22''$ N.

Nearest airport to Ujh Project is Jammu, which is about 120 km from Dam site and about 83 km from power house. Nearest railway station Kathua is 84 km away from dam site and 34 km away from power house. The second nearest Railway station is Jammu about 120 km from Ujh Dam site and 88 km from power house.

1.2.1 Approaches to Dam Site

As of now, the proposed dam site can be approached from Jammu Airport and Jammu Railway Station through Jammu - Delhi National Highway upto a place Dayalachak, which is 60 km away from Jammu. From Dayalachak to Mandli the distance is 55 km through road. Then from Mandli to Nargari, a place near to dam site can be reached through another link road. The distance between Mandli to Nargari is 8 km. From Nargari the dam site is 4 km and can be reached on foot.

The dam site can also be approached through the Delhi-Jammu National Highway while coming from the Punjab side. There is a place Lakhanpur on the Delhi-Jammu Highway on the border of J&K and Punjab. Dhar Road connects the Lakhanpur on national highway to Udhampur. From Lakhanpur to Mandli, the distance is 55 km through the Dhar road and this road is connected through a link road to Nargari, a place near the dam site. Hence, through the Dhar Road the project site can also be reached from the Udhampur.

1.2.2 Approaches to Power House and Barrage Site

Nearest railway station to power house site is Kathua which is about 34 km from power house site and nearest airport to power house station is Jammu which is about 83 km from Power house site. Power house site of Ujh MP Project can be approached through national highway up to Rajbagh. From Rajbagh to Jakhol there is single lane metalled 13 km long connecting road and from Jakhol to power house the 4 km distance is to be covered on foot. Before reaching power house site River Ujh is required to be crossed at two places.

Barrage site of Ujh MP Project is approximately 1.5 km D/s of power house site and the approach is same as that of the power house site. The proposed main canals (RMC and LMC) are also approachable from national highway at many intermediate points.

1.3 PROPOSAL OF UJH MPP PROJECT

Ujh Multipurpose Project is storage project in the Kathua district of J&K. Installed capacity of Ujh Multipurpose Project has been proposed as 186 MW. The project is meant to provide hydro power, irrigation and drinking water. A 116.00 m high dam is proposed with FRL at 608 m and the MDDL at 564 m elevation and the water from the reservoir is proposed to be diverted by means of 2.474 km long HRT to a right bank power house.

The annual energy benefit from the project in the 90% dependable year would work out to be 238.66 MU. The firm power from the project has been estimated as 27.28 MW. Three unit of Francis turbine with the unit size of 62 MW have been proposed for the power house. A dam toe powerhouse comprising of units of 2 MW and an additional unit of 24 MW has also been proposed to harness the

hydro-electric potential of the water meant for mandatory environmental releases. The unit of 2 MW will run through the environmental releases in lean period as well as in monsoon period while the unit of 24 MW will run through the releases in the monsoon months of July, August and September.

A Barrage has been proposed 1.5 km d/s of Power house which also lies in tehsil and district Kathua. Two canals, Right Main Canal (RMC) and Left Main Canal (LMC) will be emanating from barrage along both the banks of the River. From each of the canals ten cusec water has been earmarked for drinking water for the district Kathua of J&K. The RMC will provide irrigation in tehsil Kathua, Hiranagar and Samba district while, the LMC will provide irrigation in district Kathua. The CCA of RMC is 5595 ha and CCA of LMC is 3053 ha. In addition to that, the RMC will irrigate an additional area of 8095 ha in Kharif season and 5989 ha in Rabi Season from Samba to Vijaypur in the command area of existing Ravi and Tawi canals.

1.4 IMPORTANT PROJECT FEATURES

1.4.1 Concrete Face Rock Fill Dam

The main dam comprises of a compacted rock fill section with a concrete face slab on the upstream slope and a concrete toe slab on the Plinth. A plastic concrete cut off wall, 1200 mm thick and deep up to the bedrock has been proposed at the upstream toe of dam which will act as a seepage barrier through the foundation. There is also a provision of consolidation grouting five meter deep in to the bed rock along with the curtain grout for a depth equal to half to one third of the reservoir head. The FRL has been fixed at 608 m and and top of dam, as decided has been kept as EL 619.0 m i.e. same as envisaged in earlier DPR (2013).. This arrangement would provide an option to raise the storage capacity in future in view of growing demand of water. The average existing River bed level at dam axis is about EL 503.00 m. The total length of dam at its top will be 420 m.

1.4.2 Cofferdams and Diversion Tunnels

For the construction of Concrete Faced Rockfill Dam, Ujh River would be diverted through 4 diversion tunnels, each of 12.0 m diameter and of approximately 450 m in length. Two diversion tunnels will be provided with the

goose neck and one of these diversion tunnels will be utilized as a HRT for the dam toe power houses, while another will be provided with goose neck arrangement for passing the water in case of any emergency or in case of extraordinary flood. For diverting the water through the diversion tunnels an upstream coffer dam of 21.13 m height have been proposed. The height of downstream coffer dam has been kept as 8.30 m.

1.4.3 Spillway

A chute spillway has been proposed in a saddle on the hill at left flank of the dam. This spillway will have five bays controlled by radial gates of size 13.00 m (W) X 19.16 m (H). The length of the proposed overflow structure shall be 81.00 m. The entire spillway structure and non-overflow block will be founded on the rock. Along with the spillway, one of the diversion tunnels with goose neck arrangement will also be used for passing the PMF.

1.4.4 Water Conductor System and Power House

A bell mouth intake with five bay and crown at EL 564 has been provided through the hill on the right bank of the reservoir. From the intake, a 2.474 m long lined Head Race Tunnel of 7.30 m dia has been provided. A surge shaft of 87 meter height, 25 meter dia with an orifice of 4.50 m dia has been provided. After surge shaft, a steel lined 6.30 m dia vertical drop shaft of 85.35 m height followed by a 397.10 m long horizontal pressure shaft has been provided. After two bifurcations, three penstocks of 4 m dia each have been provided to feed three Francis Turbines of 62 MW capacities each installed in a surface powerhouse located on the right bank of Ujh. The size of power house at the turbine floor level is 72.25 m x 35.50 m. The transformer hall, GIS Hall and Switch Yard have been provided beside the power house towards the hill on a higher elevation.

1.4.5 Dam Toe Power House

A dam toe power house has been tentatively proposed with one unit of 24 MW and another 2 MW to utilize the mandatory environmental releases to the downstream of the dam. Power Potential studies have been carried out by HP&I Directorate of CEA. The Civil design for the same and other studies will be carried out at the time of construction. However while calculating the financial analysis, the energy from dam toe Power House and cost of Civil & Electro-Mechanical works have been incorporated in proportion to the cost of these structures in main Power House.

1.4.6 Barrage and Canal System

A regulating barrage of 17.50 m height and 380 m length has been proposed 1.5 km d/s of Powerhouse to utilize power house releases for irrigation purpose. The barrage also lies in tehsil and district Kathua. Two canals, Right Main Canal (RMC) 36.628 km long and Left Main Canal (LMC) 32.510 km long will be emanating from barrage along both the banks of the River. The RMC will provide irrigation in tehsil Kathua, Hiranagar and Samba district while, the LMC will provide irrigation in district Kathua. The CCA of RMC is 5595 ha and CCA of LMC is 3053 ha. In addition to that, the RMC will irrigate an additional area of 8095 ha in Kharif Season and 5989 ha in Rabi Season from Samba to Vijaypur in the command area of existing Ravi and Tawi canals.

Location map of the Project is presented at **Annexure - III**.

The Layout Plan and L-Section of the project are presented at **Annexure IV** and **Annexure V**.

1.5 BENEFITS AND NEED OF UJH MULTIPURPOSE PROJECT

Ujh Multipurpose project is storage project having both direct and indirect benefits. Drinking water, irrigation, hydro power, flood controls are among the direct benefits. In addition to these major benefits, there will be indirect benefit for tourism, development of fisheries, industries, infrastructure improvement in the form of roads and buildings. Besides this the project will have a potential for employment generation which will help in the socio-economic development of the people of the region.

Ujh River is a tributary of River Ravi which is one of the eastern Rivers of the Indus system and according to Indus Water Treaty India can fully utilize the water of eastern Rivers and its tributaries. After completion of this project the water which is going unutilized to Pakistan can be properly utilized for irrigation, drinking and hydropower. The State of J&K is perpetually energy deficient and has to rely on power purchase from Northern Grid to meet its requirement particularly in winters, when its own generation recedes and demand peaks.

The estimated hydro power potential of the State is 20,000 MW, out of which about 6480 MW have been identified. Out of the identified potential, only 2457.96 MW i.e. 15 % (of identified potential) has been exploited so far. Due to

resource constraints, exploitation of the potential economic rejuvenator like hydro power has been very steady. The demand and availability scenario (Energy in MU) of J&K is tabulated below:

Table 1: Demand and Availability Scenario (Energy in MU) of J&K

YEAR	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Energy Requirement (MU)	14037.00	14750.00	15656.00	16544.00	17323.00	17842.69
Energy availability (MU)	8743.96	9147.21	10238.00	10667.00	11091.26	11465.58
Energy deficit (MU)	5293.04	5602.79	5418.00	5877.00	6207.59	6282.66
Energy deficit (%)	37.71	37.99	34.61	35.52	35.83	35.21

The demand and availability scenario (Peak Power - MW) of J&K is tabulated below:

Table 2: Demand and Availability Scenario (Peak Power - MW) of J&K

YEAR	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Energy Requirement (MW)	2020	2120	2247	2369	2500	2600
Energy availability (MW)	1350	1340	1407	1492	1788.9	1900
Energy deficit (MW)	670	780	833	877	711.10	700
Energy deficit (%)	33.17	36.79	37.07	37.02	28.44	26.92

The figure shows that from 2007-08 to 2012-13 the actual demand has increased from 14037 MU to 1784.69 MU respectively. The power shortfall has increased at an alarming rate. Recognizing the urgency and need of development of this sector, there is an urgent need of hydro power development and hence the implementation of this project becomes very important. The power of Ujh MPP will increase the power availability of northern grid and J&K state will be benefited by this additional power.

1.6 HISTORY OF THE PROJECT

1.6.1 Earlier Proposals

The Ujh project is a multipurpose River valley scheme and is first of its kind in Jammu and Kashmir State. Earlier investigations on this project date back to year 1927, when the Punjab Government had constituted a Valley Committee comprised of a team of American Engineers and Geologists to inspect and

UJH MULTIPURPOSE PROJECT

submit its report on the feasible sites for storage on eastern Rivers and their tributaries. The valley's committee suggested two dam sites on River Ujh, a major tributary of River Ravi. One of these sites was the present dam site near Barbari and another at d/s of present site. The present dam site about 1.6 km below Panchtirthi, a place of confluence of five tributaries including Ujh has been preferred over the another site, because of its advantages of being located in a narrower gorge and involving a lesser height of dam for the same storage capacity.

The detailed investigation for dam and power plant were taken up by the erstwhile CW&PC (now CWC) in the year 1960 and that of irrigation canal system by the State Government. The investigation on the present Barbari site started by the CW&PC in the year 1961, and the work of detailed contouring of the area was entrusted to the Survey of India. In November, 1961 the site was inspected by Dr. K.L. Rao, the Member of D&R wing along with other senior officers of the CW&PC, GSI and J&K State Government. During the inspection, it was suggested to explore the alternative site for the dam near Challan village, 2km below Barbari Site.

The merits and demerits of the alternative sites were examined in a meeting held in Delhi at CW&PC on 24.1.1962 attended by the senior officers of the CW&PC and the State Govt. In the meeting, it was found that the original Barbari site had topographical and geological advantage over the Challan dam site; hence the original dam site at Barbari was finally selected.

The earlier DPR for Ujh project was prepared by J&K Government in coordination with CWC in 1966. It envisaged the hydro power production of 117 MW. In the year 2001, the J&K Government requested CWC to take up the investigation of Ujh MP Project based on the extant guidelines for preparation of DPR, revised by CWC in 1984. But, it could not be taken up due to various reasons.

Then after, a Pre-Feasibility Report (PFR), a desk study of the project was undertaken by the WAPCOS in 2004. In PFR the hydropower potential was estimated at 280 MW. The grey area of this study was that its major portion was based on the investigations for the 1966 DPR and no additional investigations/studies were carried out.

1.6.2 Present Studies

On 14.12.2007, after the visit of Chairman, Central Water Commission to Jammu and discussion with J&K State Government officials, CWC started investigation from April 2009 and established G&D and sediment observation sites at dam and power house locations. The sites were also established for meteorological observation at Bhakta near power house site. The detailed topographical survey covering dam, power house, surge shaft, head race tunnel, tailrace tunnel, spillway, diversion tunnel, cofferdam, reservoir area, barrage area and command area was conducted. Detailed geotechnical investigation of the project has been carried out as suggested by the GSI. A total 2095.57 m of diamond core drilling of Nx size was achieved at the location of dam, intake, spillway, diversion tunnel, headrace tunnel, surge shaft, pressure shaft, underground and surface Power house.

Six numbers of drifts (2.1 m X 2.1 m) of total length 255 m were excavated on dam axis. The detailed geological mapping of all components including reservoir of the project has been completed. Laboratory tests of core samples and in situ plate load tests and shear tests in the drifts were carried out by CSMRS. Geo physical studies, construction material studies, rock fill material studies, petrographic studies, water quality studies, soil studies, access and infrastructure studies and power evacuation studies have been carried out in detail. Property survey of submergence area has also been carried out along with J&K State revenue department.

The study of site specific seismic spectra has to be carried out and will be submitted latter. IIT Roorkee and CWPRS Pune have been contacted for carrying out the study.

1.7 STUDIES FOR THE BEST ALTERNATIVES

1.7.1 Type of Dam

Detailed studies were conducted for assessing the suitability of concrete dam, rockfill dam and Concrete Face Rockfill Dam (CFRD). Initially concrete dam was proposed but after detailed geo technical investigation, it was found that rock at dam site belongs to Lower Siwaliks group and are characterized by medium to fine grained sandstone with partings/bands of clay stone and is not enough

competent for concrete dam so, after discussion with GSI and designers, possibility of concrete dam was ruled out.

Detailed analysis of rock fill dam vs concrete face rock fill dam was carried out. Rock at dam site has been found competent for both rock fill dam and concrete face rock fill dam. But CFRD has been found economically cheaper than the rock fill dam since, the clay for core was not available near dam site and it has to be brought from a distance of 100 km from the site. Comparison of cost of CFRD and conventional rock fill dam was carried out and it was found that conventional rock fill dam is many times costlier than the CFRD. In CFRD, the placement of rockfill material is possible during rainy season also but in case of conventional rockfill dam, core placement is not possible. Hence, the construction time of earthen core rockfill dam is also greater. The project site falls in Zone-IV and CFRD is supposed to be inherently safer during earthquake in comparison to conventional rockfill dam. Hence, after the detailed studies and economic analysis Concrete Face Rock Fill Dam has been preferred and finalized.

1.7.2 Location of Barrage

Studies were undertaken for the alternative locations of barrage. Earlier, state government had proposed the barrage site about 500 m downstream of the tail race channel outfall. Later, it was shifted to the present location which is 1.5 Km downstream of tail race channel as the earlier location was very close to the power house and the level difference between TRC outfall and the barrage location was very low and there was a possibility of impact of backwater on the power house.

1.7.3 Alternative Alignment of the Canals

The earlier decided alignment of RMC of Ujh MPP was passing through the Jasrota Wild Life Sanctuary. As, it was not possible to construct the canal or to lay underground pipes through the wild life sanctuary hence, various alternatives were explored and contemplated upon by the experts from the GSI and designers of CWC to circumvent the sanctuary. After detailed topographic survey and geological mapping of the area the alignment has been finalized and now, it will be passing about one km away from the sanctuary. This alternative alignment will be underground and passing through the forest area between Bhaktakhad and Tarnah Khad. Also from the geological view point this alternative has been found most suitable.

1.8 GEOLOGY OF THE PROJECT AREA

Regional Geology

Regionally the project area forms a part of the Tertiary belt of outer Himalaya occupied by rocks belonging to Murree Group, Lower Siwalik, Middle Siwalik and Upper Siwalik Groups from North to South. The most of the project features are located in Lower Siwalik Group, represented by medium to fine grained grey, greenish and purple sandstone with alternate bands of reddish, brownish, occasionally purplish siltstone and claystone. The Middle Siwalik Group is represented by massive salt and pepper colored sandstone with partings of brownish, light red claystone and siltstone. The northern periphery of the Ujh reservoir exposes Lower Murree Formation represented by grey, dark grey, purplish sandstone with alternate bands of claystone and siltstone. Profuse calcite veinations in the siltstone have been recorded. The generalized stratigraphic sequence exposed in the area is tabulated below;

1.8.1 Reservoir Area

a) Geology: The Ujh Multipurpose Project is a storage scheme in the State of Jammu and Kashmir and total 34.5 sq km area will become under submergence. The reservoir competency studies were carried out by the GSI covering 150 sq km area on 1:50000 scale.

The reservoir area extends from the dam site upto 7.2 km along the main Ujh River, 9.2 km along the Bhini River in the eastern side of dam site and 10.1 km along the Talyan Khad in the western side. Sutar and Dunari Khad are the other important catchments of the reservoir. The maximum area will be submerging along the Sutar and Dunari Khad because these are low-lying area and having very gentle gradients.

The area under investigation comprises a thick sequence of sedimentaries belonging to Murrees and Siwaliks consisting of sandstone, shale, clay siltstone, conglomerate, pseudo-conglomerate and concretionary grit.

The Murree Group of rocks is a monotonous, inter-bedded argillaceous and arenaceous sequence. The Siwalik Super Group of rocks is an inter-bedded-argillo-arenaceous-rudaceous sequence exposed in the area.

b) Geotechnical Assessment of the Reservoir: Two major structural features are present in the reservoir and its adjoining area i.e. Kishanpur - Mandli Thrust between Murree Group and Siwalik Super Group and Suriansar – Mastgarh Anticline within the Siwalik Supergroup. Structurally, the rocks have undergone intense deformation with the development of number of joints and shear planes. Both bedding and cross shear planes have been recorded. The Suriansar – Mastghar anticlinal axis is passing 700 m upstream of the dam axis and Kishanpur – Mandli Thrust is about 500 m away from the FRL in the upstream. Kishanpur – Mandli thrust is dipping north-easterly. All these major as well as minor structural discontinuities recorded in the reservoir area seem to have no affect on the overall water tightness of the reservoir area. From the overall assessment of the reservoir area and its periphery, it is inferred that there is no possibility of water leakage in the adjoining valleys or basins as the water divide along northern as well as southern periphery is above EL1080 m whereas, FRL of the reservoir is at EL608 m. Since the reservoir periphery is occupied by slope debris/River terraces at places, after filling of the reservoir sliding at some points along the periphery is anticipated this may not have any effect on the competency of the reservoir but may add to the siltation problems in the reservoir.

1.8.2 Geology of the Spillway and Diversion Tunnel

Detailed geological mapping of the proposed spillway and four diversion tunnels of 12 m dia each was carried out covering 0.10 sq km area on 1:1,000 scale. The spillway and diversion tunnels are planned along the left bank slightly away from the dam abutment. The same rock units which are exposed at the dam site are extending at the diversion tunnels and spillway.

Four diversion tunnels with average length of 450 m and diameter 12 m each are proposed to divert water of the Ujh River during the construction of the dam. The diversion tunnels are aligned through a ridge on left bank near the dam axis. The area along the proposed tunnels and spillway is occupied by rocks of Lower Siwalik Group and is characterized by medium to fine grained sandstone with partings/bands of claystone, forming steep scarp along the left bank with the slope angle varying from 70° to 80°. The general trend of the rocks at the proposed diversion tunnels and spillway is N 60° W – S 60° E, dipping 65° to 70° south-westerly. There are three sets of joints but the bedding joint is the most

prominent joint set present in the area. The alignment of tunnels follows the dip direction of the bedding of rock mass.

1.8.3 Geology of Power House, Surge Shaft, Vertical Shaft and Penstock Area

Detailed geotechnical investigation of underground power house was carried out by GSI. At the proposed underground powerhouse, from the drill holes data the permanent water table was recorded at 18 m below surface. The foundation level of the underground powerhouse was at 145 m below surface and coming under fully saturated condition. Sand rock with thin clay bands was encountered during drilling. The nature of the sand rock is highly fragile, the core recovery is almost 50% and the RQD varies from 20 to 50 %, which indicates poor rock quality. The observations made from the geological mapping and subsurface explorations have also been supported by the mechanical properties of the rocks. The mechanical properties of the core samples drilled at proposed underground powerhouse were determined at the geotechnical laboratory of CSMRS, New Delhi. The uniaxial compressive strength, tangent modulus and Poisson's ratio, etc. could not be determined. Because, the whole samples were dissolved in water during their processing. On the basis of these studies and discussions with the designers of CWC, the option of underground powerhouse has been modified to surface powerhouse.

Detailed geological mapping of proposed surface powerhouse site and other components like surge shaft, vertical drop shaft and penstock, of UMHP, was carried out. An area of 0.10 sq km was mapped on 1:1,000 scale. The area exposes sandstone and clay of Middle Siwalik Group. The sandstone is grey in colour, medium to coarse grained, thickly bedded and shows cross bedding. The clay beds are brownish to yellowish brown in colour and comparatively thinner than the sandstone beds. The clay is forming erosional valleys between the sandstone bands, whereas, sandstone bands stand out as sharp pointed ridges. The general trend of bedding in the mapped area is N65°W – S65°E / 35° south westerly. Besides, two sets of joints trending N85°W – S85°E / 45° NE and N20°E – S20°W / vertical, were also recorded in the area. The main objective of the detailed geological mapping of the powerhouse site was to demarcate each and every clay band passing through the area.

Three boreholes have been drilled for an aggregate depth of 260.50 m in the proposed surface powerhouse area. Out of these, one borehole each has been drilled at the surge shaft, turbine location, and vertical draft shaft to understand the subsurface geological condition and structure.

1.8.4 Geology of Barrage Site

The area along both the banks exposes rocks of Middle Siwaliks, characterized by medium to coarse grained soft sandrock with thin partings of clay with some gritty layers forming steep scarps along the left bank. A thick cover of River terrace material is resting over the soft sandrock along left abutment of proposed barrage site. The barrage axis is almost aligned at the contact of Middle Siwalik and Upper Siwalik Group which is gradational.

At the proposed barrage site, River is forming wide span of 600 m. The River bed portion is occupied by River borne material represented by boulders, pebbles and coarse sand. The general trend of the rock mass exposed along both the abutments of the proposed barrage site is N 60° W-S60°E and N65°W-S65°E and dip varying from 15° to 25° towards SW. The rock units are traversed by number of joint sets whereas, bedding joint is the prominent joint set.

In order to understand the subsurface geological conditions, subsurface exploration by drilling was suggested. Total 9 no. of boreholes were drilled at the proposed barrage site and geologically logged. After borehole logging and detailed geological mapping, the bedrock is established below the River borne material and thickness of the RBM vary from 8.50 m to 18 m. After core logging of these nine boreholes, it is concluded that the rock encountered in the River bed portion is slightly of better quality than the rock exposed along the abutments. Finally, it is concluded that the overall site condition for the construction of barrage is feasible and it has been further recommended by the GSI that the foundation of the barrage may be kept on the fresh rock than on RBM.

1.8.5 Geotechnical Appraisals of RMC & LMC

Traverse geological mapping of the right bank main canal and left bank main canal was carried out on 1:10,000 scale. Both the canal alignments expose massive conglomerate with impersistent bands of friable sandrock and clay of Upper Siwalik Group and reworked Siwalik/piedmont sediments and RBM of variable thickness represented by boulders and pebbles embedded in soil. The general trend of these rock units is N65°W-S65°E and dip varying from 10° to 15° southerly. The considerable canal length is either on aqueduct or underground in the boulder bed of Upper Siwaliks whereas; in the piedmont plain cut and fill sections are proposed. During geological mapping it was noticed that number of hand pumps and dug wells are existing in the area along the alignment in the piedmont plain. The existence of hand pumps and dug wells indicate that water table in the area is at shallow depth. The detailed geotechnical investigation is required before construction of the canals particularly where the alignment is passing below the major nalas/khads.

1.9 HYDROLOGY

1.9.1 Water Availability Studies

Ujh River drains a catchment area of 854 km² at the dam site. Discharge measurements of Ujh have been taken daily at two locations near the Ujh dam site as mentioned below:

S. No	Location	Period
1	Ujh Dam Site	1989-2008
2	Ujh barrage site	1984-2008

Water availability studies for the project have been carried out by Central Water Commission based on which an inflow series for 23 hydrological years (June to May) for the period 1984-85 to 2006-07 has been developed after deducting environmental flows to be released directly into the River and recommended to be utilized for power potential studies.

Based on the hydrological studies carried out, annual run-off during the study period varies from a maximum of 2362 MCM (year 1984-85) to a minimum of 412 MCM (year 1989-90) with the average run-off being 1041 MCM. The average inflows in the River during monsoon months from June to October constitute about 76% of the total average annual run-off. The average inflows in the River during lean months from Nov. to Feb. constitute just about 12% of the total average annual run-off. The minimum monthly flow in the flow series have been observed as 0.97 cumec in Feb, 2001 and the maximum flow of 335.54 cumec in Aug, 1984.

1.9.2 Design Flood Studies

As per the BIS guidelines, large dams with gross storage capacity greater than 60 MCM & hydraulic head greater than 30 m are to be designed to safely pass the Probable maximum Flood (PMF). Since Ujh MPP HE Project falls in this category, it has to be designed to safely pass the PMF. Accordingly, PMF estimation was done for this project. The PMF computed as 11400 cumec is found to be comparable to the PMF value of 11452 cumec recommended earlier by CWC in 1962 and also compares well with the 10000-yr return period flood value of 11132 cumec. Therefore, the PMF value of 11400 cumec has been recommended by the CWC for the planning of Ujh dam project.

1.9.3 Sedimentation Studies

The sediment data observation at Ujh dam site has been started from August, 2010 onward. No sediment observation data is available on Ujh River prior to August, 2010. The Reservoir Sedimentation Studies of Ujh Multipurpose Project is based on short term observed sediment load data at Ujh dam site for the period August, 2010 to January, 2011. The average annual sedimentation transport rate is worked out as 0.33 mm/year, whereas it is considered as 1mm/year including 20% bed load in this study.

The Reservoir Sedimentation problem has been classified as insignificant as per Bureau of Indian Standards 12182 "Guidelines for determination of sedimentation planning and performance of reservoirs". As such the sediment inflow into the

reservoir has been worked out considering the variable trap efficiency using the Brune’s Median Curve for normal ponded reservoirs. The New Zero Elevation (NEZ) corresponding to 50 years & 100 years have been computed and work out to 514.63 m and 523.15 m respectively against the original bed level of 503 m.

1.10 POWER POTENTIAL STUDIES

1.10.1 Project planning

Ujh Multipurpose project was not identified during Hydro Electric Potential Reassessment Studies completed by CEA in 1987. However, a PFR for the project was prepared by WAPCOS under PM’s 50000 MW initiative.

1.10.2 Selection of FRL & MDDL

In the PFR for Ujh H.E. Project, prepared by WAPCOS in the year 2004, the FRL had been selected as 614m. However, in the earlier DPR submitted by CWC during September, 2013, possibility of raising the FRL beyond 614m was also explored. Based on the field surveys conducted by CWC, the submergence details & the population affected for alternative FRL scenarios of 614m, 620m, 630m & 640m, are summarized below:

FRL (M)	Population Affected (Nos.)		Area submerged (km²)	
	Houses	People	Total	Agricultural Land
614	1067	6293	38.55	24.77
620	1275	7542	45.45	30.44
630	2214	12786	55.18	37.50
640	2643	15117	64.91	46.61

It was observed that large scale submergence is involved for the alternative FRL beyond 614 m. It was further seen from the studies discussed in succeeding paras that there would be hardly any spills from the reservoir for alternative FRL of 614m and, as such, additional energy generation would be negligible for FRLs beyond 614m. As such, the alternative FRL beyond 614 m was not considered in the DPR submitted by CWC during September, 2013.

For selection of MDDL, it is observed that New Zero Elevation for the project after 50 years and 100 years of sedimentation works out as 514.63m & 523.15m

respectively. As such, the minimum alternative MDDL has been considered as 564 m from sedimentation as well as turbine head variation considerations.

For selection of the optimum FRL and MDDL for the project, Reservoir simulation studies have been carried out in CEA for alternative FRL scenarios ranging from 608 m to 614 m in a step of 2 m considering MDDLs varying from 564 m to 594 m in a step of 10 m. From the analysis, it was observed that the cost per MW as well as the cost of generation is minimum corresponding to the FRL-614m and the MDDL-564 m. However, to reduce the submergence, FRL and the MDDL have now been fixed as 608 m and 564 m respectively in the Modified DPR.

1.10.3 Firm Power & Installed Capacity

With the FRL and the MDDL for the project as 608 m and 564m respectively, the firm power from the project has been estimated as 27.28 MW. Installed capacity for the project has been proposed as 186 MW which would enable peaking operation of the power house for about 3.5 hrs with a load factor of about 14.67%. Further, the annual energy benefits from the project in the 90% dep. year (1990-91) would work out to be 238.66 MU. Design energy benefits from the project (with 95% machine availability in 90% dependable year) have also been assessed as 238.66 MU. In addition to this 71.80 MU energy per annum will also be available from the 26 MW dam toe power house. Hence the total annual energy generation from the project comes out to be 310.46 MU. In future, if it is decided to enhance the storage in the reservoir in view of the increase in demand for water, the level of the reservoir can be progressively increased up to the level of 614m. In this scenario of Reservoir operating at FRL of 614m with the Installed capacity of 186 MW, the load factor will get improved to about 16.79% and the Firm power will be of the order of 31.23 MW.

With the FRL and the MDDL as 608 m and 564 m respectively, the net head acting on the turbines would vary from about 100 m to 150 m with weighted average net head as about 138 m. Accordingly, a Francis turbine has been found suitable for the above head range. Corresponding to the weighted average net head of 138 m, the unit discharge would be of the order of 51 cumec.

1.10.4 Selection of Unit Size

The transport limitations to the project site in terms of the largest package have been indicated as 3.75 m (W) X 4.8 m (H) with the weight of heaviest equipment that could be transported as 68 T. As such, there is unlikely to be any major constraint in transportation of heavy and large size equipment to the project site. Accordingly, three units with the unit size of 62 MW have been proposed for the main power house. For the dam toe power house one unit of 2 MW and another unit of 24 MW has been proposed.

1.10.5 Environmental Flows and Generation

The possibility of additional energy generation by having a power house to harness the hydro-electric potential of the water corresponding to the Environmental Releases, before releasing the same into the River from environment considerations have been separately explored. The month-wise environmental flows considered in the 90% dependable year are given below:

<i>Month</i>	<i>Environmental Release (cumec) in 90% dep. year</i>
<i>Jun</i>	<i>8.88</i>
<i>Jul</i>	<i>45.72</i>
<i>Aug</i>	<i>62.6</i>
<i>Sep</i>	<i>28.82</i>
<i>Oct</i>	<i>2.06</i>
<i>Nov</i>	<i>2.06</i>
<i>Dec</i>	<i>2.06</i>
<i>Jan</i>	<i>2.06</i>
<i>Feb</i>	<i>2.06</i>
<i>Mar</i>	<i>2.06</i>
<i>Apr</i>	<i>2.06</i>
<i>May</i>	<i>2.06</i>

It is proposed to harness the hydro-electric potential of the water corresponding to the above Environmental Releases in the 90% dependable year before releasing the same into the River from environment considerations. A power potential study has, therefore, been carried out to assess the likely power potential and possibility of its exploitation corresponding to the same. On the basis of the study, a 2 MW unit is proposed to harness the hydro-electric potential of the water corresponding to the same. In addition, to exploit the hydro-

electric potential in the monsoon months of July, Aug. and Sept., a unit of 24 MW is also proposed. The additional generation on account of these units would be of the order of 71.8 MU. Accordingly, a dam toe power house at the dam site is also proposed.

1.10.6 Conclusion

Finalized features of Ujh Multipurpose Project are as under:

1. The FRL and the MDDL at Ujh project have been selected as 608 m and 564 m respectively with live storage (781 MCM) which is equivalent to about 75 % of the average annual flows.
2. The year 1990-91 constitutes 90% dependable year with annual flows as 452 MCM.
3. The gross head acting on the turbines would vary from about 100 m to 150 m with weighted average net head as 138 m.
4. Firm power from the project would be of the order of 27.28 MW.
5. The project is proposed for operation as a peaking station and a barrage structure is proposed in the downstream with pondage of above 2.55 MCM for re-regulation of the flows to cater to the downstream irrigation requirements.
6. In the earlier DPR, submitted by CWC during September, 2013, the Installed capacity of 186 MW was arrived at based on the Power potential studies carried out by CEA with FRL as 614m. In the present modified DPR, same no. and size of the machines (3 Nos. of 62 MW each) have been proposed for reduced FRL of 608m also to cater for future requirement by progressively raising the reservoir level to increase the storage capacity in view of the growing demand of water in future.
7. Installed capacity of the dam toe power house meant for releasing the environmental flow will be 26 MW comprising of one unit of 2MW and another unit of 24 MW.
8. Design energy generation during 90% dependable year from the main power house would be 238.66 MU. Whereas, the dam toe power house will generate 71.8 MU per annum. Hence, the total energy generation will be 310.46 MU per year.
9. The unit discharge would be about 51 cumec.

1.10.7 Re-Regulating Barrage

Ujh Multipurpose project has been envisaged for operation as a Peaking Station. As such, a re-regulating barrage has been proposed in the downstream of the Dam to cater to the downstream Irrigation requirements to be met through the power house. The pondage level of the barrage has been worked out as 458 m corresponding to the maximum daily irrigation requirements assessed as about 2.55 MCM in the month of May.

1.11 POWER EVACUATION SYSTEM

As, there is no upstream or downstream hydro power project in the vicinity of Ujh MPP and therefore the evacuation of this generation project only is required to be planned. It is proposed that the generated power will be evacuated through a 220 V DC line from generation switchyard to 220/132kV Hiranagar substation of PDD, J&K. The length of this 220 KV line will be 15 km (approx).

1.12 CONSTRUCTION PROGRAMME

Ujh MPP Project is proposed to be completed in 72 months time. It is expected that all the major works would be awarded to contractors on competitive bidding basis. For this purpose the NIT would be floated and bids received and evaluated within such a time that immediately after the financial closure, work will be awarded to the successful bidder. The Zero date for commencement of construction is 1st January -2019.

Diversion Tunnels: The work of diversion tunnels is proposed to be started w.e.f. 1st January-2019. All the four diversion tunnels shall be completed in all respect by May 2021, which also includes erection of gates at their Intakes.

Upstream Cofferdam: Before starting the construction of 21.13 m high Rockfill Upstream Cofferdam, it is proposed to dump material obtained from the dam stripping / tunnel excavation as a pre-coffer dam and divert the non monsoon flow of the river through the diversion tunnels. The upstream coffer dam will be completed by January 2021.

Concrete Face Rockfill Dam: The CFRD of Ujh Multipurpose Project, which is the most important structure of this Project and is on the critical path, is being planned in such a way that the following major activities are completed as per the given schedule:

Table 3: Construction Schedule

Sl. No.	Activity	Commencement Date	Completion date
1	Abutment Stripping and excavation	March 2021	March 2022
2	Cut- off wall and Plinth of CFRD section.	March 2022	June 2022
3	Rock-filling in CFRD portion.	June 2022	February 2024
4	Face slab and Top of CFRD.	January 2023	May 2024

Power Intake and Pressure Shaft: The vertical drop shaft and pressure shaft are proposed to be excavated from the adits after the adits are completed by September 2020 starting from February 2019. The underground excavation of the pressure shaft will be completed in all respect including the vertical portion of the pressure shaft by May 8th 2023.

Construction of Spillway

The stripping and excavation work for spillway would commence from February 2020 after the construction of access paths. The civil work of the spillway is proposed to be completed within the 24th December 2023.

Powerhouse Civil Works: The stripping and excavation work for surface power house would commence from 30th of February 2019 after the construction of access paths. This excavation will also take care of the excavation required for transformer hall and switch yard.

The civil works of the power house and transformer hall super-structure, crane beam, architectural works etc. are proposed to be completed within the 7th May 2023. The switch yard works are also scheduled to be completed by 7th May 2023.

The Service bay and crane beam are scheduled to be ready by 7th May 2023 so that erection of E&M equipment can start for commissioning the entire project by May 2023.

1.13 COST ESTIMATE

Based on the April 2017 price level and considering the requisite methodology and for construction of this project within 72 months, the cost estimate was done on the basis of analysis of rates as per CWC guidelines for Civil & HM Works. The unit rates have been formulated based on market survey and prevailing rates of similar project, which have similar scope of works. The rate of equipment and machinery has been included in the unit cost rate. Excise duty, VAT and other taxes as applicable have also been considered in the adopted rates of various materials and items of works. Contractor's profit has not been taken on the price of cement and steel. As, it is proposed that the cement and steel would be supplied by the department itself. Hence, only overhead charges has been taken on the cost of the same to meet the departmental expenses.

The Abstract of Cost Estimate is enclosed at **Annexure VI**.

The cost of the Project is estimated to Rs 475008.54 lakhs at April 2017 price level.

1.14 PROJECT COST

Based on the construction period of 6 years and the cost mentioned above, the IDC of the project and the Levellised Tariff have been calculated. The assumptions in the calculations are as under:

Base Cost

Cost of the project is taken as estimated and discussed above. The cost is estimated at April 2017 price level.

IDC

Simple Interest during construction has been worked out based on the disbursement of cash flow. The interest rate is taken as 12% p.a.

1.14.1 Construction Period and Phasing

The project has been planned to be completed in 6 years. Capital cost for the project will be disbursed during the project construction period. Yearly phasing of expenses has been worked out.

1.14.2 Financing

The project is proposed to be financed with an interest rate of 12%.

1.14.3 Energy Benefits

The economic analysis is based on the energy output on 90% dependable year at 95% plant availability. One percent auxiliary consumption has been considered in preliminary financial evaluation of the project.

1.14.4 Energy Sale Price

The energy tariff has been worked out as per the basis of the discounted cash flow analysis so as to recover whole cost of the project in its lifetime.

1.14.5 Annual Costs

Annual operation and maintenance expenses have been taken as 1% of the capital cost.

1.14.6 Others

The economic evaluation of the project has been carried out for 35 years. The salvage value of the power component has been taken as 10% of the cost. The levellised tariff has been calculated for three discount rates i.e. 8%, 10% and 12%.

1.15 ECONOMIC AND FINACIAL EVALUATION

1.15.1 Cost of Power Generation

The levellised tariff of the power produced has been worked out based on completed cost of April 2017 price level. The cost of the project apportioned for power generation is 182596 lakhs for net annual generation of 310.46 MU. The cost has been calculated on the basis of the discounted cash flow analysis. The economic life of the project for the study purpose has been taken as 35 years. The auxiliary consumption and transformation losses have been taken as 1%. The O&M cost has been taken as 1.5%. The salvage value of the project at the end of the life has been considered as 10% of the project cost. It is presumed that all the three units shall be commissioned after the end of 6th year.

The cost of energy generation in a 90% dependable year at different discount rate is given below:

Cost per unit	= Discounted Cost/ Discounted Benefits	
Cost per unit @8% discount rate =		Rs. 08.80
Cost per unit @10% discount rate =		Rs. 10.90
Cost per unit @12% discount rate =		Rs. 13.27

1.15.2 Irrigation and other Benefits

The cost of the project allocated to Irrigation, Drinking water supply and flood protection component is 277112 lakhs. The net annual benefit from agriculture, drinking water supply and flood protection in post project period is 34276.50 lakhs annually as worked out in subsequent sections. The breakup of benefits (Rs. In lakhs) is given below:

Net Annual Irrigation Benefit	:	29283.98
Drinking Water Supply	:	756.86
Annual benefit from flood prevention	:	4235.66
Net Annual Benefit	:	34276.50

1.15.3 Benefit Cost Ratio for Irrigation Component

Benefit Cost (BC) Ratio has been worked out by considering the direct irrigation benefit and benefit from drinking water. The BC Ratio calculation has been carried out at April, 2017 price level. It includes cost of men and material for land preparation, cultivation, seeds, manure, pesticides, land and water taxes, profits etc. The details of cost of inputs and estimated value of farm produce in pre and post project periods are given in the Chapter 18.

The BC Ratio for Irrigation, drinking water supply and flood protection is given below:

$$\text{B.C. Ratio} = \text{Net Annual benefit} / \text{Total Annual cost} = 1.052$$

1.16 CONCLUSIONS

The Ujh Project, being a multipurpose project located in the Samba and Kathua district is economically not very much attractive. But given to socio-economic development of the area from hydro power production in power short area, supplying the drinking water as well as catering the irrigation demand of the area, the project can be implemented. Hence, implementation of the project is recommended on the following grounds:-

1.16.1 Power Benefits

The power demand in J&K is very high. Industrialization in the area is also very prominent. Peaking hour demand for the power is even higher. Ujh Dam Project has been proposed to be a Peak load station. Therefore the power generated from the Ujh Dam can be utilized economically at the peak hours and can be sold to the industries even on high rates.

1.16.2 Irrigation benefits

The BC ratio for the irrigation, drinking water supply and flood protection component works out to 1.052. Thus, the project does not offer a very good return on capital invested but it will definitely bring about an improvement of socio-economic conditions of the people of the area. An improvement in farming practices and increase in yield will lead to the development of the area.

1.16.3 Drinking Water benefits

The project has provision for the supply of drinking water to the Ujh Command area. It will solve the misery of the people in the area.

1.16.4 Flood Protection and other Indirect Benefits

The Project will provide a great relief from the miseries of flood to the people living in the area. The project has the scope of indirect benefits such as pisciculture, tourism and other progressive development. No significant adverse environment impact due to construction of this project is anticipated.

Ujh Multi- Purpose Project, Jammu & Kashmir

Report of the team constituted to explore the alternative options with reduced submergence/ displacement along with minimum loss of power and irrigation benefits

Indus Basin Organisation
Central Water Commission, Chandigarh

May, 2017

1.0 Introduction

The Detailed Project Report (DPR) of Ujh Multipurpose Project, J&K has been prepared by Central Water Commission, Jammu after extensive field survey and investigations viz., topographical survey, command area survey, exploratory drilling and drifting etc. The DPR was submitted on 6th September, 2013 to National Projects-1 Directorate (NP-1) of Central Water Commission, New Delhi, for appraisal. Ujh Multipurpose Project was declared as National Project in the year 2008.

The DPR was considered in 131st meeting of the “Advisory Committee for consideration of techno-economic viability of Major, Medium Irrigation, Flood Control and Multipurpose project proposals” on 16th November, 2016. Considering the importance of the Project, this project was agreed to ‘In- Principle’ by the Advisory Committee of MoWR, RD & GR. However, due to the issue of large submergence of land measuring about 41 sq km, the Committee decided that a team comprising of concerned officers from CWC and other experts shall visit the project site/ area and explore the alternative options with reduced submergence/ displacement along with minimum loss of power and irrigation benefits, so that the potential of east flowing rivers may be fully utilized as envisaged in Indus Water Treaty. Extracts from the minutes of the 131st meeting of Advisory Committee is enclosed as **Annexure-1**.

2.0 Indus Water Treaty

The Indus System of rivers comprises of the three Western Rivers namely, the Indus, Jhelum and Chenab together with three Eastern Rivers, the Sutlej, Beas and the Ravi. Indus Water Treaty was signed between Government of India and Government of Pakistan in presence of International Bank for Reconstruction and Development for sharing of water of Indus System. As per provisions of the treaty, India has the right to unrestricted use of all the waters of Eastern Rivers namely, Sutlej, Ravi & Beas.

Ujh River, on which Ujh Multipurpose Project is proposed to be constructed is a tributary of river Ravi, one of the eastern Rivers of the Indus system and

accordingly, India can fully utilize its water. After completion of this project, India can gainfully utilize its share of water which is currently going unutilized to Pakistan.

3.0 Project Proposal

The Ujh Multipurpose Project has been envisaged as a storage project to utilise water resources of river Ujh which is one of the main tributary of river Ravi. The main components of the Project are located in district Kathua of Jammu and Kashmir. The River Ujh is joined by four other tributaries viz., Sutarkhad, Dunarikhad, Bhini and Talyan at a place called Panchtirthi, the name derived from the confluence of these five streams. The proposed dam site is located in the village Barbari about 1.6 km downstream of Panchtirthi. The Powerhouse site is approximately 9.5 km downstream of dam site near a village called Deoli. A Barrage has been proposed 1.5 km d/s of Power house which also lies in district Kathua. Two canals, Right Main Canal (RMC) and Left Main Canal (LMC) will be off-taking from the barrage. From each of the canals ten cusec water has been earmarked for drinking water for the district Kathua. An Index map of the project is attached as **plate-I**.

The RMC will provide irrigation in tehsils Kathua & Hiranagar and in Samba district while, the LMC will provide irrigation in district Kathua. The CCA of RMC is 5595 ha and CCA of LMC is 3053 ha. In addition to that, the RMC will irrigate an additional area of 6840 ha in Kharif season from Samba to Vijaypur in the command area of existing Ravi and Tawi canals. Thus the targeted Irrigation Potential of the project works out to 24136 ha (Kharif:15488 ha, Rabi: 8648 ha).

Installed capacity of Ujh Multipurpose Project has been proposed as 186 MW. In addition to this a dam toe powerhouse comprising of two units of 5 MW has been proposed to harness the hydro-electric potential of the water meant for mandatory environmental releases.

A 116m high Concrete Face Rockfill Dam (CFRD) has been proposed to store water

with FRL at 614m, MWL 615.5m and the MDDL at 564m elevation. Water from the reservoir is proposed to be taken to the right bank power house by diverting through 2.474Km long head race tunnel. Gross & Live storage of the Dam is 1159 MCM & 1015 MCM respectively. The cost of the Project is estimated to be Rs 3630.73 Crore at April 2013 price level. General layout plan of the project is placed at **plate-II**.

4.0 Constitution of Team

In pursuance to the decision taken during 131st meeting of the Advisory Committee of MOWR, RD & GR, a team was constituted by National Projects-I Directorate, CWC vide letter no 3/7/2016/NP-I/358-69 dated 27th December, 2016 to explore the alternative options with reduced submergence/ displacement along with minimum loss of power and irrigation benefits, so that the potential of east flowing rivers may be fully utilized as envisaged in Indus Water Treaty. Officers of field Unit of CWC, Design and Hydrology experts from CWC(HQ) and a representative of Jammu & Kashmir State Power Development Corporation (JKSPDC) were included in the team. As any other alternative would have bearing on power potential of the project, subsequently, vide letter no. 3/7/2016/NP-I/14-24 dated 16th January 2017 a representative from CEA, viz., Director, HPP&I was also included in the team. Copies of the letters constituting team are enclosed as **Annexure-2**.

5.0 Deliberations and Site Visit by the Team

In order to assist the team in studying various alternatives, CWC, Jammu carried-out desk top studies based on topo-sheets of reservoir area. At various levels of reservoir, corresponding storages available and area under submergence was worked out. The same is enclosed as **Annexure-3**.

With the comparative studies carried out by CWC, Jammu as stated above, team visited the project site on 16th March 2016. The list of officers of CWC, CEA & JKSPDC who participated in the visit with team is enclosed as **Annexure-4**.

In accordance with the mandate, the Team decided to visit the submergence area of the reservoir. The proposed dam site is located just down-stream of the Panjthirithi i.e. confluence point of 5 rivers, viz., Binni, Dunari khad, Ujh, Suter khad and Talyan.

Hence, the team visited submergence area between different streams as indicated below:

- Submergence area between Suterkhad stream and Ujh River. (below EL 590)
- Submergence area between Suterkhad stream and Talyan stream (below EL 595)
- Submergence area between Ujh river and Dunari khad. (below EL 588)
- Historical temple of Panjthirithi where all the five streams meet. (EL 530)
- Dam site, Diversion tunnels site, Intake site
- Dhar road which is coming under submergence and also the submergence area around the Binni Bridge. Dhar road is very important road connecting Lakhanpur i.e. the entry point of J&K, to Udhampur. This road acts as by-pass to Jammu-Srinagar National Highway.

Photographs of the ares visited by the team are placed at plates- III to VIII.

As a follow up to the visit by team, a meeting at Jal Ayog Bhawan Jammu was held on 17th March, 2017 wherein officers from Ravi Tawi Irrigation complex and Irrigation and Flood control department, Jammu also participated. The list of officers who attended the meeting is attached as **Annexure-5**.

It was discussed in the meeting that reduction in height/ submergence has a direct bearing on the power generation and may also reduce the storage capacity and consequently affect the command area to be served. Accordingly, Irrigation and Flood Control department was requested to firm up the CCA to be served by the project. A letter in this regard was written to the Secretary, PHE/Irrigation & Flood Control department which is attached as **Annexure-6**.

In order to assess power production at different levels vis-à-vis the optimum power to be produced for minimum submergence, Director HPP&I, CEA was requested to work out power generation, annual energy generation at different FRLs.

A further follow up meeting was held between Director (M&A), CWC, Jammu and concerned officers with Executive Director, JKSPDC and Chief Engineer, JKSPDC on 31.03.2017. In this meeting JKSPDC was requested to submit their concerns about the project proposal as contained in the DPR of Ujh Multipurpose Project, which they would like to be addressed by this team. JKSPDC was also requested to co-ordinate with concerned Irrigation Department of J&K state to firm up the Command Area to be irrigated along with the possibility of the increase in the Command Area to be brought under irrigation, as decided in the meeting held on 17th March, 2017. The summary record of discussion of the meeting is attached as **Annexure-7**.

Meanwhile, Director HPP&I, CEA New Delhi submitted the report of power potential studies for alternative FRL scenarios ranging from 614m to 608m which is attached as **Annexure-8**. The report was shared with JKSPDC. Further, JKSPDC vide their letter no CI&D/Ujh/98-103 dated 10/04/2017 requested to restrict the FRL up to 608m (letter of JKSPDC is attached as **Annexure-9**). However, there was no reason cited by the JKSPDC for restricting the FRL to EL 608 m.

To finalise the recommendations, the team decided to take opinion of all the experts/specialists involved in the preparation of the DPR. Hence, a meeting was called at Sewa Bhavan on 17th April, 2017 wherein officers from IBO, CWC, representatives of JKSPDC, Officers from Design Directorates, Hydrology and National Projects-I Dte. of CWC and officers from Indus Wing of MOWR, RD & GR participated. The list of officers who attended the meeting is attached as **Annexure-10**. In the meeting CEA was requested to work out power generation, annual energy generation below FRL 608m also. Various options with reduced dam height were also discussed.

6.0 Conclusions

On the basis of field visits and various meetings with officers of related organisations, following conclusions are drawn:

- 1) During field visit the team observed that as per current project proposal, about 41 Sq km (4100 ha) of area is getting submerged, out of which about 16.94 Sq km (1694 ha) is culturable. Hence, Team decided to explore the possibility of different options to minimise such submergence as mandated.
- 2) After the field visit, it was confirmed that the dam site identified by the CWC is ideal for storage of river water because of the narrow gorge available just downstream of the confluence of the five streams. This is the most techno-economically suitable site for construction of a storage project in the entire Ujh valley. Hence, the only option to reduce submergence is reduction of dam height at this location only, keeping in view the requirement and the resources of the State Govt.
- 3) The team noted that the water required for the purpose of serving the identified command from this project is of the order of 179.83 MCM only against the Live Storage capacity of 1015 MCM and the drinking water requirement is 9.45 MCM. Thus the total annual consumptive requirement is about 190 MCM.
- 4) During discussions the team observed that such high storage was planned to arrest the flow of water of river Ujh, an east flowing river, in India only, as all the waters of east flowing rivers have been allocated to India as per the IWT.
- 5) The team then decided to get the current utilisation from the existing barrage on river Ujh. The extraction from the existing barrage is 209.25 MCM at present. Thus the annual consumptive requirement is about 400 MCM, taking into account the existing utilisation and the one proposed from the Ujh Multi-purpose Project.

- 6) This project will serve its intended purpose if all the stored water released to generate hydropower can subsequently be consumptively utilised in India.
- 7) Unless any other consumptive use is planned, the water released to generate hydropower, in excess of about 400 MCM (190+ 210), will flow out of the country.
- 8) JKSPDC has requested to restrict the FRL up to 608m. CEA had initially estimated power generation scenario up to FRL 608m only, hence the Team asked CWC, Jammu office to work in association with CEA to analyse additional scenarios upto FRL of about 580 m.
- 9) CWC and CEA have further carried out studies for various alternatives at different reduced dam heights and have estimated power generation, submergence, storage capacity, BC ratio etc. which is given below:

MWL (m)	FRL (m)	Height of Dam(m)	Gross storage (MCM)	I.C (MW)	Area under submergence in sq km	Houses under submergence	Tentative Tariff (Rs /Unit) (at August 2013 Price level)	Tentative BC ratio (at August 2013 Price level)	Total cost of the Project in crores at April 2013 Price Level
615.5	614	116	1160	186	41	2235	6.05	1.039	3630.73
613.5	612	114	1115	177	37.755	2064			3566.6
611.5	610	112	1050	168	36.128	1874			3531.41
609.5	608	110	984	162	34.493	1698	8.31	1.16	3497.06
601.5	600	102	760	119	27.404	1007	9.40	1.166	3349.18
591.5	590	92	521	73.6	19.076	497	8.31	1.086	3174.53
581.5	580	82	347	42.6	14.707	162			3075.61

- 10) A study of the table given above indicates that by reducing the dam height to 112m, the corresponding gross storage will be 1050 MCM and the submergence area and number of affected houses will get revised to 36.128 sq km and 1874 respectively. The installed capacity will get reduced to 168 MW instead of 186 MW.

7.0 Recommendations

- 1) Keeping in view the BC ratio, area under submergence, installed capacity etc, FRL of 608 m, appears to be optimal, which has also been agreed to by the JKSPDC. Under such a scenario, the dam height shall be 110 m, the corresponding submergence area and number of affected houses will be 34.493 sq km and 1698 respectively. The installed capacity will get reduced to 162 MW. Hence, it is advisable that the dam and other appurtenant structures may be constructed with FRL as 608 m, but the actual reservoir level can be progressively decided based on development of command and actual consumptive use within India.
- 2) However, as the scope of further consumptive utilisation of water for irrigation / drinking or any other purpose besides the Rehabilitation & Resettlement plan is to be decided by the J&K, based on their requirement, hence the above alternatives may be evaluated by the state government and the most suitable alternative may be selected for revision / modification of the DPR.
- 3) Further, the possibility of tapping the regulated releases from the proposed Ujh Multipurpose Project and its consumptive utilisation should be explored somewhere in the D/S for utilisation in India itself before it enters in Pakistan.

Annexure-1

No. 16/27/2016-PA(N)/4709-01

GOVERNMENT OF INDIA
MINISTRY OF WATER RESOURCES
Central Water Commission
(Project Appraisal Organization)

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Ph: 26103561, e-mail: panorth@nic.in
Dated: 30.11.2016

Sub: 131th meeting of the Advisory Committee of MoWR, RD & GR for consideration of techno-economic viability of Irrigation, Flood Control and Multipurpose Projects proposals held on 16th Nov., 2016.

A copy of the Summary Record of Discussions of the subject meeting held on 16th Nov., 2016, Wednesday, in New Delhi is enclosed herewith for information and further necessary action, please.

Comments, if any, may kindly be forwarded to the undersigned within 15 days.

Encl: As above


Chief Engineer (PAO) &
Member Secretary of the
Advisory Committee

To

Members of Committee:

1. Chairman, CWC, Sewa Bhawan, R. K. Puram, New Delhi.
2. Secretary (Expenditure), Ministry of Finance, (1st Floor) North Block, New Delhi.
3. Secretary, Department of Power, S.S. Bhawan, IInd Floor, New Delhi.
4. Secretary, Ministry of Environment & Forests, 4th Floor, Room No - 404/05, Paryavaran, Bhawan, CGO Complex, New Delhi.
5. Secretary, Department of Agriculture & Cooperation, Krishi Bhawan, New Delhi.
6. Secretary, Ministry of Tribal Affairs, Room No. 738, A-Wing, Shastri Bhawan, New Delhi.
7. Director General, ICAR, Room No-108, Krishi Bhawan, New Delhi.
8. Chairman, CEA, Sewa Bhawan, R. K. Puram, New Delhi.
9. Chairman, Central Ground Water Board, Jam Nagar House, New Delhi.
10. Sr. Adviser (Power), NITI Aayog, Room No-107, Yojana Bhawan, New Delhi.
11. Adviser (WR), NITI Aayog, Yojana Bhawan, New Delhi.
12. Joint Secretary & Financial Adviser, Ministry of Water Resources, RD & GR, Room No-401 S.S. Bhawan, New Delhi.

Government of India
Ministry of Water Resources, River Development & Ganga Rejuvenation
Central Water Commission

SUMMARY RECORD OF DISCUSSIONS OF THE 131ST MEETING OF THE ADVISORY COMMITTEE FOR CONSIDERATION OF TECHNO-ECONOMIC VIABILITY OF MAJOR & MEDIUM IRRIGATION, FLOOD CONTROL AND MULTI-PURPOSE PROJECT PROPOSALS HELD ON WEDNESDAY, NOVEMBER 16TH, 2016 IN NEW DELHI

The 131st meeting of the Advisory Committee of Ministry of Water Resources, River Development & Ganga Rejuvenation (MoWR, RD&GR) for consideration of techno-economic viability of major & medium irrigation, flood control and multi-purpose project proposals was held under the Chairmanship of Shri Shashi Shekhar, Secretary to the Government of India, MoWR, RD&GR on Friday, 16th November, 2016 at 10:30 Hrs at New Delhi. The list of members of the Committee or their representatives/nominees and Special Invitees and Officers from various Ministries/Organizations and representatives of State Governments, who attended the meeting, is at **Annex-I**.

At the outset, the Secretary (WR, RD & GR) and Chairman, Advisory Committee welcomed the participants and asked the Member Secretary to take up the agenda items.

(i) Confirmation of the minutes of 130th meeting of the Advisory Committee

1. CE (PAO), CWC and Member Secretary informed that the 130th meeting of the Advisory Committee of MoWR, RD&GR on Irrigation, Flood Control and Multi-purpose Projects was held on 30.09.2016. Summary Record of Discussions was circulated vide letter No. 16/27/2015-PA(N)/3939-73 dated 06.10.2016. CE(PAO) pointed out a minor correction in the Summary Record of 130th Meeting in respect of the project ***"Swan River Flood Management & Integrated Land Development Project starting from Punjab Boundary (D/S of Santokhgarh Bridge) to its Confluence Point with River Sutlej at U/S Thana Bridge near Sri Anandpur Sahib including D/S Flood Protection Works in Dist. Roopnagar (Punjab) (Estimated Cost Rs. 210.23 Cr. @ PL 2014), B.C. Ratio 2.36"*** which is given as under:

In line no. 2 "protect an area of 776 ha and approximately 367,900 people" ***may be read as "protect an area of 2227 ha and approximately 67,900 people"***.

No other comment on the Summary Record of Discussion was received, hence Advisory Committee accordingly confirmed the Summary Record of Discussion of the 130th Meeting, with above correction.

(ii) Project Proposals considered by the Advisory Committee

A. Irrigation and Multi-purpose Projects

1. **Andhra Pradesh Irrigation and Livelihood Improvement Project Phase – II (APILIP-II) (New Major, Estimated Cost Rs. 2000 Cr.)**

Director External Assistance Dte., CWC made a presentation on the above proposal. It was informed that the project consists of 2 major irrigation schemes, 18 medium irrigation schemes and 485 minor irrigation schemes.

The proposal was discussed in detail and it was observed that the inter-state issue regarding water sharing between the States of Andhra Pradesh and Telangana needs to be resolved. It was decided that the resolution of inter-state issue may be awaited. Accordingly the Project proposal was deferred to the next meeting of Advisory Committee.

**2. Sukhahar Medium Irrigation Project, Himachal Pradesh.
(New ERM, Medium, Estimated Cost Rs. 153.80 Cr.@PL 2015, B. C. ratio 2.39:1)**

CE (PAO), CWC and Member Secretary briefed the Committee that the project proposal envisages lifting the water of Gaj Khad to irrigate the agriculture field situated on the right and left bank of Gaj Khad with CCA of 2186 ha and an annual irrigation of 5572 ha to benefit approximately 24,120 persons in the command area in Kangra district of Himachal Pradesh.

The Project Authority made a detailed presentation on the proposal. The durability of HDPE pipe being used in distribution network was enquired. The Project Authority informed that HDPE pipe has been used by them in other similar projects and have been performing well for the last 5 years. After deliberation, the Advisory Committee accepted the Project proposal.

General Conditions:

- (i) Participatory irrigation Management (PIM) may be encouraged by State Govt. and Water Users Associations (WUAs) shall be formed at appropriate stage to ensure awareness and participation of farmers in order to achieve the specific objectives. Later on, once project is completed WUAs shall have the responsibility of Operation and Maintenance of canals, Warabandi etc. to ensure PIM.
- (ii) Water charges from the farmers shall be collected and part of this revenue shall be used for Operation & Maintenance (O&M) of the project.
- (iii) Minimum environmental flow in the downstream of the river may be ensured as per the prevailing law/as per the terms and conditions stipulated by MoEF&CC.
- (iv) Annual maintenance, de-weeding etc. should be ensured by deploying a dedicated team or through annual contract (Reach wise).
- (v) Option of pressurized piped network instead of canal network may be explored by the Project Authority wherever feasible.
- (vi) The micro irrigation shall be introduced and approximately 50% of command shall be covered under micro irrigation.
- (vii) Acceptance of project proposal by Advisory Committee of MoWR,RD&GR does not guarantee any eligibility towards release of fund under any existing scheme of MoWR,RD&GR such as AIBP, PMKSY, RRR, FMP etc.
- (viii) The State should complete the project within 5 years and BC ratio and total cost will hold valid for this period only.

**3. Medium Irrigation Project to various Panchayats of Jawalamukhi Area in Distt. Kangra, Himachal Pradesh.
(New Medium, Estimated Cost Rs. 194.474 Cr. @ PL 2016, B. C. Ratio 1.49:1)**

CE (PAO), CWC and Member Secretary informed the Committee that the proposal envisages lifting of water from Beas river and irrigate the agricultural field of Jawalamukhi area of Himachal Pradesh. The project contemplates to provide annual irrigation of 5957 ha benefitting Kangra district of Himachal Pradesh. 30% of total area is proposed to be irrigated using micro irrigation.

The Project Authority made a detailed presentation on the proposal. After deliberation, the Advisory Committee accepted the Project proposal subject to the following conditions which are mandatory for granting Investment Clearance:

- (i) Clearance for diversion of total 4.47 ha of forest land from MoEF&CC.
- (ii) No Objection Certificate (NOC) from Bhakra Beas Management Board (BBMB) to lift the water from Beas river.

General Conditions:

- (i) Participatory irrigation Management (PIM) may be encouraged by State Govt. and Water Users Associations (WUAs) shall be formed at appropriate stage to ensure awareness and participation of farmers in order to achieve the specific objectives. Later on, once project is completed WUAs shall have the responsibility of Operation and Maintenance of canals, Warabandi etc. to ensure PIM.
- (ii) Water charges from the farmers shall be collected and part of this revenue shall be used for Operation & Maintenance (O&M) of the project.
- (iii) Minimum environmental flow in the downstream of the river may be ensured as per the prevailing law / as per the terms and conditions stipulated by MoEF&CC.
- (iv) Annual maintenance, de-weeding etc. should be ensured by deploying a dedicated team or through annual contract (Reach wise).
- (v) Acceptance of project proposal by Advisory Committee of MoWR, RD&GR does not guarantee any eligibility towards release of fund under any existing scheme of MoWR, RD&GR such as AIBP, PMKSY, RRR, FMP etc.
- (vi) The State should complete the project within 3 years and BC ratio and total cost will hold valid for this period only.

**4. Ujh Multipurpose Project, Jammu & Kashmir.
(New Multipurpose, Estimated Cost Rs. 3262.28 Cr. (PL 2013), B. C. Ratio 1.039:1)**

Director, NP-II Directorate, CWC made a detailed presentation on the proposal. It was informed that the proposal envisages construction of a storage dam across Ujh river, tributary of Ravi near village Barbari in Kathua district of Jammu and Kashmir. A power house approximately 9.5 km downstream of dam site and a dam toe powerhouse are also proposed. A barrage has been proposed 1.5 km downstream of Powerhouse. The project contemplates to provide Annual Irrigation of 31380 ha benefitting Kathua and Samba districts of J&K. The proposed installed capacity of the project is 196 MW including 10 MW capacity

of Dam Toe Power House. 18.92 MCM of water is proposed for drinking water requirement of the enroute areas of canal. The Project has been declared as National Project by Gol.

It was observed that the price level is of year 2013. CE(PAO), CWC mentioned that as the Environment Clearance of the project is awaited, the cost of R&R has been taken provisionally.

Considering the importance of the project, this project was agreed "In Principle" by the Advisory Committee. However, the issue of large submergence by the project was also discussed. It was observed that there is submergence of 41.00 sq km of land which includes 16.94 sq km of culturable land, 3.0 sq km of irrigated land, 2.42 sq km of forest land; 11.3 km of road, 25.6 km of transmission line and 11498 persons etc.

The project was discussed in detail and after deliberation, it was decided that "a team consisting of concerned officers from CWC and other experts shall visit the project site/area and explore the alternate options with reduced submergence/displacement alongwith minimum loss of power and irrigation benefits, so that the potential of east flowing river may be utilized, as envisaged in Indus Water Treaty. This exercise should be completed within 2 months.

Accordingly, the project will be re-submitted after Environment and Forest Clearance alongwith optimization suggested by team for utilization of full potential as per Indus Water Treaty.

**5. Morand & Ganjal Complex Project, Madhya Pradesh.
(New Major, Estimated Cost Rs. 2427.02 Cr. @ PL 2016-17, B. C. ratio 1.54:1)**

Director, PA(C) Dte., CWC made a presentation on the above project. The project envisages construction of two dams, one on Morand River and the other on Ganjal river, both tributaries of Narmada. Morand dam is proposed to be located near Morghat village, Hoshangabad district and the Ganjal dam is proposed near Jawardha village, Harda district. The project contemplates to provide Annual Irrigation of 70476 ha benefitting Hoshangabad, Harda and Khandwa districts of Madhya Pradesh. A provision of 6 MCM has been made from Morand reservoir for drinking water supply to Seoni Malwa town and also a provision of 9.18 MCM of water from Morand reservoir for drinking water supply to 211 villages in the command area which includes industrial use.

It was observed that the following statutory clearances are yet to be obtained:

- (i) Environment Clearance from MoEF&CC.
- (ii) Forest Clearance from MoEF&CC for the diversion of 2371.13 Ha of forest land.
- (iii) Clearance from Ministry of Tribal Affairs (MoTA) for the R&R plan of tribal population.
- (iv) The agriculture yield and rate for pre and post project needs to be duly vetted by State Agriculture Department.

The project was discussed in detail and after deliberation, it was decided that pipe network may be included in the project proposal. It was decided that the project proposal shall be re-submitted alongwith required Statutory Clearances.

1



Annexure 2(a)



NATIONAL PROJECTS-I DIRECTORATE
CENTRAL WATER COMMISSION

2B, 8th Floor (N), Sewa Bhawan, R.K.
Puram Sector-1, New Delhi-110066

राष्ट्रीय परियोजना-1 निदेशालय

केन्द्रीय जल आयोग

Tele/Fax: 011-26195302

Email: np1dte@gmail.com

No. 3/7/2016/NP-I/ 358-6)

Date: 27 December, 2016

Sub: Constitution of a team to explore alternate options for Ujh Multi-Purpose Project, J&K - reg.

In pursuance of the decision taken during the 131st meeting of Advisory Committee of MoWR, RD&GR for consideration of techno-economic viability of major & medium irrigation, flood control and multi-purpose project proposals held on 16th November 2016, a team is hereby constituted with the following composition to visit the Ujh Multi-Purpose Project site/area and explore the alternate options with reduced submergence/displacement alongwith minimum loss of power and irrigation benefits so that the potential of east flowing river may be utilized as per Indus Water Treaty.

1. Chief Engineer (IBO), CWC, Chandigarh - Team Leader
2. Chief Engineer (CI&D Wing), Jammu Kashmir State Power Development Corporation (JKSPDC), Jammu
3. Director, Embankment (N&W) Dte., CWC, New Delhi
4. Director, BCD (N&W) Dte., CWC, New Delhi
5. Director, Hydrology (N) Dte., CWC, New Delhi
6. Director (M&A), CWC, Jammu - Member-Secretary

The team will complete the above exercise within 2 months. The project will be resubmitted after Environment & Forest Clearance alongwith optimization suggested by the team for utilization of full potential as per Indus Water Treaty.

This is issued with the approval of Chairman, CWC.

भवदीय
27/12/16
(भूपेश कुमार)
निदेशक

Chief Engineer (IBO), CWC, Block IV, 6th Floor, Kendriya Sadan, Sector - 9A, Chandigarh - 160107
Chief Engineer (CI&D Wing), Jammu Kashmir State Power Development Corporation (JKSPDC), 18 C/C Gandhi Nagar, Jammu-180004
Director, Embankment (N&W) Dte., CWC, New Delhi

Annexure - 2(b)



NATIONAL PROJECTS-I DIRECTORATE
CENTRAL WATER COMMISSION
2B, 8th Floor (N), Sewa Bhawan, R.K.
Puram Sector-1, New Delhi-110066



भारत सरकार

राष्ट्रीय परियोजना-1 निदेशालय
केन्द्रीय जल आयोग
Tele/Fax: 011-26195302
Email: np1dte@gmail.com

No. 3/7/2016/NP-I/ 14-24

Date: 16 January, 2017

Sub: Constitution of a team to explore alternate options for Ujh Multi-Purpose Project, J&K - reg.

In continuation to this office letter no. 3/7/2016/NP-I/358-67 dated 27th December, 2016 vide which a team was constituted to visit the Ujh Multi-Purpose Project site/area and explore the alternate options with reduced submergence/displacement alongwith minimum loss of power and irrigation benefits so that the potential of east flowing river may be utilized as per Indus Water Treaty, **Director, HPP&I Division, Central Electricity Authority, New Delhi has also been included as a member of the above committee.** Accordingly, the revised composition of the committee will be as under.

- | | | | |
|----|---|---|------------------|
| 1. | Chief Engineer (IBO), CWC, Chandigarh | - | Team Leader |
| 2. | Chief Engineer (CI&D Wing), Jammu Kashmir State Power Development Corporation (JKSPDC), Jammu | | |
| 3. | Director, HPP&I Division, CEA, New Delhi | | |
| 4. | Director, Embankment (N&W) Dte., CWC, New Delhi | | |
| 5. | Director, BCD (N&W) Dte., CWC, New Delhi | | |
| 6. | Director, Hydrology (N) Dte., CWC, New Delhi | | |
| 7. | Director (M&A), CWC, Jammu | - | Member-Secretary |

The team will complete the above exercise within 2 months. The project will be resubmitted after Environment & Forest Clearance alongwith optimization suggested by the team for utilization of full potential as per Indus Water Treaty.

This is issued with the approval of Chairman, CWC.

(Signature)
16/1/17
(भूपेश कुमार)
निदेशक

Copy to:

1. Chief Engineer (IBO), CWC, Block IV, 6th Floor, Kendriya Sadan, Sector - 9A, Chandigarh - 160107
2. Chief Engineer (CI&D Wing), Jammu Kashmir State Power Development Corporation (JKSPDC), 18 C/C Gandhi Nagar, Jammu-180004.
3. Director, HPP&I Division, CEA, New Delhi
4. Director, Embankment (N&W) Dte., CWC, New Delhi

Detail of submergence at various levels of Ujh Multipurpose Project				
Elevation	Area under submergence in sq km	Area under submergence in sqm	houses under submergence	Capacity(MCM)
503	0	0	0	0
510	0.057	56850.219	0	0.199
520	0.47	469961.429	0	2.833
530	1.124	1124279.258	0	10.804
540	2.245	2245093.856	0	27.651
550	4.018	4017688.053	0	58.965
560	6.548	6547696.055	0	111.792
570	9.566	9565614.405	34	192.358
580	13.419	13419244.72	123	307.238
590	18.384	18384122.18	398	466.3
600	25.369	25368727.82	869	685.064
610	34.493	34493353.2	1698	984.374
616	41	41000000	2235	1160

List of officers of CWC, CEA and JKSPDC who visited the Ujh Multipurpose Project site on 16/3/2017.

Central Water Commission

- (1) Sh. Atul Jain, Chief Engineer, IBO, CWC, Chandigarh.
- (2) Sh. Vijai Saran, Director, (M&A) Dte., CWC, Chandigarh.
- (3) Sh. M.Ramesh Kumar, Director, Embankment (N&W) Dte., CWC, New Delhi
- (4) Sh. Samir Kumar Shukla, Director, (M&A)Dte., Jammu.
- (5) Sh .Hradesh Kumar, Executive Engineer, Chenab Division, CWC, Jammu.
- (6) Sh. Rishi Kumar, Assistant Executive Engineer, NSD-II, CWC, Jammu.
- (7) Sh. Nabendu De, Assistant Director-II,(M&A)Dte.,CWC, Jammu.
- (8) Sh. Parmjit, Sub Divisional Engineer, NSD-I, CWC,Jammu.
- (9) Sh. Amit Kumar, Junior Engineer, NSD-II, CWC,Jammu.

Central Electricity Authority.

- (1) Sh. Rakesh Goyal, Director, HPP&I, CEA, New Delhi.

Jammu & Kashmir State Power Development Corporation

- (1) Sh. B.L. Dhar, Chief Engineer,(CI&D Wing),JKSPDC, Jammu.
- (2) Sh. Anil Sharma, General Manager, Civil, JKSPDC, Jammu.
- (3) Sh. Variender Gupta, Executive Engineer, (CCD,Ujh), JKSPDC, Jammu.
- (4) Sh. Ajit Singh, Assistant Executive Engineer, (CCD,Ujh), JKSPDC, Jammu

List of officers of CWC, CEA, JKSPDC, Ravi Tawi Irrigation department and Irrigation and Flood Control department who attended the meeting on the Ujh Multipurpose Project on 17/3/2017.

Central Water Commission

- (1) Sh. Atul Jain, Chief Engineer, IBO,CWC, Chandigarh.
- (2) Sh. Vijai Saran, Director, (M&A) Dte., CWC,Chandigarh.
- (3) Sh. M.Ramesh Kumar,Director,Embankment (N&W) Dte., CWC, New Delhi
- (4) Sh. Samir Kumar Shukla, Director, (M&A) Dte., CWC,Jammu.
- (5) Sh .Hradesh Kumar, Executive Engineer, Chenab Division, CWC, Jammu.
- (6) Sh. Rishi Kumar, Assistant Executive Engineer, NSD-II, CWC, Jammu.
- (7) Sh. Rakesh Gupta, Assistant Director,(M&A) Dte., CWC, Jammu.
- (8) Sh. Nabendu De, Assistant Director-II,(M&A) Dte., CWC,Jammu.
- (9) Sh. Parmjit,Sub Divisional Engineer, NSD-I, CWC,Jammu.
- (10)Sh. Amit Kumar, Junior Engineer, NSD-II,CWC, Jammu.

Central Electricity Authority.

- (1) Sh. Rakesh Goyal, Director, HPP&I, CEA, New Delhi.

Jammu & Kashmir State Power Development Corporation

- (1) Sh. B.L. Dhar, Chief Engineer,(CI&D Wing),JKSPDC, Jammu.
- (2) Sh. Ajit Singh, Assistant Executive Engineer, (CCD,Ujh), JKSPDC, Jammu.

Ravi Tawi Irrigation Department.

- (1) Sh.H.C.Jerath, Chief Engineer, Ravi Tawi Irrigation Department.

Irrigation and Flood Control Department.

- (1) Sh.Ashok Kumar Gandotra, Superintendent Engineer, Hydraulic, Kathua.
- (2) Sh. Sunil Bhasin, Technical officer to Chief Engineer, I&FC dept.
- (3) Sh. Sanjeev Malhotra, Executive Engineer, Flood Control Division.Kathua.

Annex-6



GOVT OF INDIA
CENTRAL WATER COMMISSION
Monitoring & Appraisal Directorate

Jal Ayog Bhawan, Rajinder Nagar Phase-I, Bantala, Jammu- 181123
Phone: 0191 2597667, Fax: 0191 2597669, E Mail: dirmajammu-cwc@nic.in

No: M&AD/DB-782/2016/ 505-30

Dated: 17/03/2017

To,

The Secretary,
PHE/ Irrigation & Flood Control Department,
Govt. of Jammu & Kashmir,
Jammu.

Sub: DPR of Ujh Multipurpose Project, constitution of a team to review- reg.

Sir,

As you may be aware that CWC has prepared a DPR for Ujh Multi Multipurpose Project declared as National Project by MoWR, RD&GR, New Delhi. As per DPR, the project envisages 118 m high Dam to store 1016 MCM of water to irrigate 16743 ha (CCA) and to generate (186+10) MW of power. The DPR was considered by TAC of MoWR, RD&GR held on 16.11.2016 and it was decided inter alia to constitute a team to "explore the alternate options with reduced submergence/ displacement along with minimum loss of power and irrigation benefits so that the potential of east flowing river may be utilized as per Indus Water Treaty". The copy of the letter constituting the team is enclosed for reference.

Accordingly, the team visited the project sites on 16.03.2017 and held a meeting with officials of RTIC and I&FC Dept., Jammu (J&K) on 17.03.2017. One of the important issue to be decided by the team is reduction of submergence/ displacement along with minimum loss of power and irrigation benefits so that the potential of east flowing river may be utilized as per Indus Water Treaty. As reduction in height / submergence/ storage has a direct bearing on the command area to be served and power generation, hence it is essential that the CCA to be served by the project is identified and firmed up by the state govt. A copy of the DPR is already available with JKSPDC. However, a map indicating command area identified in the DPR is also enclosed herewith. It is requested to review and confirm the command area indicated, so that recommendation of the team could be firmed up.

An early action in this regard is solicited.

Encl: As above.

Yours faithfully,

(S. K. SHUKLA)
Director

Copy for information to:

1. The Secretary, Power, J&K Govt.
2. The Managing Director, JKSPDC, Jammu with a request to indicate the concerns/ issues in respect of DPR of Ujh Multipurpose project vis-a-vis ToR of the team.
3. The Chief Engineer, JKSPDC, Jammu.
4. The Chief Engineer, RTIC, Jammu.
5. The Chief Engineer, I&FC, Jammu.

Annex-7



GOVERNMENT OF INDIA
CENTRAL WATER COMMISSION
MINISTRY OF WATER RESOURCES, RD & GR

Monitoring & Appraisal Directorate
JAL AYOGBHAWAN, Rajinder Nagar, Ph-1,
Bantalab, Jammu- 181123
TEL: 0191 2597667/ 2597669

No. M&AD/DB-782/2016/621-24

Dated: 31.03.2017

To
The Executive Director
JKSPDC
Satwari
Jammu

Subject: The summary record of the discussions of the meeting held on 31.03.2017

Sir,

Undersigned is directed to forward the summary record of the discussions of the meeting held on 31.03.2017 in your conference hall at Satwari, Jammu.
This is for kind information please.

Encl- As above

Yours faithfully
A.P. Kandiyal
31/03/2017
(A.P. Kandiyal)
Deputy Director

Copy to:

1. Chief Engineer, IBO, CWC, Chandigarh.
2. The, Chief Engineer JKSPDC, Gandhi Nagar, Jammu
3. Executive Engineer, Chenab Division, CWC, Jammu- Member.

o/c

Ujh Multipurpose Project
Summary Record of Discussions of the meeting held with the Officers of JKSPDC
On 31.03.2017 at Jammu

The DPR of the Ujh Multipurpose Project was considered in 131st meeting of the Advisory committee of MOWR, RD & GR for consideration of techno-economic viability of Irrigation, Flood Control and Multipurpose Projects proposals on 16th Nov. 2016. Considering the importance of the project, it was agreed “In Principle” by the Advisory committee. The issue of large submergence of 41 sq km of land is also discussed and it was decided in TAC that a team consisting of concerned officers from CWC and other experts shall visit the project site/area and explore the alternative options with reduced submergence/displacement along with minimum loss of power and irrigation benefits so that the potential of east flowing rivers may be utilized as per Indus Water Treaty.

In pursuance to the decision taken during 131st meeting of the Advisory committee of MOWR, RD & GR, the team of officers from CWC, CEA and JKSPDC visited the project site on 16th March 2016. Further a meeting was also held in CWC office Jammu on 17th March 2017. It was discussed in the meeting that reduction in height/submergence /storage has a direct bearing on the command area to be served and power generation so it was decided that the Irrigation and Flood control department will firm up the CCA to be served by the project.

Secretary PHE/Irrigation & Flood Control department, Govt. of J&K was requested vide this office letter no. M&AD/DB-782/2016/525-30 dated 17.03.2017 requesting therein to identify the CCA to be served by the Project. Managing Director, JKSPDC, Jammu was also requested to indicate the concerns/issues in respect of DPR of Ujh Multipurpose Project.

As a follow up, a meeting was held in the office of the Jammu Kashmir State Power Development Corporation (JKSPDC), Jammu on 31.03.2017 on the request of Director, M&A Directorate, CWC, Jammu. The following officers attended the meeting:-

S/Shri

1. Ajay Gupta, Executive Director, JKSPDC, Govt. of J&K, Jammu
2. B.L. Dhar, CE, JKSPDC, Jammu.
3. Samir Kumar Shukla, Director, M&A Dte., CWC, Jammu.
4. Anil Kumar Sharma, GM, JKSPDC, Jammu.
5. A. P. Kandiyal, Dy. Director, M&A Dte., CWC, Jammu.
6. Rishi Kumar, AEE, CWC, Jammu.
7. Parmjit, SDE, CWC, Jammu

The Executive Director, JKSPDC welcomed the participants Director, M&A Directorate, CWC, Jammu briefed about the background of the issue at hand. The table indicating the tentative detail of submergence of houses at various water levels of Ujh MPP was handed over to Chief Engineer, JKSPDC during the meeting.

After detailed deliberations, the following decisions were taken:

1. JKSPDC will submit their concerns about the DPR submitted by CWC in writing.
2. JKSPDC will co-ordinate with concerned Irrigation Department of J&K state to firm up the Command Area to be irrigated along with the possibility of the increase in the Command Area to be brought under irrigation.
3. Director, CWC Jammu requested that the above points may be considered keeping in view the Indus Water Treaty (IWT).
4. JKSPDC assured to give the above information at the earliest preferably before 10.04.2017.
5. JKSPDC requested to provide the details of power at various water levels of Ujh MPP. Director, CWC, Jammu told that he will approach Director, HPI, CEA to submit the details at the earliest.

The meeting ended with thanks to the chair.

Subject: Visit of a team to Ujh Multipurpose Project, J&K to explore alternatives options –reg.

Reference is invite to discussion held during the visit of team to Ujh Multipurpose Project, J&K on 16th-17th March, 2017 to explore alternative options with reduced submergence/ displacement along with minimum loss of power and irrigation benefits so that the potential of east flowing rivers may be utilized as per Indus Water Treaty. In this regard, it is to mention that based on the irrigation requirements indicated by CWC, Reservoir simulation studies was earlier carried out in CEA for alternative FRL scenarios ranging from 608 m to 614 m in a step of 2 m considering MDDL as 564 m. Results of the simulation studies are reproduced below:

FRL (m)	MDD L (m)	Firm Power (MW)	Inc. Firm Power (MW)	I.C. (MW)	Annual Energy (MU)	Inc. Energy (MU)	Inc. Energy (kWh/kW)	Irrigation Failures (NO.)
614	564	31.09	0.85	186	263.68	4.06	676.67	4
612	564	29.63	0.86	177	252.18	2.70	900.00	5
610	564	28.14	0.85	168	243.12	5.55	1850.00	6
608	564	27.14	1.14	162	235.31	7.67	1278.33	6

It is observed that the irrigation failures were more than 5 for the FRL alternatives of 608 and 610 m. **The result may, however, undergo some change based on revised e-flow and other parameters.**

(Rakesh Goyal)
Director (HPP&I)

 <p>JK PDC GOVERNMENT OF JAMMU & KASHMIR ENTERPRISE</p>	<p>GOVERNMENT OF JAMMU & KASHMIR J&K STATE POWER DEVELOPMENT CORPORATION</p>
	<p>OFFICE OF THE CHIEF ENGINEER CI&D WING, JKSPDC JAMMU 1st FLOOR 18 C/C GANDHI NAGAR JAMMU (NEAR PUNJAB NATIONAL BANK) EMAIL: cecidj@gmail.com & cecidjmu@gmail.com</p>

No:-CI&D/Ujh/ 98-103
Dated: 10/04/2017.

Director,
Central Water Commission,
M&A Directorate
Bantalab Jammu.
e-mail:-dirmajammu-cwc@nic.in

Subject: - DPR of Ujh Multipurpose HEP in Kathua District of J&K State.

Reference:-

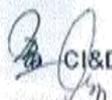
1. Your office letter no:-M&AD/DB-782/2016/525-30 dated:-17-03-2017.
2. Your office e-mail dated:-7th April 2017.
3. Meeting held on 10th April 2017 at corporate office Satwari Jammu.

Sir,

As advised by the Technical Advisory committee of MOWR, Govt of India, as decided in the meeting and in order to minimize submergence level, it is requested to restrict the FRL to EL.608m, based on the minimum levels calculated by your organization.

This is also in reference to above referred e-mail from CWC, wherein power potential calculations of Ujh HEP stands submitted to this office.

Yours faithfully,


Chief Engineer,
CI&D Wing JKSPDC Jammu

Copy to the:-

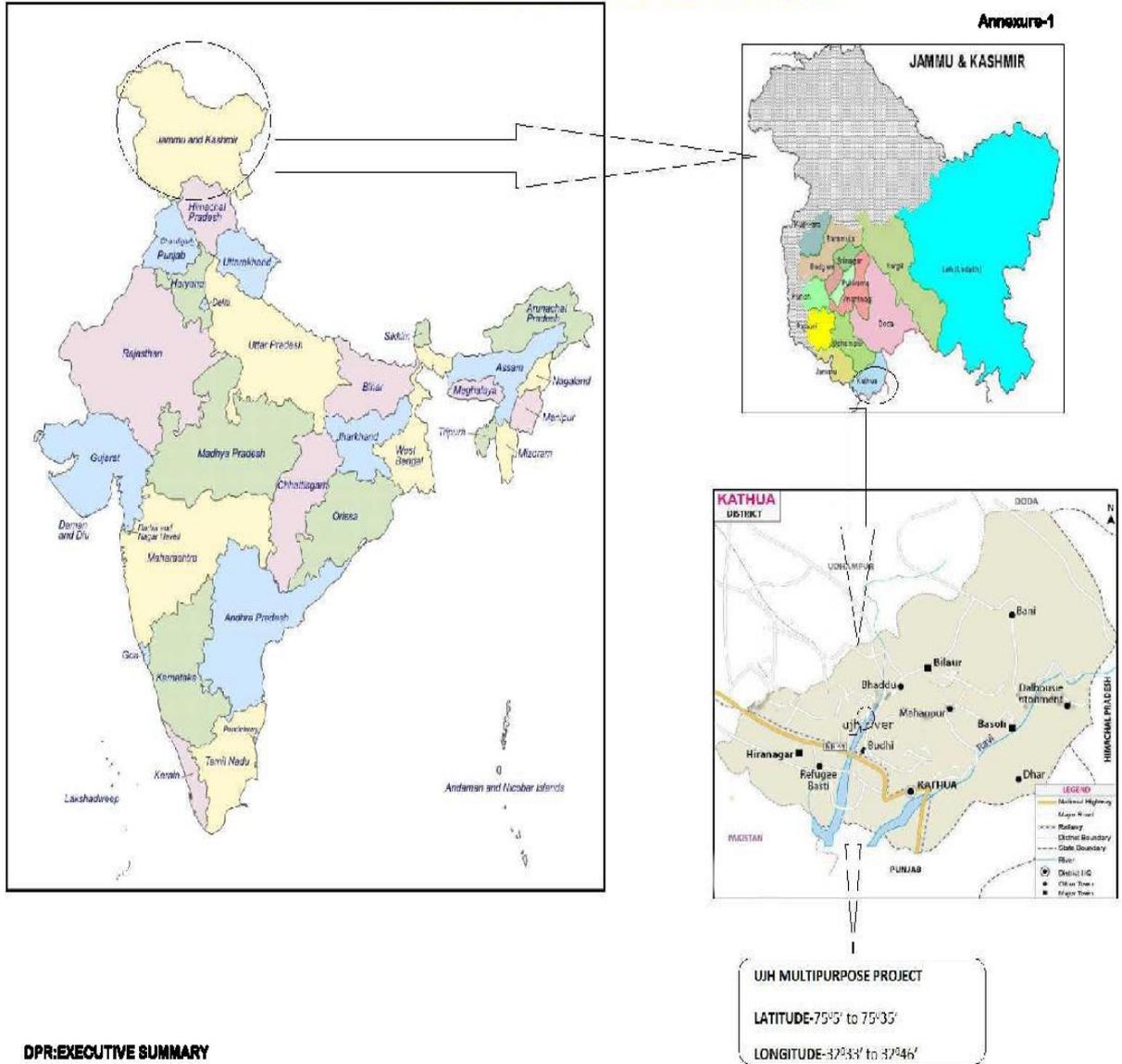
1. Managing Director JKSPDC Jammu for his kind information please.
2. Executive Director (Civil)/Electrical) JKSPDC Jammu for his kind information please.
3. Director Finance JKSPDC Jammu for his kind information please.
4. General Manager (Civil) JKSPDC Jammu for his information.
5. Executive Engineer, CCD Ujh HEP Kathua for follow up action.

List of officers of CWC,CEA and JKSPDC who visited the Ujh Multipurpose Project site on 17/4/2017 at Sewa Bhawan, New Delhi

Central Water Commission

- (1) Sh. Atul Jain, Chief Engineer, IBO, CWC, Chandigarh.
- (2) Sh. B.L. Dhar, Chief Engineer (CI&D Wing), JKSPDC, Jammu
- (3) Sh. Vijai Saran, Director, (M&A) Dte., CWC, Chandigarh.
- (4) Sh. A. K. Agarwal, Senior Joint Commissioner, MoWR, RD & GR
- (5) Sh. Bhupesh Kumar, Director, NP-I, CWC, New Delhi
- (6) Sh. M. Raghuram, Director, Hydrology (N), CWC, New Delhi
- (7) Sh. A. K. Shukla, Director, HCD (E&NE),CWC, New Delhi
- (8) Sh. Rajveer Singh, Deputy Commissioner, MoWR, RD & GR, New Delhi.
- (9) Sh .Hradesh Kumar, Executive Engineer, Chenab Division, CWC, Jammu.
- (10) Sh. A. P.Kandiyal, Deputy Director, M&A Directorate, CWC, Jammu
- (11) Sh. Rishi Kumar, Assistant Executive Engineer, NSD-II, CWC, Jammu.

LOCATION MAP OF UJH MULTIPURPOSE PROJECT



DPR:EXECUTIVE SUMMARY

Plate-I: Index map of the Ujh Multi Purpose Project

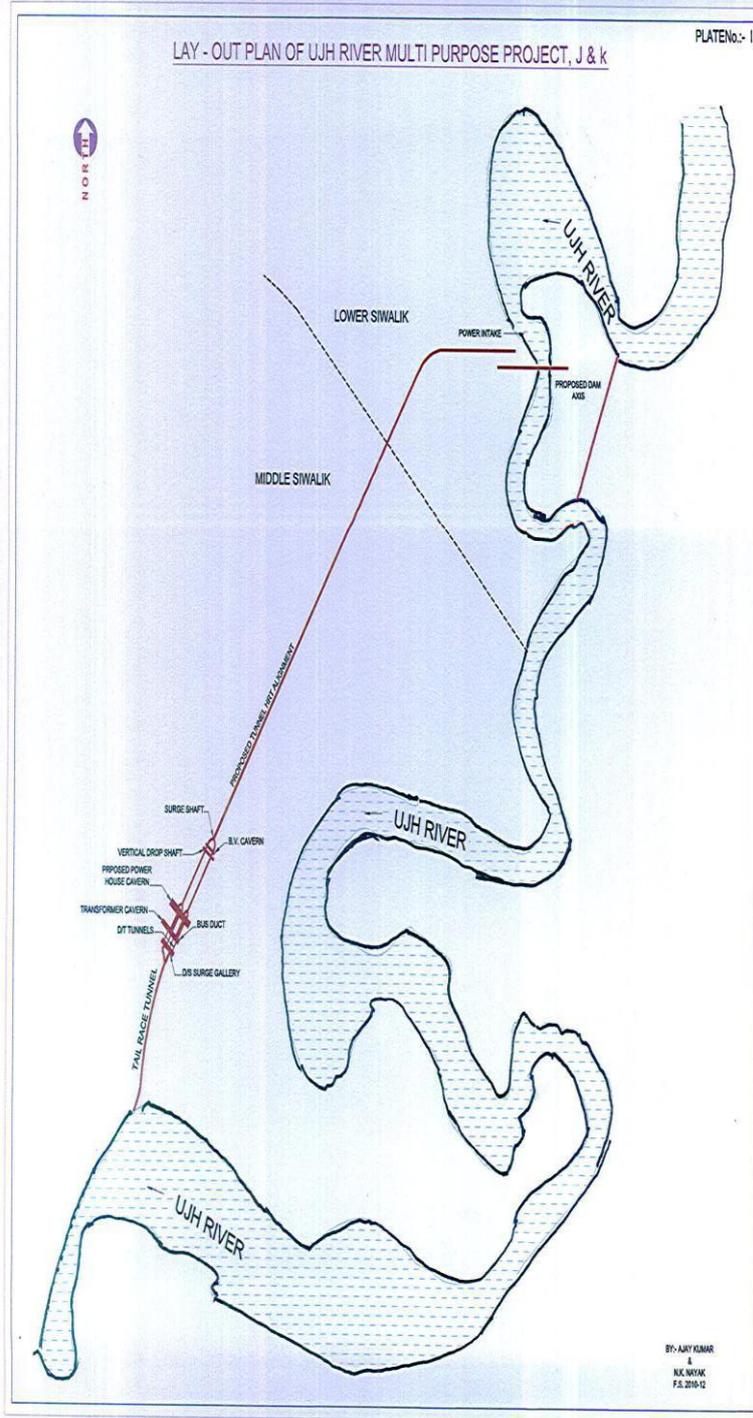


Plate – II: Detailed Layout Plan of the Ujh Multi Purpose Project



Plate-III:Submergence area between Suterkhad stream and Ujh River. (below EL 590)



Plate-IV:Submergence area between Suterkhad stream and Ujh River. (below EL 590)



Plate-V:Submergence area between Suterkhad stream and Ujh River. (below EL 590)



Plate-VI:Submergence area between Suterkhad stream and Talyan stream (below EL 595)



Plate-VII:Submergence area between Suterkhad stream and Talyan stream (below EL 595)



Plate-VIII:Submergence area between Ujhriver and Dunarikhad. (below EL 588)



भारत सरकार
केन्द्रीय जल आयोग
तटबंध (उ. एवं.प.) निदेशालय
आठवाँ तल (द), सेवा भवन, रामा कृष्ण पुरम, नई दिल्ली



No. 1/75/2017-Emb(N&W)/432-38 dated 10/10/2017

Sub: Summary Record of Discussions, held on 12-09-2017 at CWC (HQ), New Delhi, for preparation of modified DPR of "Ujh Multipurpose Project, J&K" in the light of Report of the team constituted to explore alternate options.

A meeting amongst officers of Design (N&W) Unit of CWC and officers from Indus Basin Organisation, CWC was held in the chamber of Chief Engineer, Designs (N&W), CWC, New Delhi on 12th September, 2017 at 11:00 AM to finalise the modalities for modifying the DPR of Ujh Multipurpose Project (J&K), in light of the Report of the Committee (May 2017), constituted by National Project-I Directorate of CWC vide letter No. 3/7/2016/NP-I/14-24 dated 16-01-2017 and the decision of Govt. of Jammu and Kashmir conveyed vide letter No. PW/Hyd/P&S/45/2017-18 dated 14-08-2017. The list of officers present during the meeting is given as **Annexure – I**.

At the outset, Chief Engineer, Designs (N&W) welcomed the participants and requested CE, IBO to give a fist of the project and recent developments. Chief Engineer, IBO described the details about the Project, background of the constitution of the Committee and its recommendations. Apart from the brief details about the Ujh Multipurpose Project, following were the main points covered in the deliberations made by Chief Engineer, IBO:

- a. The Ujh project is declared as National Project, the DPR of which was prepared by Chenab Division under M&A Directorate, Jammu in consultation with Specialized Directorates of CWC (HQ) and was submitted in September, 2013 to National Projects –I Directorate of CWC. The Project is proposed to be constructed on River Ujh which is a tributary of River Ravi, one of the eastern Rivers. As per provisions of the Indus Water Treaty, India has the right to unrestricted use of all the waters of Eastern Rivers namely, Sutlej, Ravi and Beas. In the DPR, the height of the dam was envisaged as 116 m (with Dam top level as 619 m) with FRL as 614 m. The Installed capacity of power house envisaged was of the order of 186 MW.
- b. The DPR was taken up in 131st meeting of the Advisory Committee for Consideration of Techno-Economic viability of Major & Medium Irrigation, Flood Control and Multipurpose Project proposals of MoWR, RD & GR, held on 16-11-2016. Considering the importance of the Project being a National Project, it was agreed "In Principle" by the Advisory Committee. However, it was decided that " a team consisting of concerned officers from CWC and other experts shall visit the project site/area and explore the alternate options with reduced submergence/displacement along with minimum loss of

power and irrigation benefits, so that the potential of east flowing river may be utilized, as envisaged in Indus Water Treaty.”

- c. In pursuance of the decision of Advisory Committee of MoWR, RD & GR, a team of experts from CWC, CEA and JKSPDC, led by the Chief Engineer, IBO, CWC, Chandigarh, visited the Project site on 16-03-2017 and submitted its Report (May 2017) to NP-I Directorate, CWC.
- d. In its Report of May, 2017, it has been advised by the team of experts to construct the dam and other appurtenant structures with FRL of 608 m, however, the actual Reservoir level can be progressively decided based on development of command and actual consumptive use within India.
- e. Secretary (WR, RD &GR) CWC in his e-mail dated 14-07-2017 to Member (WP) has informed that Govt of J&K has conveyed ‘In Principle’ agreement for reduction of dam height and accordingly CWC may prepare modified DPR in consultation with J&K Govt urgently. Secretary (WR, RD &GR) also advised to explore the possibility, in consultation with J&K Govt, of retaining the dam height as originally envisaged while keeping the FRL at 608 m so as to cater for future requirement, if need arises.
- f. Indus Wing, MoWR, RD & GR, vide letter No. Y-18011/1/2016-IT/718 dated 18-08-2017, has also requested Chief Engineer, Designs (N&W) Organisation to give highest priority for design and preparation of revised drawings for the Project.
- g. Govt. of Jammu and Kashmir vide letter No. PW/Hyd/P&S/45/2017-18 dated 14-08-2017 has also conveyed that J&K Govt has accorded ‘in principle’ approval to the execution of the Ujh Multipurpose Project, vide Cabinet Decision No. 145/10/2017 dated 09-08-2017, subject to few conditions. One of the conditions says that ‘the height of the dam will be reduced in a manner so as to ensure minimum displacement /dislocation of the inhabitants’.

All the officers, present during the meeting, appreciated the need of fully utilizing water of eastern Rivers and its tributaries as per provisions contained in Indus Water Treaty. After detailed deliberations, the following decisions were arrived at:

1. Considering the fact that the present site for the dam is an ideal site for locating the dam and no suitable site is available down stream on the Ujh river or downstream of its confluence, there is a need to utilize the present location to its utmost capacity. Keeping this in view, it was decided that the DPR should be modified by keeping the Dam height same, as originally envisaged in the DPR, prepared and submitted by Chenab Division under Monitoring & Appraisal Directorate, CWC, Jammu, during September, 2013 to National Projects-I Directorate of CWC, New Delhi. However, reservoir may be maintained at a lower level, so as to address the issue of submergence / displacement of people. This arrangement would provide an option to raise the storage capacity in future in view of growing demand of water,
2. As recommended by Expert Committee constituted by NP-I Directorate, CWC, the FRL may be brought down to 608 m to reduce submergence from 41 sq km to around 34.50 sq km. The MWL may be kept 1.5 m above the FRL i.e. 609.50 m. However, final MWL may be fixed based on routing studies. This will require re-designing the spillway

arrangement and the design of gates. All other levels such as MDDL, TWL etc may be kept as same as envisaged originally in the DPR, submitted in September, 2013.

3. Design discharge for power generation may also be taken as same as what has been envisaged in the original DPR.
4. It was agreed that CEA may be requested to carry out the revised Power Potential studies based on the revised FRL of 608 m by keeping MDDL and TWL as same as envisaged in the original DPR. However, CEA may keep same number and size of the Generating unit to cater for future requirement.


(एम. रमेश कुमार)
निदेशक

TO

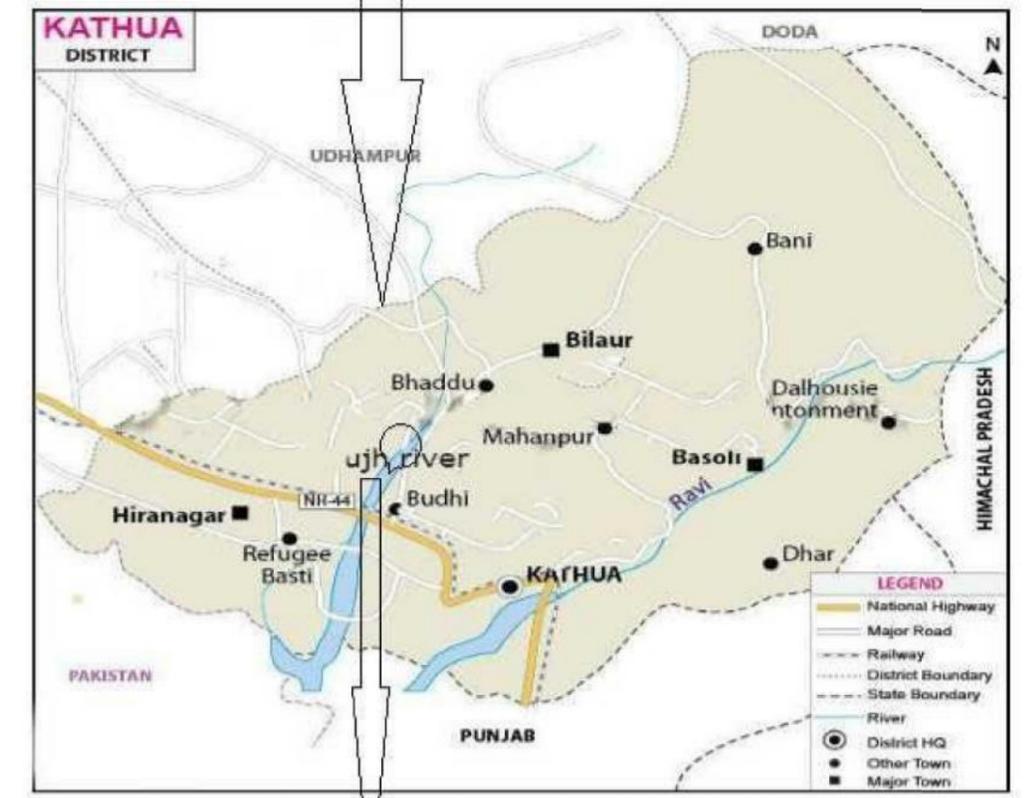
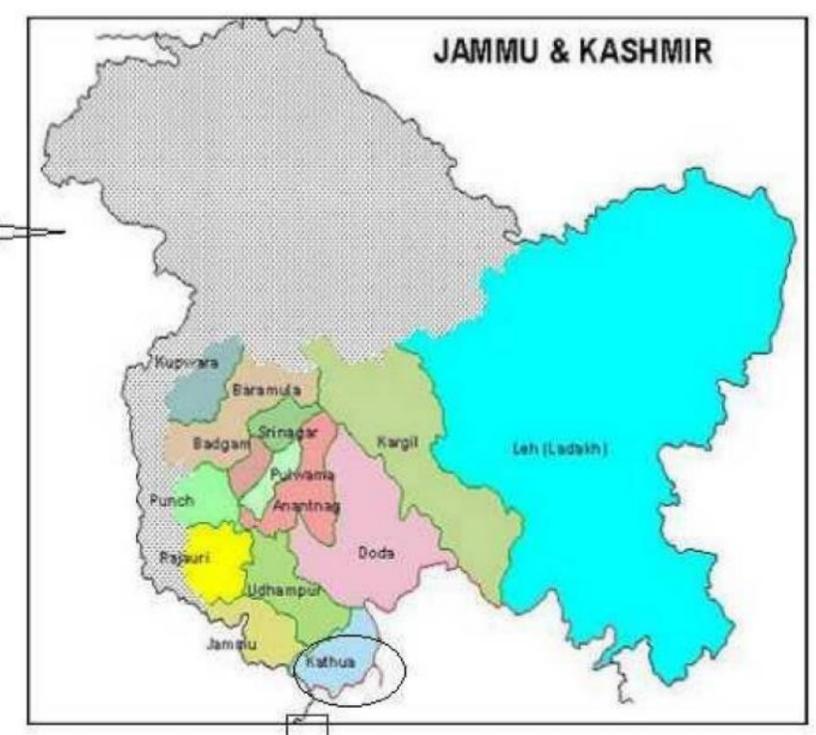
1. Chief Engineer, IBO, CWC, Chandigarh
2. Chief Engineer, Designs (N&W), CWC, New Delhi
3. Director, CMDD (N&W), CWC, New Delhi.
4. Director, Gates (N&W), CWC, New Delhi.
5. Director, BCD (N&W), CWC, New Delhi.
6. Director, HCD (N&W), CWC, New Delhi.
- ✓ 7. Director, M&A, CWC, Jammu

Officers present during the meeting:-

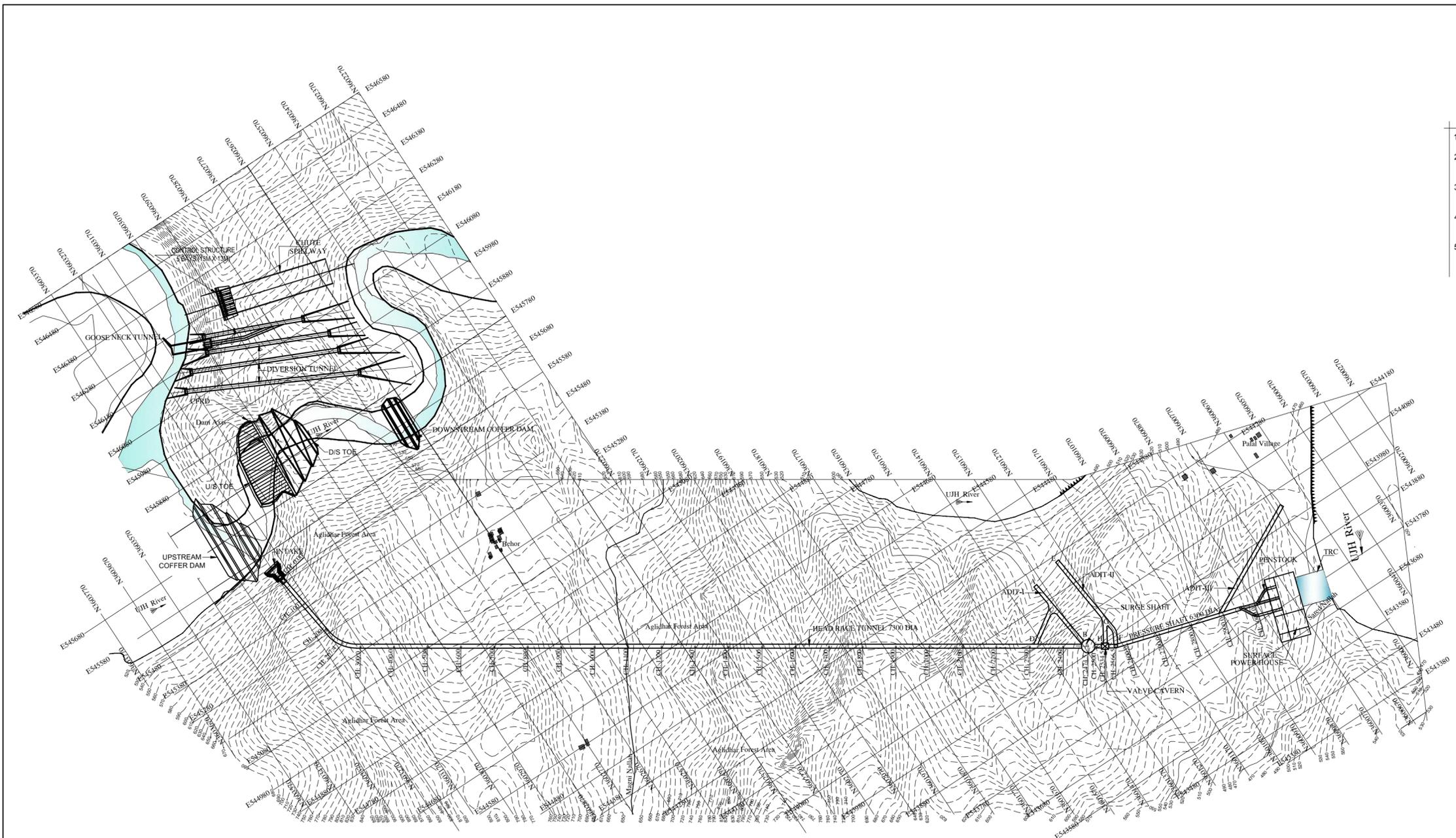
S/Shri

1. Atul Jain, CE (IBO), CWC, New Delhi.
2. T.K. Sivarajan, CE, Designs (N&W), CWC, New Delhi
3. Saibal Ghosh, Director, CMDD (N&W), CWC, New Delhi.
4. M. Ramesh Kumar, Director, Emb (N&W), CWC, New Delhi.
5. Waseem Ashraf, Director Gates (N&W), CWC, New Delhi.
6. P. Devender Rao, BCD (N&W), CWC, New Delhi.
7. Yoki Vijay, Director, M&A, CWC, Jammu
8. Girish Kumar, HCD (N&W), CWC, New Delhi.
9. Rajesh Gupta, DD, CMDD (N&W), CWC, New Delhi.
10. Kamlesh Jain, DD, M&A, CWC, Jammu
11. Paneerselvam, DD, HCD (N&W), CWC, New Delhi.
12. Aneppu Praveen, AD, BCD (N&W), CWC, New Delhi.
13. A. Raghvendra, AD, CMDD (N&W), CWC, New Delhi
14. N. Karthikeyan, AD, CMDD (N&W), CWC, New Delhi

LOCATION MAP OF UJH MULTIPURPOSE PROJECT



UJH MULTIPURPOSE PROJECT
LATITUDE-75⁰⁵' to 75⁰³⁵'
LONGITUDE-32⁰³³' to 32⁰⁴⁶'



PLAN

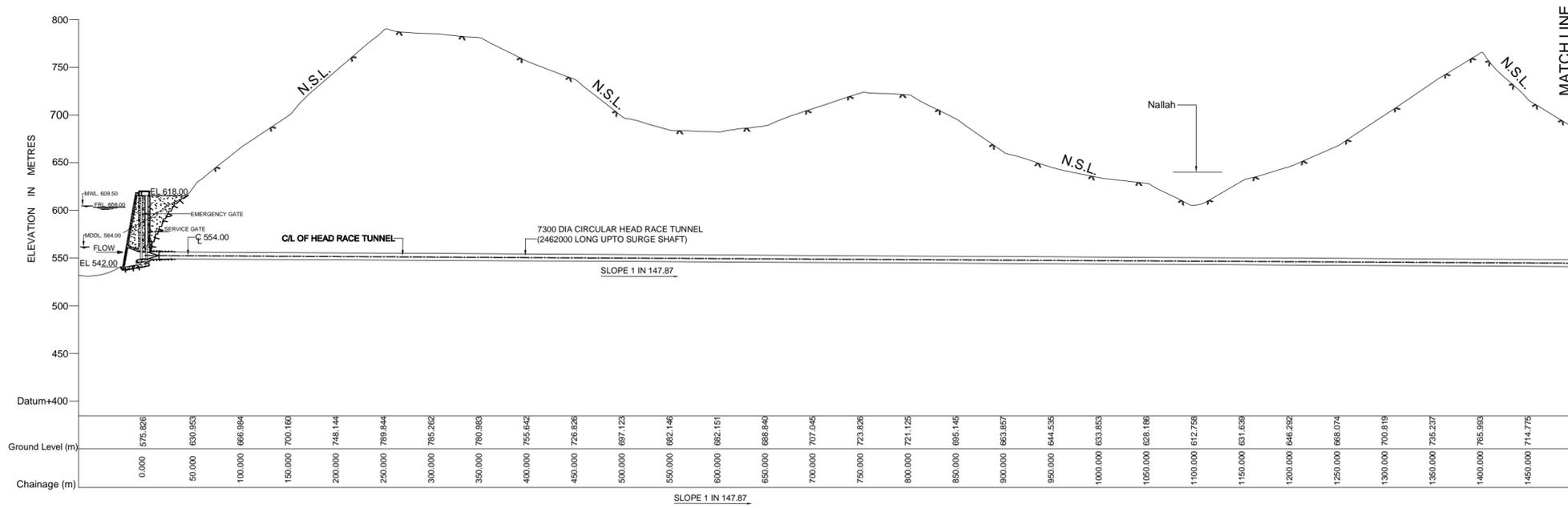
- NOTES:-**
1. All dimensions are in millimetre and elevations in metre.
 2. No dimension shall be measured from the drawing. Only written dimensions shall be followed.
 3. This drawing shall be read in conjunction with Drg no. UJH - 5220-DPR-2002.
 4. This drawing has been prepared on the basis of data supplied by project authority.
 5. For details of individual components of the project, refer relevant drawings

SALIENT FEATURES	
1. POWER INTAKE DETAILS	
a) F. R. L.	608.00m.
b) M. W. L.	609.50m.
c) M. D. L.	564.00m.
d) % OF INTAKE	EL 554.00m.
e) INTAKE INVERT LEVEL	EL 550.35m.
2. HEAD RACE TUNNEL	
a) No.	1 No.
b) DIAMETER	7.30 m.
c) LENGTH	2462.00m
d) DISCHARGE	153.00cumec.
3. SURGE SHAFT	
a) DIAMETER	25.00m (CIRCULAR)
b) HEIGHT	86.0 m
4. PRESSURE SHAFT	
a) No.	1No.
b) DIAMETER	6.30m
c) LENGTH	53.278 m TOP HORIZONTAL 31.40 m VERTICAL BEND (VB-1) 44.85 m VERTICAL 31.40 m VERTICAL BEND (VB-2) 365.70 m BOTTOM HORIZONTAL UP TO BIFURCATION
AFTER BIFURCATION:	
d) No.	3Nos
e) DIAMETER	4.50m/4.0m
f) LENGTH	93.63 m
5. ADIT- D SHAPE	
a) No.	3Nos.
b) SIZE	7.0 m x 7.250 m
c) LENGTH ADIT-I	210.0m
AB	116.7m
d) LENGTH ADIT-II	311.8m
EF	52.40m
f) LENGTH ADIT-III	367.50m
6. POWER HOUSE	
a) LENGTH	121.275 m
b) WIDTH	38 m
c) HEIGHT	43 m
d) CAPACITY	3X 62 mw
e) % OF UNIT	452.50 m
f) SPACING OF UNITS	21.5 m
8. TAIL RACE CHANNEL	
a) T. W. L. (MAX.)	458.00 m
b) T. W. L. (NORMAL)	456.00 m
c) LENGTH	100 m

SL.No.	CHAINAGE	LOCATION	NORTHING	EASTING
1.	00.00	INTAKE	3603278	545494
2.	267.41	BEND	3603232	545226
3.	2474.5	SURGE SHAFT	3601344	544006
4.	2900.0	ADIT- III	3600970	543859

FOR D.P.R ONLY

 <p>भारत सरकार GOVT. OF INDIA केन्द्रीय जल आयोग CENTRAL WATER COMMISSION</p>		
<p>उच्च बहुउद्देशीय परियोजना (ज.क.) UJH MULTIPURPOSE PROJECT (J & K)</p>		
<p>GENERAL LAYOUT P L A N</p>		
DESIGN.	CHKD.	SUBMTD.
(Rajesh Gupta)	(Narendra Singh)	(Girish Kumar)
DRWN.	INSPD.	RECMD.
(Rakesh Sharma)	EMB(N&W)	(J.Chandrasekhar Iyer)
TRACED.	CMDD(N&W)	APPD.
		(S.K.G.Pandit)
FILE NO.	NEW DELHI	DRG. NO.
HCD (N&W), 8 / 8 / 2013.	MARCH -2013	UJH - 5220-DPR-2001



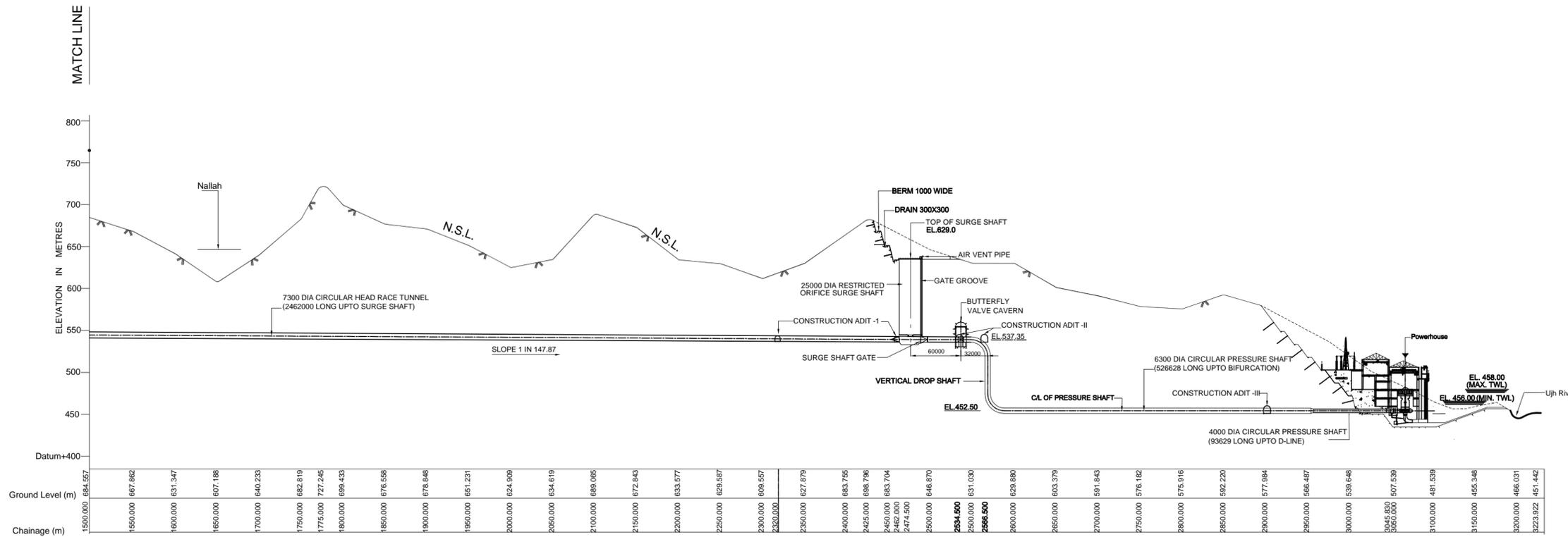
LONGITUDINAL SECTION ALONG THE WATER CONDUCTOR SYSTEM

NOTES:-

- All dimensions are in millimetres and elevations in metres, unless otherwise specified.
- No dimension shall be measured from this drawing. Only written dimensions shall be followed.
- This drawing is prepared on the basis of data supplied by CWC Jammu vide their letter no. CD/ DB/ E- 12/ 2009/4254-55 dated 24. 11. 2012.
- This drawing is prepared on the basis of GSI report supplied by CWC Jammu vide their letter no. CD/ DB/ E- 12/ 2009/1433-34 dated 02. 05. 2012.
- For Concrete Face Rock Fill Dam, Spillway and hydromechanical details, refer relevant drawings.
- For details of individual components of the project, refer relevant drawings.

REFERENCE DRAWINGS :

- General Layout Plan ---- UJH - 5220 - DPR - 2001.



LONGITUDINAL SECTION ALONG THE WATER CONDUCTOR SYSTEM

FOR D.P.R ONLY

DD DIR.	भारत सरकार GOVT. OF INDIA	
AD	केंद्रीय जल आयोग CENTRAL WATER COMMISSION	
PARTICULARS	उष्ण बहुउद्देशीय परियोजना (ज.क.) UJH MULTIPURPOSE PROJECT (J & K) L - SECTION (POWER INTAKE, HRT, SURFACE POWER HOUSE AND TRC)	
DESIGN.	CHKD.	SUBMTD.
(Rajesh Gupta)	(Narendra Singh)	(Girish Kumar)
DRWN.	INSPD.	RECMD.
(Rakesh Sharma)	EMB(N&W)	(J.Chandrashekhar Iyer)
TRACED.	GATES(N&W)	APPD.
		(S.K.G.Pandit)
FILE NO.	NEW DELHI	DRG. NO.
HCD (N&W) 8 / 8 / 2013	MARCH -2013	UJH -5220-DPR -2002

UJH MULTIPURPOSE PROJECT
ABSTRACT OF COST ESTIMATE

PL: April,2013
Amount in Rs. Lakh

Sl. No.	DESCRIPTION	Unit-I	Unit-II	Unit-III	Total Cost
DIRECT CHARGES					
I	WORKS				
	A- Preliminary	1730.87	1159.47	682.33	3572.67
	B- Land	111457.76	9565.15	231.00	121253.91
	C- Works	92491.61			92491.61
	D- Regulators		4930.45		4930.45
	E- Falls		410.22		410.22
	F- Cross Drainage Works		15363.77		15363.77
	G- Bridges		223.84		223.84
	H- Escape		55.00		55.00
	J- Power Plant Civil works			30997.72	30997.72
	K- Buildings	18515.00	5644.00	6831.00	30990.00
	L- Earth Works		90157.17		90157.17
	M- Plantation	20.12	72.67	23.82	116.61
	O- Miscellaneous	3230.26	0.00	0.00	3230.26
	P- Maintenance	1136.80	1192.69	720.96	3050.45
	Q- Special T&P	342.00	141.00	194.90	677.90
	R- Communication	2673.00	962.50	1028.09	4663.59
	S- Power Plant Electromechanical System			36037.30	36037.30
	U- Distributaries		951.28		951.28
	V- Watercourses		570.77		570.77
	X- Environment & Ecology	93.50	281.60	75.23	450.33
	Y- Losses on stock	284.20	298.17	180.25	762.62
	Total of I - Works	231975.12	131979.75	77002.59	440957.46
II	ESTABLISHMENT	11684.01	6626.71	7927.61	26238.33
III	TOOLS & PLANTS	1159.88	659.90	385.01	2204.79
IV	SUSPENSE	Nil	Nil	0.00	Nil
V	RECEIPTS & RECOVERIES (-)	-607.70	-281.53	-210.65	-1099.88
	TOTAL DIRECT CHARGES	244211.31	138984.83	85104.56	468300.70
INDIRECT CHARGES					
a	Capitalisation of abatement of land	2378.67	331.46	8.01	2718.14
b	Audit & Account Charges	2147.44	1649.75	192.51	3989.70
	TOTAL INDIRECT CHARGES	4526.11	1981.21	200.52	6707.84
TOTAL COST OF PROJECT		248737.42	140966.04	85305.08	475008.54
Say Rs. In Crore					4750.00